Microeconomics: Theory & Applications
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Lecture - 20
Price Change & Consumer Welfare (Part - 3)

Hello! Welcome back to the lecture series on Microeconomics. In this lecture, we are going to study two different things. Here, we are talking about price, change of one commodity and we are interested to see what is happening to that vary commodity whose price is changing but you probably have seen that there is an impact of price change of a commodity on the other goods demand as well. Now, let us going to study a concept which will help us analytically model that or measure that and we are going to discuss how the consumer is going to compare two different consumption bundles in two different time periods when prices change.

So far, we have discuss the case of price change in one single period, but if there are two, three or more periods then prices of course will change due to several reasons and how then consumer is going to compare consumption bundles. That is very interesting question applied economic question and we are going to study this in the lecture. We can now talk about a concept called cross price elasticity. In the case of price consumption curve, we have seen as price of commodity one falls, there is an impact on consumption of commodity too as well. So, theoretically we can explain via cross price elasticity.

Cross price elasticity is going to be defined as percentage change in commodity 2 due to a percentage change in price of commodity 1. Let me repeat, in the case of cross price elasticity, we can define this concept as percentage change in consumption of commodity 2 due to percentage change in price of commodity 1. Now, depending upon this concept we can classify various commodities in three different groups; namely complementary, substitute and independent. Now, we are going to look at these cases.

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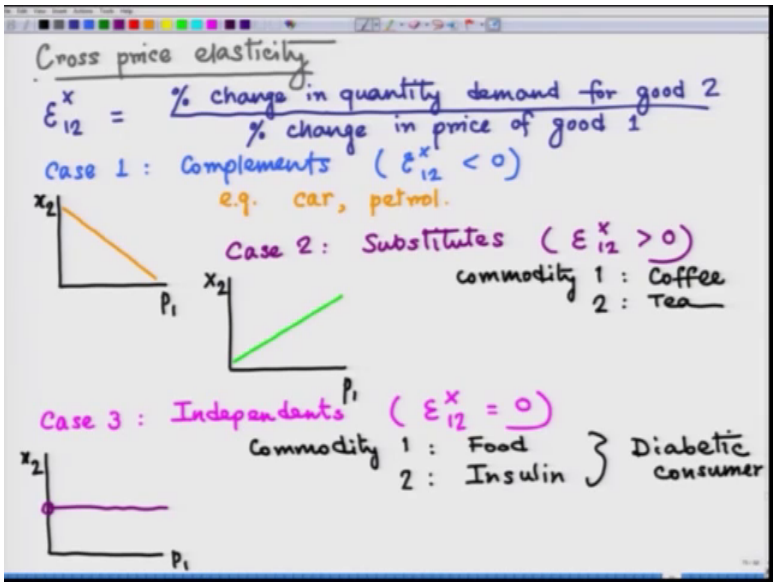

Now, we are going to start with case number 1 which is the case of compliments. Now, in the case of compliments the value of this cross price elasticity will be negative. Now, what could be the example of compliments? Think about petrol, diesel, this kind of fossil fuels and cars these are complementary goods. So, if demand for cars increase in an economy that will lead to an increase in the demand for fossil fuels and that may rise the price of fossil fuels petrol, diesel etcetera. So, these commodities are complementary as they are consumed together.

Now, if we have these kind of goods, let me see how can we represent these concept graphically. So, in this case, we can have a very simple graph where we plot price of commodity 1 along the horizontal axis and consumption of commodity 2 along the vertical axis and as the elasticity we have seen negative we can have a downward sloping curve depicting the relationship between price of commodity 1 and consumption of commodity 2. The example, we have already discussed say car and petrol.

Now, let us going to talk about case number 2 which is the case of substitutes; for the substitutes these cross price elasticity will take positive values. What could be the example of substitutes? I can give you two examples; one could be you know the case of butter and margarine and one could be the case of tea or coffee. So, if price coffee goes up in the market, then the consumer tends to substitute coffee with tea because then tea becomes a relatively cheaper item. So, in that case you know what would be the graph

look like? So, let us draw a similar graph that we have drawn in the case of complements before. So, we are going to have p 1 and then we are going to plot x 2.

Now, let us assume my commodity 1 is coffee and commodity 2 is tea. So, if the price of coffee increases as there substitute goods, we can expect demand for tea will also increase in the market. So, we are expecting some kind of a positive relation between x 2 and p 1 in this case. Now, let us look at the final case which is the case of independent. Now, in the case of independent, we assume that this cross price elasticity takes 0 value. Now, what could be the example? An example could be given as you know insulin to a diabetic patient right.

