Introduction to Environmental Economics

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Lecture – 26
Consumer Demand for Environmental Goods – I

In this lecture, I will explain Consumer Demand for Environmental Goods. You have studied that most of the consumer goods are non-rival and non-excludable; therefore market does not exist in case of environmental goods. So, therefore, it is a big challenge before the environmental economist, how to develop the demand theory for those goods which are not traded in the market. So, question here is can we determine the demand of a product which is not having any price or not traded in the market.

So, the main focus of this lecture is actually on how to develop the demand for environmental goods which are in most of the cases not traded in the market.

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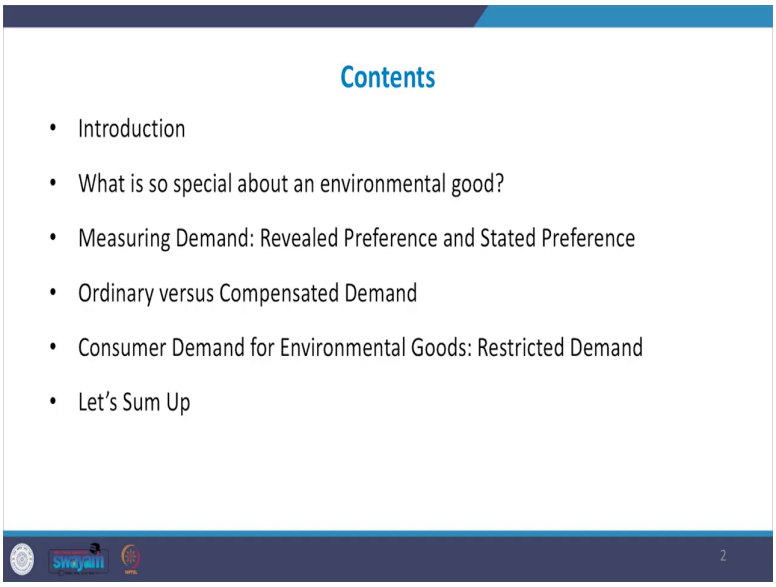

In this lecture, I will explain you what is so special about the environmental goods, how to measure the demand. There are two approaches to measure demands, one is revealed preference approach and second is a stated preference approach. These two approaches will be discussed in brief because separate discussion will be held when you will study about environmental valuation on these approaches. Then I will also explain you the two types of demand, one is ordinary demand and other is the compensated demand. In fact, developing the compensated demand is necessary to further study the environmental goods demand.

Then, you will also study about the environmental goods demand function which is known as restricted demand function and at the end the lecture will be concluded.

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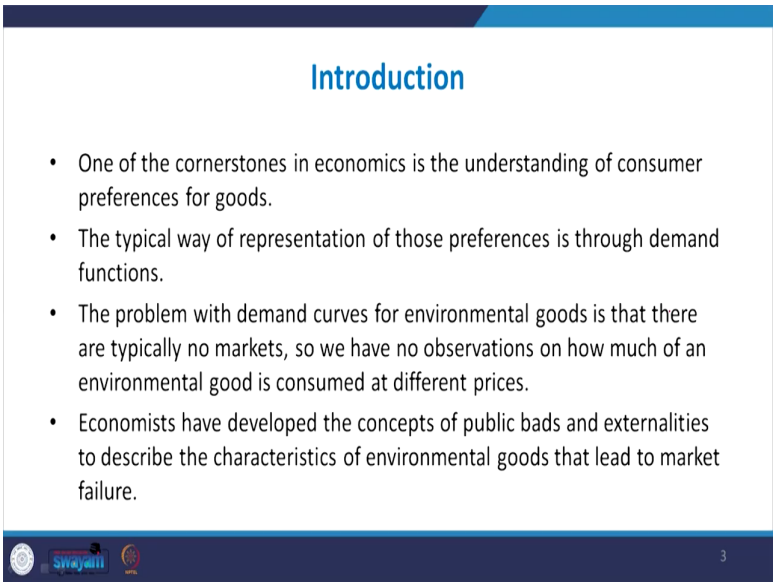

One of the cornerstone in economics is the understanding of consumer preferences for different kinds of goods and services. The typical way of representing of those preferences is through demand functions. So, we construct various demand functions to represent the relationship between price and other determinants and quantity demanded.

