Strategic Trade and protectionism Theories and Empirics
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Lecture – 12
Heckscher - Ohlin Theory of Trade

Welcome to the lecture number 12, week number 3 on the NPTEL module of Strategic Trade and we know trade protectionism straight Theories and policies Empirics on it, how you know we can define all possible strategies to facilitate trade. Now, we are concentrating on various theories of international trade.

So, this is our third week where we have already taken off in the previous lecture for the understanding of new classical trade theories where the most important aspect, or the feature of this state theory is you know the production function that is very realistic and exhibiting of increasing opportunity cost of production, is it clear.

Now, so, this lecture is an extension of the previous lecture where we are emphasizing one of the most important discussed trade theory, modern trade theory called Heckscher-Ohlin Theory, in short it is also called H-O theory. H-O theory, we very famous in the international trade theory discussion and there are number of implications of this theory.

So, myself Doctor Pratap C Mohanty faculty member of Department of Humanities and Social Science, IIT, Roorkee. So, I will be explaining various possibilities of trade strategies we are derived from it. Now, onwards in another 2-3 lectures we are for sure going to give you a wrap off on; complete wrap off on strategic trade; especially, we will attach the supply side aspects.

We already discussed in the previous class on the production possibility frontier, commodity indifference curves and they are autarky equilibrium point. So, these are already covered; now, we will be deriving you know economies out of it or the possibility of trade out of it.

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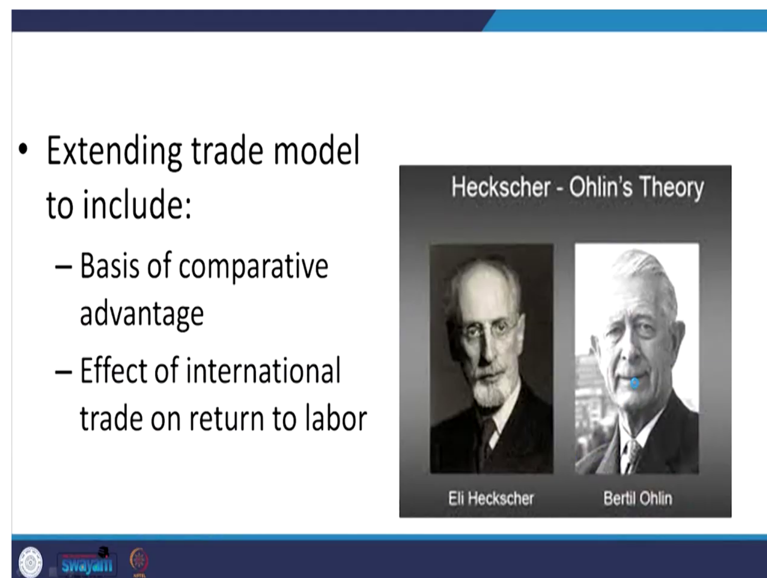

So, these are the two person's experts on international trade and here Heckscher and Ohlin. So, they are very famous in the in international trade discussions. So, we are, this is basically an extension of the comparative advantage theory to a more realistic format and where the effect of international trade on labor is very clearly defined.

So, then what are the assumptions, you know there might be a question if it is descriptive in some format, but largely our evolution will be you know based on objective, you know test; MCQ based test. And, the MCQs are more informative, like you know you cannot just be you know quick to determine one option you have to calculate sometimes you rough work on it.

So, and you know there are possibility of number of logical thinking on it so, in order to arrive into the answer. So, though it is objective test we are going to follow largely I am skew based, but a straight answer is not derived, you have to apply the techniques.

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Assumptions of the Theory

- **Heckscher-Ohlin theory** based on following assumptions:
  1. Two nations, two goods, two factors of production
  2. Technology same in both nations
  3. Commodity X is labor intensive, commodity Y is capital intensive in both nations
  4. Constant returns to scale for X and Y in both nations

Now, if it is a descriptive one, somewhere else you are writing it then usually the questions are like critically examined; critically examine; examine the H-O theory, theory of international trade. So, when the criticality of any theory is concerned we are supposed to understand by their caveats or their limitations. So, limitations are actually based on the assumptions. So, based on certain you know assumption is the theory actually explained many important aspects which are quite good for deriving better strategies.

So, first assumption is likewise in the classical theory we explained 2 by 2 by 1, here it is 2 by 2 by 2 model. So, 2 by 2 stands for 2 countries, 2 goods and 2 factors here this is a new

addition in this format. Now, technology is same in both the nations while we are discussing trade across the countries and so, commodity X is assumed to be labor intensive and Y is vice versa capital intensive both the nations. And, constant returns to scale follows while explaining the, or mapping the trade from one point to another trade and one point to another point for the possibility of international trade.