So, in that case you know how we can draw the diagram that we have seen earlier before the relation, I mean you know between the relation p 1 between relation. In the case of independents now let us look at the diagram which depicts the relationship between p 1 and x 2. Here, in this case we can assume commodity 1 become a, commodity 1 can be any consumption item say, food any food item or it can be clothing whatever; now the commodity 2 in this case is say insulin and we are dealing with a diabetic patient.

So, in that case, it does not matter what is the level of price level for food. The diabetic patient will use the same level of this is same level it is not changing same level of insulin as prescribed by the doctor. So, we have seen now the role of cross price elasticity on various types of demand.

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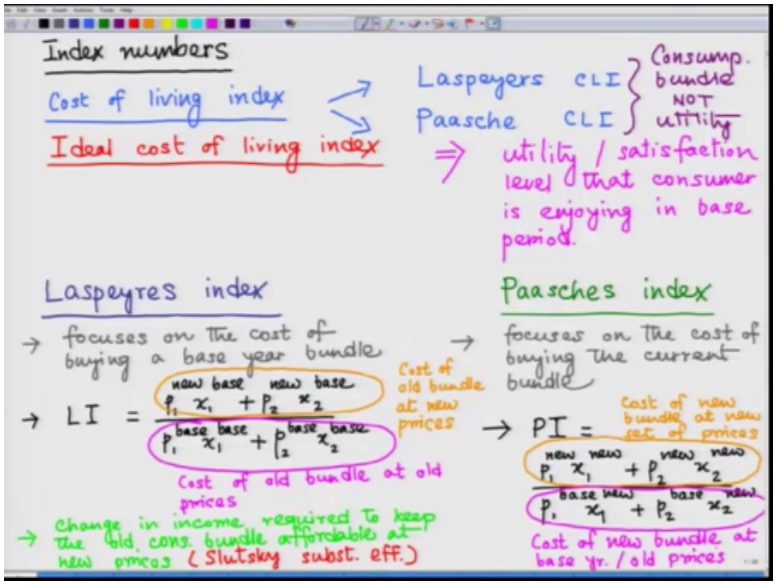

Now, let us going to study index numbers, many elderly people in society has their sole income source as the social security payments from the government. In India, like when a government employee retires he or she is entitled to get a pension. I am talking about those who join government service before 2010.

So, at the time of retirement when the pension is fixed of course, after that infession will take place price of the commodities are going to go high. So, in that case government also attempts to make them little bit comfortable with this you know price increase situation and there is an attempt by the government to you know adjust the social security payments or pension in this case so that the consumer can enjoy the constant purchasing power. Now, to do that consumer price index is being used and this method is called indexing now a question emerges, the formula that is being used for the indexing is it appropriate enough you know does it have the microeconomic theoretical backing, is it robust.

In this discussion, we are going to study this particular problem in general especially if we think about u s the Laspeyres consumer price index numbers used for indexing. In this lecture, we are going to study Laspeyre and another popular price index number, Paasche and we will see you know how will they fare you know as they are compared with some microeconomic theory. To have detailed idea of this Laspeyre and Paasche, let us first talk about the cost of living index. So, the cost of living index is the ratio of cost of a typical consumption bundle of goods and services valued at the new price level and the cost of that same bundle at a base year price level or old price level.

Now, this cost of living index as I told earlier also, there are several options several formula are available but the most popular ones available in literature is Laspeyres cost of living index C L I and Paasche cost of living index. Now, note that this Laspeyres and Paasche price index numbers are not provided by economist. There were two statisticians in the late 19 century; laspeyres and paasche, they provided this formula.

So, now we are going to compare their formula with a concept called ideal cost of living index or exact cost of living index which has you know attach of microeconomics in it. So, the ideal cost of living index is basically the cost of attaining a given level of utility at current prices relative to the cost of attaining the same level of utility at base prices. So, what the difference we can see here between these two concepts is this. In the case of

ideal cost of living index, people are concerned more at the utility or satisfaction level that consumer is enjoying in base period where as in the case of the cost of living index, the focus is on the consumption bundle that the person is consuming and not utility.

So, this is the basic difference. Now, we are going to study Laspeyre and Paasche index in formula terms. So, let us first start with Laspeyres and to make easy comparison, let me also create some space for Paasches just beside that. The first thing that is to be noted under Laspeyre index that it focuses on the cost of buying a base year bundle; in contrast, the Paasche index focuses on the cost of buying the current consumption bundle.

Now, the mathematical formula for Laspeyre cost of living index given by L I is the following. So, p 1 new times x 1 base plus p 2 new x 2 base this is divided by p 1 base x 1 base plus p 2 base x 2 base. So, let us now look at the numerator and denominator separately. Let us first look at the numerator. What does it mean? This is the cost of old bundle old means before the price change the base period I mean.