The problem with demand curves for environmental goods is that there are typically no markets as I already told you. So, we have no observation on how much of an environmental good is consumed at different price level. As in theory of demand we try to construct the demand curve taking different quantities of product with reference to the change in the price of the product. But since in case of environmental goods, we do not have the price, so it becomes very difficult to construct the demand curve taking price and quantity. Economists

have developed the concept of public bads and externalities to describe the characteristics of environmental goods that lead to market failure.

We have made detailed discussions earlier on the different kinds of environmental goods and I also explain the concept of externalities. So, due to externalities and the public bads which are non-rival and non-excludable market fails to deliver these either good product or bad products. So, therefore, it is a big challenge for the environmental economist to develop the theory of demand for environmental goods.

What is so special about an environmental good?

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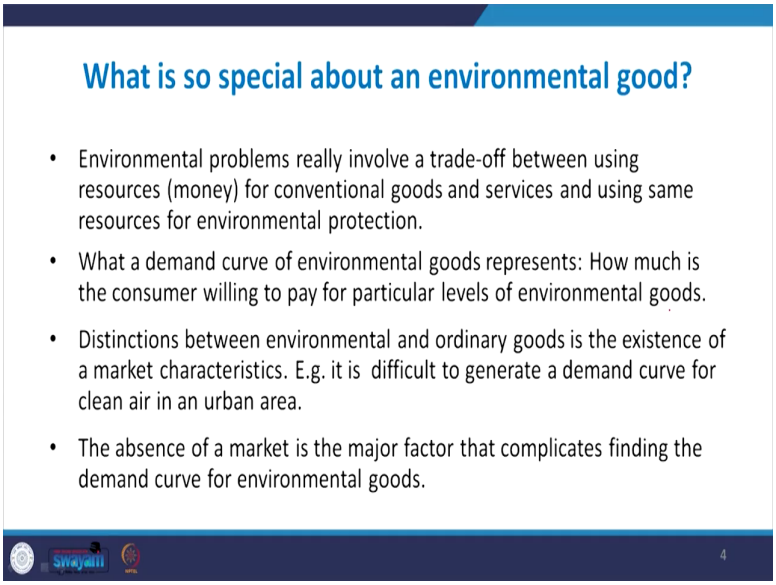

Environmental problems really involve a tradeoff between using resources, resources are like money and other financial resources for conventional goods and services and using the same

resources for environmental protection. So, as we study in economics that resources are limited and these limited resources can be put into various alternative uses. So obviously, there is a tradeoff between the demand for conventional goods and demand for environmental goods. If we are investing more money to creating the conventional goods, less money will be available for generating or creating the environmental quality. So, there is a tradeoff between conventional goods and environmental goods.

What a demand curve for environmental goods represents, how much is the consumer willing to pay for a particular level of environmental goods; These things are very very important to understand the demand for consumer goods. The distinctions between environmental ordinary goods is the existence of a market characteristics.

For example, it is difficult to generate a demand curve for clean air in the urban area. Suppose, if majority of consumers are willing to pay for the clean air and if someone is interesting to produce clean air in a particular locality environment how it will be done? Because if entire environment is cleaned through making some investments some may be willing to pay for clean air, some may not be willing to pay. And therefore, since the clean air is a non-rival and non-excludable product market will not work in case of clean air. Similarly, there are a number of others environmental good product as well as bad products, like pollution where market fails to deliver due to the nature of environmental goods and services.

So, absence of the market is the major factor that complicates finding of the demand curve for environmental goods. So, a specific characteristics of the environmental goods make it difficult to create the demand curve for environmental goods and these special characteristics are that most of these goods are non-rival non-excludable and due to this private businessman may not take initiative to produce these kind of products.