Now, constant returns to scale does not mean there is no increasing opportunity cost of production in the production function. They believe on non-linear in to the production function, but if we add you know extra 1 unit of resources to a particular commodity, that commodity will be actually exhibiting with equal return or that extend or proportional return which is called and explained from the origin; from the origin with a ray from the origin, we explained in the previous class.

Now; so, you know since the production function exhibit non-linearity or you know increasing opportunity cost function. So, complete specialization is impossible and also assumed by these two; I mean, the two economists and so far I specialize in is concerned.

So, other assumptions are tastes and preferences should remain you know equal, if there are very you know much major change in the rotation preferences then you know postulating any information out of it is very difficult. So, both commodities and factors are traded in perfectly competitive markets.

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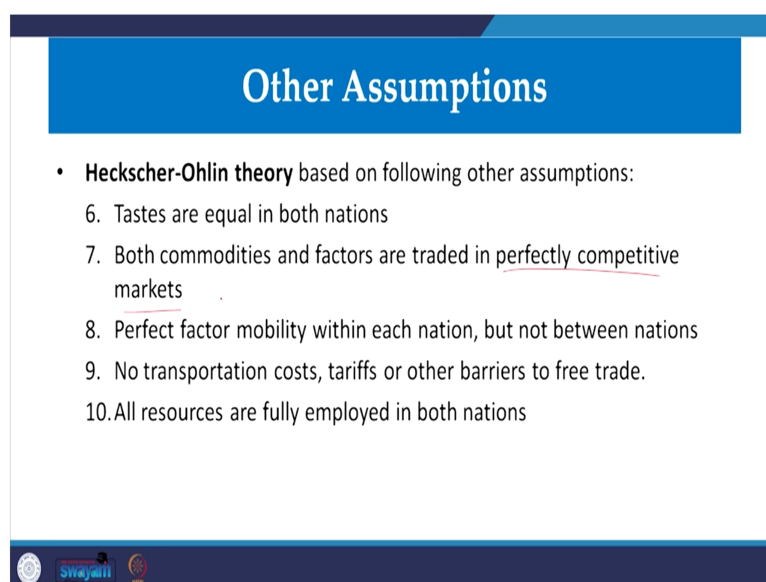

Basically, the market must be competitive, the prices for the commodities as well as factors, this is also an assumption in the earlier model as well. Many assumptions are similar in classical theory also, but we know this is very essential. Because, if prices are changed or are different or are unexpected, you know if it gets change you know with the strategic behavior of another one, then predicting based on these theory is very difficult. So, they go by these assumption.

Perfect mobility within the nation and 0 mobility across the nations, especially for the factors. No transportation cost tariffs and other barriers for free trade, all resources are fully employed in both the nations if there are still potential resources attached.

So, the cost of production; obviously is expected to be you know declining any influence the market and cannot be defined to be a perfectly competitive. So, therefore, this is one of the

important assumption also and international trade is actually balanced the trade between the nations expected to be balanced. So, those are the assumptions; so, let us expect two or three assumptions very carefully.

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Factor - End Endowment Theory

- Perfectly mobile factors within each country
  - Same wage rate earned in both industries of each country
  - Same rental rate earned in both industries of each country
- Identical and homothetic preferences across countries
  - A poorer country will buy less of both rice and airplane, but in the same ratio as a richer country facing the same prices
  - Not a realistic assumption, but it allows us to focus attention on the differences in resources as the sole reason for trade

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One is perfectly mobile factors within the nation. So, what it stands for it is, which is it is purely stands for where the same wage rate earned in both the industries of each country, because we have already made within the country perfect mobility; same rental and for another factor each country now, for both the industries.

Identical and homothetic preferences across countries. So, the poorer country; it means, the poorer country will actually buy less of both rice or airplane if you have to taking to assumptions; I mean, two products. Whereas, the you know same ratio as a richer country facing; I mean, but in the same ratio as a richer country facing the same prices. So, it means

the poorer country will buy less as compared to the ratio of the products the richer country. But the ratio to be; I mean ah, so, poorer country by less about the raise I mean by quantity same, but the ratio is a ratio is same for small and big country.

So, our interest is to look at the relative you know you know relative demand for commodity X and Y and accordingly we have lots of interpretations. So, though it is not a realistic assumption, but it allows us to focus attention on difference in resources as the sole reason for trade. So, this theory is developed by Heckscher-Ohlin is also called factor endowment theory; factor endowment theory endowment theory of international trade.