Right, now let us look at the denominator. This is the cost of old bundle at old prices. So, what does it mean in words? So, if I want to interpret this formula in words, then it will become change in income required to keep the old consumption bundle affordable at new prices. Now, having said all these, can you recognize what we have done here? Can you relate these to the earlier concept, that we have studied well this is the Slutsky substitution effect that we have studied in the last lecture.

Now, let us look at the formula used for the Paasche cost of living index and this is denoted by P I. So, this will be p 1 new x 1 new p 2 new and x 2 new and this is all divided by p 1 base times x 1 new plus p 2 base x 2 new. So, what is the difference between the Laspeyres and Paasche formula from the formula that we have written here? It is that we have just we have just replaced the base year quantity consumptions with the current year quantity consumptions. We have just replaced the base year quantity consumptions in the Laspeyres formula with the current year commodity consumptions.

And that is the way we get the Paasche formula. Now, what does it mean? Let us look at the numerator first. So, this is the cost of new bundle at new setup prices and let us look at the denominator so, that is cost of new bundle at base year or old prices. Now, having stated the formula and you know having looked at the interpretation of Laspeyre and

Paasche index, let us see their pitfalls. Now, we are going to compare the Laspeyre and Paasche index with the substitution effect income effect discussions.

So, we are going to go back to our discussion on decomposition of total price effect.

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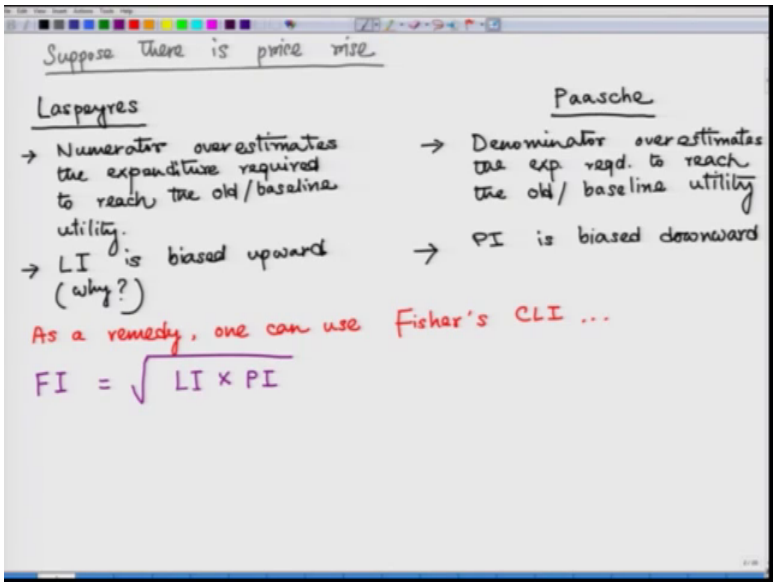

Suppose, there is price rise, just to be consistent with the motivational talk that we had before we started discussion on the index number because indexing is generally used when there is a price rise, but it does not mean that the analysis cannot be re done when there is a price fall. Absolutely, it can be re done, but let us focus on the price rise because that is where we have started our discussion.

So, in the case of price rise, let us look at the Laspeyres and Paasche case again and let us compare them. In the case of Laspeyres, the numerator overestimates the expenditure required to reach the old or baseline utility where as in the case of Paasche, the denominator over estimates the expenditure required to reach the old or baseline utility. So, this is quite evident if you go back to the previous graphs that we had where we compare the hicks substitution effect and the Slutsky substitution effect together in one diagram in the case of price rise.

So, the implication of this overestimation problem is the following. The Laspeyre index is biased upward. Why, because in the case of Laspeyre price index, people follows Slutsky substitution effect and that tends to overcompensate the consumer for a rising

price level because in Slutsky substitution, affect the consumer generally reaches a higher level of utility. So, utility level does not remain fixed as it should be in the case of a ideal cost of living index that we have seen. It is by definition, but here in the case of Laspeyre, it is not followed.

Now, let us look at the implication of this overestimation problem in the case of Paasche. The Paasche is actually biased downward. So, now, the question remains is there any index number which does not have the, you know these kind of substitution bias? The answer is yes, as the Laspeyre and Paasche gives two different dimensions of over estimation problem one is biased upward and the other one is bias downward. One may think of some kind of you know average of these two and fisher cost of living index exactly does so.

So, now as a remedy, one can use Fisher's cost of living index and that is denoted by F I and that is basically thus geometric mean of the Laspeyre and paasche price index numbers. Sorry, the geometric mean of Laspeyre cost of living index and Paasche cost of living index. So, this is it for today. In the next lecture, we are going to continue the discussion on consumer theory, we are going to look at some advanced models of consumer theory; this will be basically the extension of what we have seen already.