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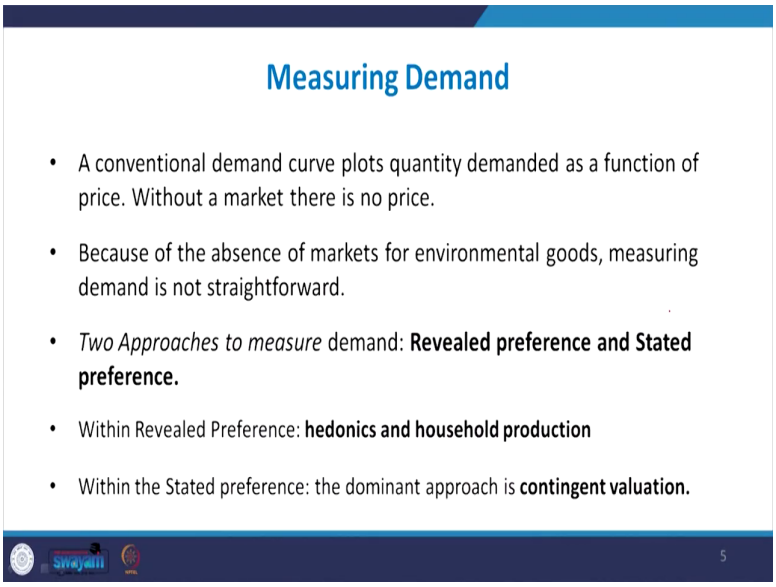

Now, let me explain you how the demand is measured. A conventional demand curve plot the quantity demanded as a function of price, without a price they without a market there is no price. So, if price system is not prevailing, then demand cannot be determined in the market. So, without a market the price will not work.

Because of the absence of the market for environmental goods, measuring demand is not straightforward. Even then there are two approaches to measure the demand, one is revealed preference approach and other is the stated preference approach, in economics in micro economics you might have studied these two approaches. Within revealed preference approaches, there is hedonic approach and household production approach and within the stated preference, one of the most dominant approach is contingent valuation method. So, we will make a brief discussion on these two approaches.

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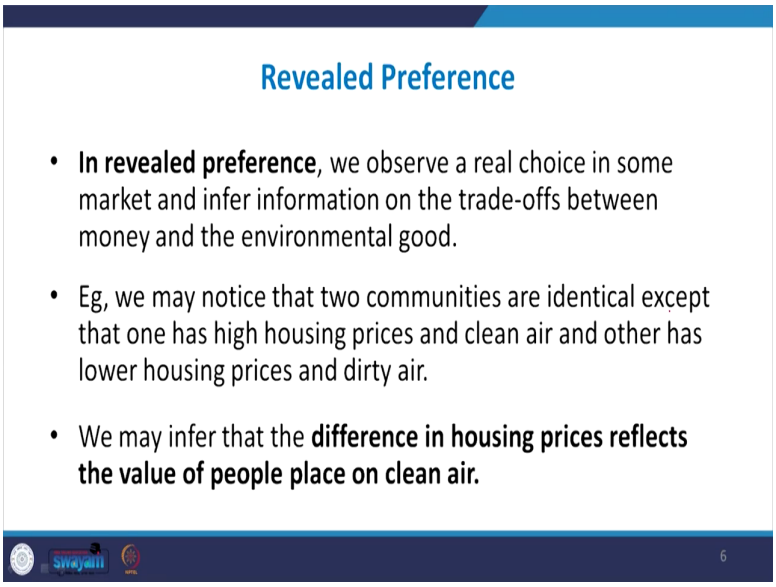

Let me first explain what is a revealed preference approach. In revealed preference approach, we observe a real choice in some market and infer information on the tradeoff between money and environmental goods. Actually revealed preference approach is based on the real data, real behavior of the market and in this approach, we study the tradeoff between money and various goods. If you want to buy a particular product, you have to pay the price of the product, so there is a tradeoff between money and quantity of the product produced. For example, we may notice that two communities are identical except that one has a high housing prices and clean air and others has lower housing prices and dirty air.

So, here in revealed preference approach. Suppose, if we wanted to measure the value of environment, then what we can do is that we can compare the two localities and a house of the same dimension same quality price can be monitored or can be compared. For example, in a one locality the air is good quality of our environment is good and in other localities the

quality of environment is very poor dirty. So, now, if in one locality the same, all other things remain same only the difference is of the quality of environment; if in one locality the same type of house is costing say 60 lakh where the quality of air is good and in another locality where the environment is dirty quality of air is poor the cost of the same dimension of same quality of houses say 40 lakh then difference between 60 and 40 is actually due to the value attach to the environment by the consumer.

So, in this way we can see how much value is attached by a consumer to the environment while buying a conventional good. So, that is called revealed preference approach. And we may inform that the difference in housing price reflect the value of people actually attached to the clean air.

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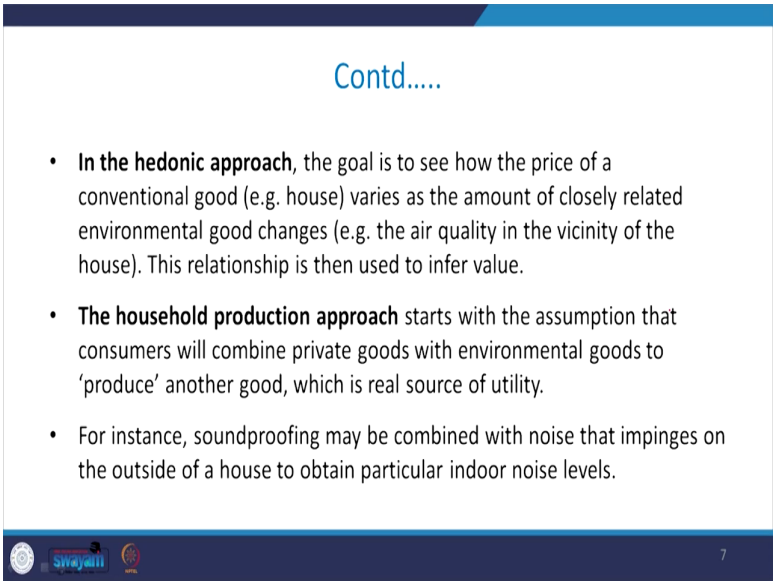

Within the revealed preference approach there is hedonic approach. The goal is to see how the price of a conventional good varies as the amount of closely related environmental goods. I already explained you by an example of house or price to in two different localities like air quality in the vicinity of house. This relationship is then used to inform value of the same conventional product in two different conditions. The household production approach, it starts with the assumption that consumers will combine private goods with the environmental goods to produce another good which is the real source of utility.

So, in a household production approach two products are combined and third product is generated. For instance, soundproofing may be combined with noise that impinged on the outside of a house to obtain particular indoor noise level. So, in household production approach conventional product is combined with another environmental related products and a third product is generated and then we can see how the price is varying.

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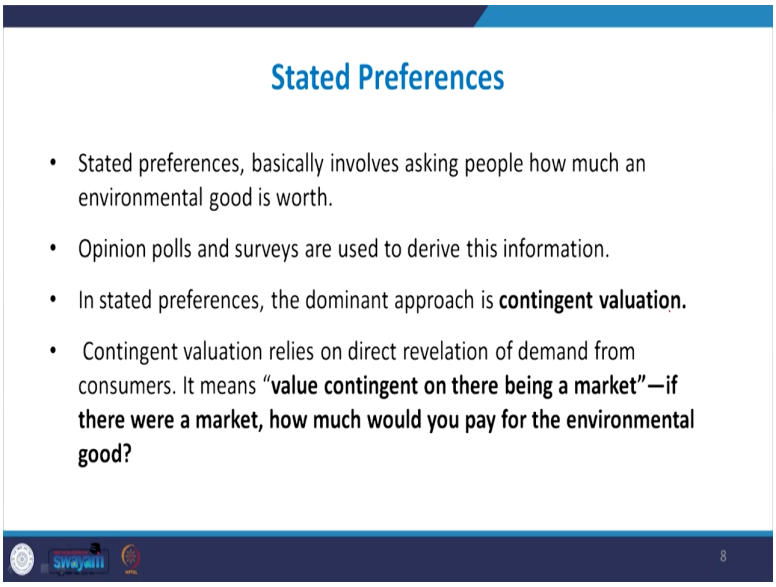

Then second approach is a stated preferences approach. In a stated preference approach, as I already told you contingent valuation method is very frequently used by the researcher to estimate the value of environment.

In contingent valuation method, opinion poll and surveys are conducted to collect the information. In this approach, we directly go to the consumer, ask from the consumers how much they are willing to pay or how much they are willing to accept. So, willing to pay and willing to accept, as compensation if there is a loss of the environmental quality due to some interventions made by the government, so how much they are willing to take as compensation. And if they wanted to improve the environment, and if some investment is required to improve the environment in the locality of some consumers how much they are willing to pay.

For instance, if in a village underground or drainage is to be constructed, so that benefit to the people living in the village, so a survey can be conducted if this demand is created, because right now demand is not adjusted if this demand is created how much they are willing to pay for the construction of drain. And different households depending upon their intensity of desire for that particular product or their income level, they may state different values. And then after cleaning the data out layers may be removed and then we can estimate how much is the value attached to a particular environmental product by the localities and on the basis of that we can estimate the value of environment. Same things happened in case of many environmental products like creating a park or preserving reserve forest etcetera.

So, all these environmental products which can be created with some investments then willingness to pay can be assessed through the consumer survey. And exact meaning of contingent valuation is value contingent on there being a market. It means that if there were a market how much would you pay for the environmental goods. Although in some cases market does not exist, but if market is created for environmental good how much you are willing to pay that can be assessed through contingent valuation method, and in estimating the environmental values in estimating the ecosystem services this contingent valuation method is very frequently used by the researcher. A detailed discussion will be made in another topic when you will study about environmental valuation, ok.

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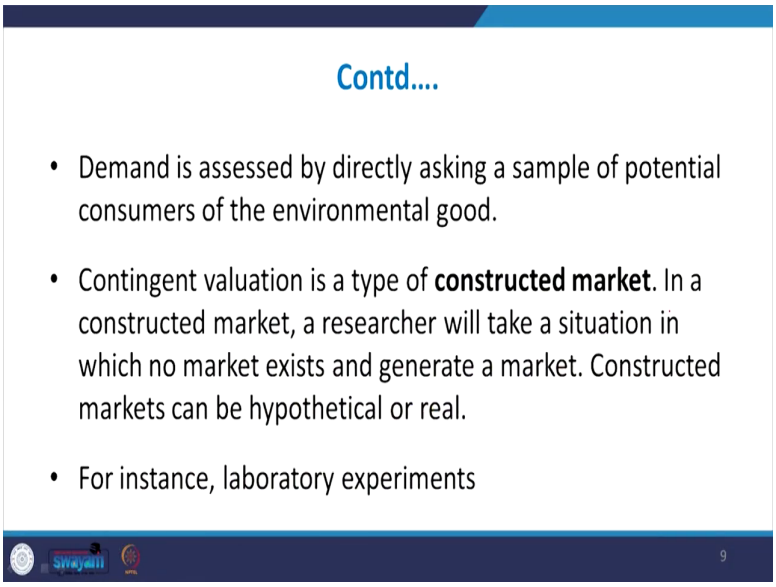

So, ah contingent valuation is a type of constructed market. In a constructed market a researcher will take a situation in which no market exists and generate a market. And constructed market can be hypothetical or sometimes it may be real. Sometimes you might have seen on TV some kind of experiments are made they are a product is displayed and prices are how much is a price of your particular product. It means that you are not knowing the price of the product, but you are steady attaching the value to the product and different consumers may cite different price for the same product.

So, similarly laboratory experiments can field surveys can be done to know how much the consumers are willing to pay for a particular environmental goods and on the basis of that demand is assessed.

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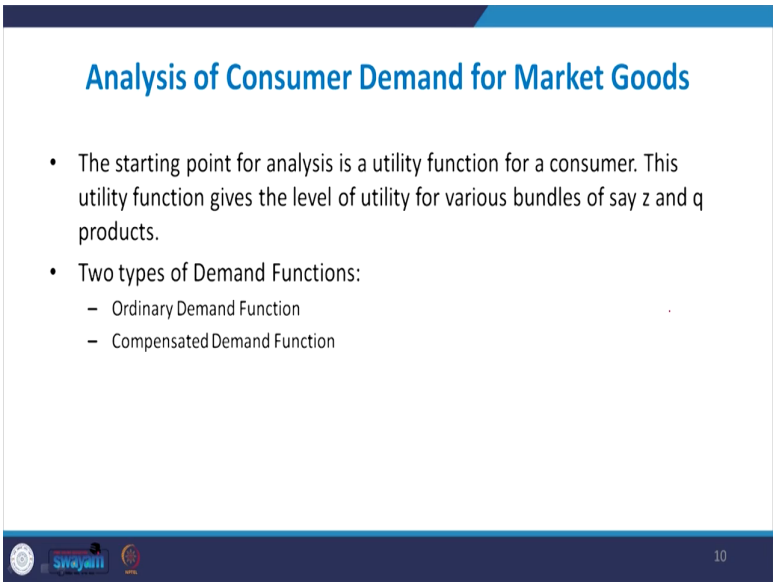

Now, we can analyze the consumer demand for first for market products and while studying the consumer demand for conventional products we can estimate the consumer demand by two approaches, one is ordinary demand approach or ordinary demand function, and second is compensated demand function. So, let me now explain these two concepts because they are very very important for the further discussion on the environmental goods demand.

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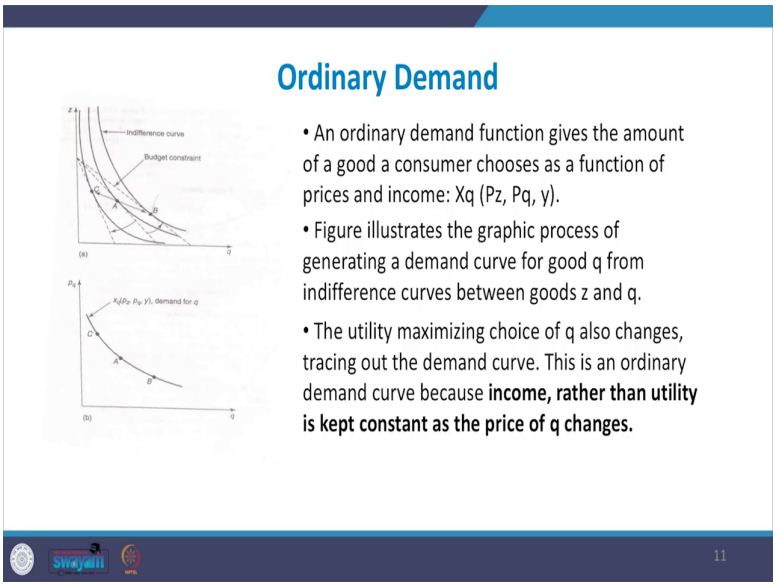

Let me first explain the ordinary demand. So, you can draw ordinary demand on the basis of the consumers utility an ordinary demand function gives the amount of a good a consumer chooses as a function of price and income. For example, if we have ordinary demand for q product, then q product demand is the function of price of q product, how much income the consumer is going to spend on q and other conventional product when we are using the indifference curve that can be explained by a graph you can see from the slide.

Initially, we can see that the utility is maximized at the point where the slope of indifference curve is tangent to the price ratio of the two product price ratio of z and q products and the price ratio is tangent at the initial indifference curve at point a. So, at point a utility or satisfaction is maximized.

Now, if price of the product q declines and budget of the consumer remains same and price of z also remain same, then the slope of the price line or price ratio will change and new price ratio is now tangent to higher indifference curve at point b. So, moment of consumer from point a to point b is due to the change in the price of the product. Since, now price of q is reduced, price of the product q falls then quantity demanded of that product will also increase depending upon the nature of the product. So, movement from a to b means the consumer reach at the higher level of utility or higher level of welfare.

Similarly, consumer may also reach to the lower level of welfare if price of the product q falls. And, in this graph you can see when the slope of the price line change and when the price of the product q increases then the new equilibrium will be achieved at point c, and at point c the welfare of the consumer is lower than the initial one and also lower from the point b where the welfare is high because of decline in the price of q product.

Now, with these different points you can draw the demand curve for q product and the graph below shows the demand curve for q product, on vertical axis price of q is taken and on vertical horizontal axis price of quantity of q is taken. And now you can see at point a how much is the quantity, you can easily determine the quantity and price is already known because we are taking the different prices to measure the optimum level of consumption or utility of the consumer on the indifference curve.

So, point a on the demand curve is one point corresponding to the initial indifference curve and initial budget line. When the price of the product q declines then consumer reach at the higher level of satisfaction and now consumer is able to consume more of q because now relatively q is cheaper than z, so substitution income effect would lead to increase in the quantity demanded of q and now consumer will reach at the b point that is corresponding to the b point in the indifference curve.

But when the price of q increases, then the welfare of consumer's falls and consumer reach to the lower level of indifference curve at point c and corresponding to this c point we have a c point on the demand curve. So, by adding all these 3 points you can have a demand curve and

this demand curve is showing inverse relationship between price of the product and quantity demanded. So, this is called ordinary demand curve.

So, in ordinary demand curve most important things is that in ordinary demand curve income is kept constant and utility is varying when the price of the product changes. So, with the change in the price of the product and income is given then welfare of the consumer also varies. So, a, b, c these three points on the ordinary demand curve indicate the different level of utility a different level of welfare of the consumers.

Point c shows the lowest level of welfare and point b shows the highest level of welfare, because here income is kept constant and utility is varying when the price of the product changes. So, this is ordinary demand curve.

Now, look at the compensating or compensated demand curve. In case of compensated demand curve major aspect is that the consumer is neither worse off nor better off. So, we want to keep the welfare of the consumer constant.

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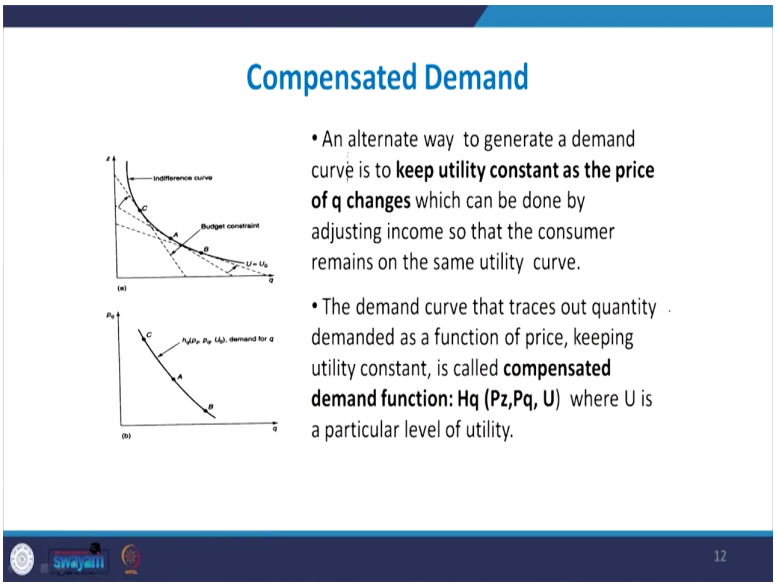

Consumer should have the same level of satisfaction and therefore, in this graph we have a given level of utility and given level of utility is shown by the indifference curve. And now, if price ratios of the two products changes and consumers may move from one point to another point on the same demand curve. For instance, when the price ratio changes then another point on the same indifference curve is b, and when again the price ratio changes then another point on the same indifference curve is c.

So, moment from a to b or b to c on the same indifference curve is due to change in the price ratio of the two products, but here utility is same. So, what happens? When you want to keep the utility constant and price is increasing or decreasing then you have to compensate the consumers in terms of providing additional income, so that the consumer may be able to maintain the same level of economic welfare.

So, this compensated demand curve is drawn from the same indifference curve taking the different price ratios and although when you look at the compensated demand curve and ordinary demand curve graph appears to be same, but they are not actually same. The c, a and b all the 3 points on the ordinary demand curve indicate the different level of utility. But on the compensated demand curve c, a and b all these 3 points shows the same level of utility means given level of utility can be achieved by the consumer using the different combination of two product z and q.

So, basic difference in case of compensated demand curve and ordinary demand curve is in compensated demand curve utility, utility is kept constant. So, welfare is kept constant and if there is a change in the price of the product then consumer is compensated if price falls, then the additional tax can be imposed on the consumer to cut the income or if price increases then welfare may decline, so in order to maintain the welfare of the consumers then additional income may be given.

So, why this compensated demand curve is more important? Because for policy making it is very very useful, sometimes the welfare of poor people declined due to rising prices, food inflation etcetera the when inflation increase and if they know correspondent increase in the income of the poor people then poor people would not be able to maintain the same level of consumption or same level of welfare. So, so additional income must be given in form of various subsidies or any other form to compensate the consumer, so that the consumer should not be worse off nor better off. So, in case of compensated demand curve consumer is neither worse off nor better off, but in case of ordinary demand curve when the price falls consumer is better off when the price increases consumer is worse off.

And now, these two demand curve can be represented by two different equations. I use here Hq for compensated demand curve and Xq for ordinary demand curve giving the price of z, q and utility.

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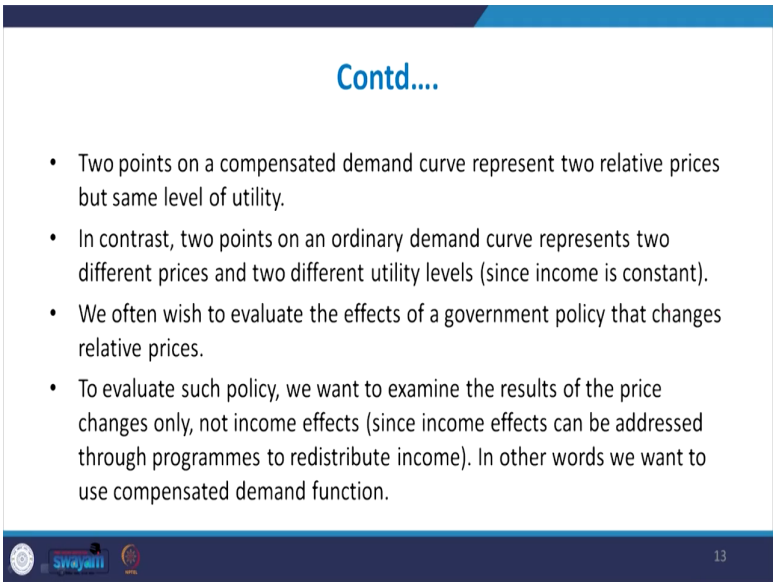

So, what can you understand from these two concept of demand? First is the two points on the compensated demand curve represent two relative prices, but same level of utility. So, relative prices change when we move from one point to another point on the same demand curve in case of compensated demand curve, but utility is same. In contrast two point on an ordinary demand curve represents two different prices and two different utility level since income is constant. Try to understand since income is constant, so change in the price of the product will lead to change in the utility of the utility achieved by the or obtained by the consumer.

We often wish to evaluate the effects of a government policy that changes the relative prices. To elevate such policies we want to examine the results of the price changes only not on income effects, since income effects can be addressed through program like reduced

redistribution of income. In other words, we want to use compensated demand function or to compensate the consumer due to increase in the price of the product.

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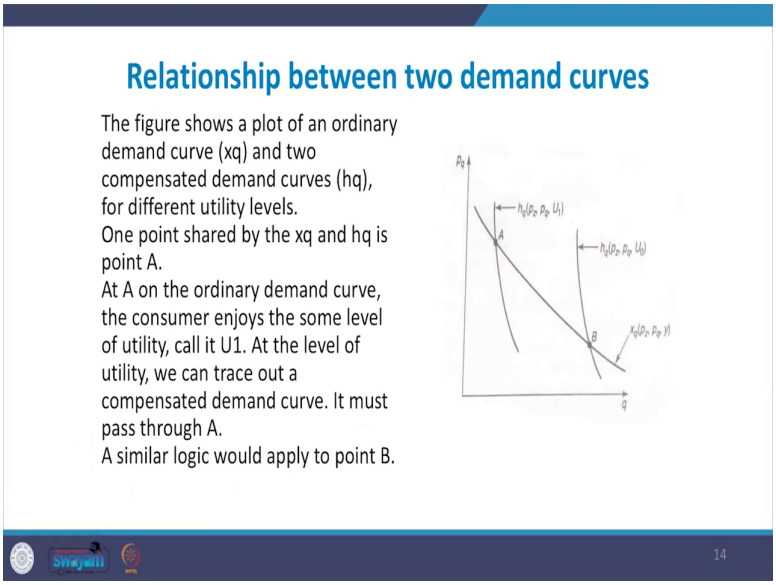

Now, what is the relationship between these two concepts of demand? From this graph you can see that every point on the ordinary demand curve has one compensated demand function. Like, A point on the ordinary demand curve is corresponding to one compensated demand function that is hq bracket Pz, Pq, U 1 when utility is U 1. Similarly, if utility is U 2 or U 0, then at B point hq, Pz, Pq, U 0 is another compensated demand function with respect to point B. So, in nutshell you can see that on each point on the ordinary demand curve there would be one compensatory compensating demand function. Remaining part of this topic we will be discussed in the next lecture.