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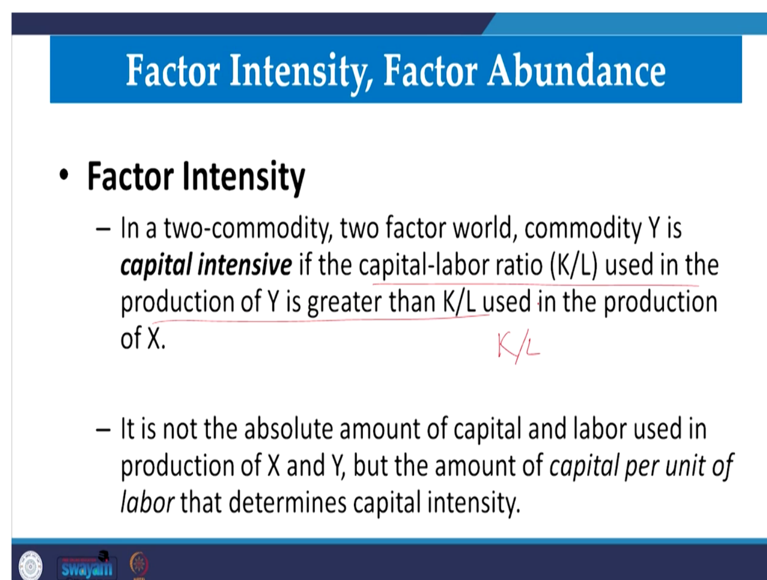

Now, they define conceptualizing conceptualize the theory in various concepts through various concepts like factor intensity and factor abundance. So, what do mean by factor

intensity, suppose there are two commodities we have already assumed commodity X should be labor intensive and commodity Y to be capital intensive.

And so, labor intensive capital intensive means more capital as compared to labor K by L should be higher than that of K by L in another industry. So, I mean X is capital intense labor intensive and Y is capital intensive. So, capital labor ratio used in the production of Y is greater than that of capital labor ratio used in the production of X. So, it is not the absolute amount of capital that matters to define you know factory intensity rather relative allocation of resources or the endowments.

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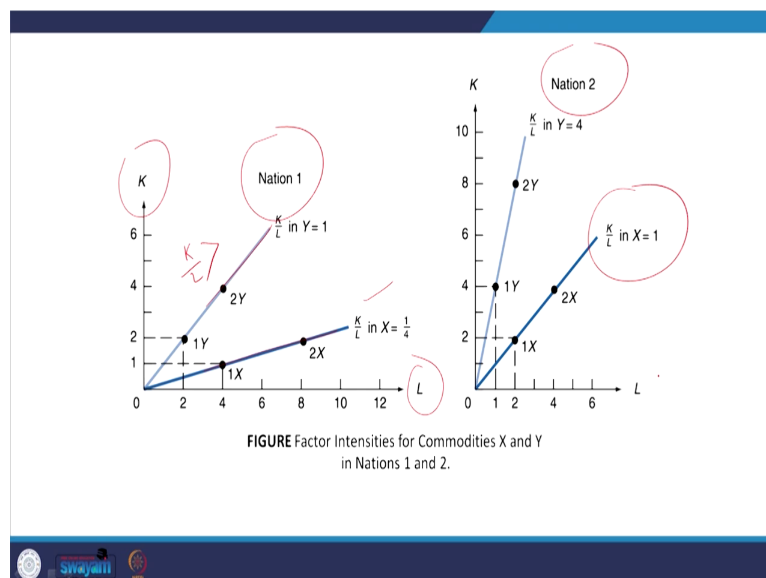

Now, this is visible here nation 1 and nation 2. We have assumed that you know commodity X is labor intensive, here it is commodity X and its extent of labor and capital use. So, this ray is for commodity X where more labor is utilized and for this is for Y expansion path of Y where

more capital is relatively you know use higher as compared to X. But in nation 2, again we said X is labor intensive we are using more I mean in nation 2 they are using more labor as compared to you know another one capital.

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Factor Intensity, Factor Abundance

- **Factor Abundance**
  - In terms of ***physical units***:
    - Nation 2 is capital abundant if the ratio of the total amount of capital to the total amount of labor (TK/TL) available in Nation 2 is greater than that in Nation 1.
    - It is not the absolute amount of capital and labor available in each nation, but the *ratio* of the total amount of capital to the total amount of labor.

$$\frac{\bar{K}^*}{\bar{L}^*} > \frac{\bar{K}}{\bar{L}}$$

Now, how to define factor abundance? Factor abundance are largely defined in two ways; one is through their availability of the physical units, another one is their market determining prices of those factors. So, factor abundance means in terms of physical units basically total capital by total labor availability TK by T l.

So, here it is it will be foreign country its ratio, again it is in relative terms not by just K by K is greater than L is not the answer, it should be relatively higher K upon L as a ratio should be higher as compared to another nation. So, this is called by you know they availability by physical units.

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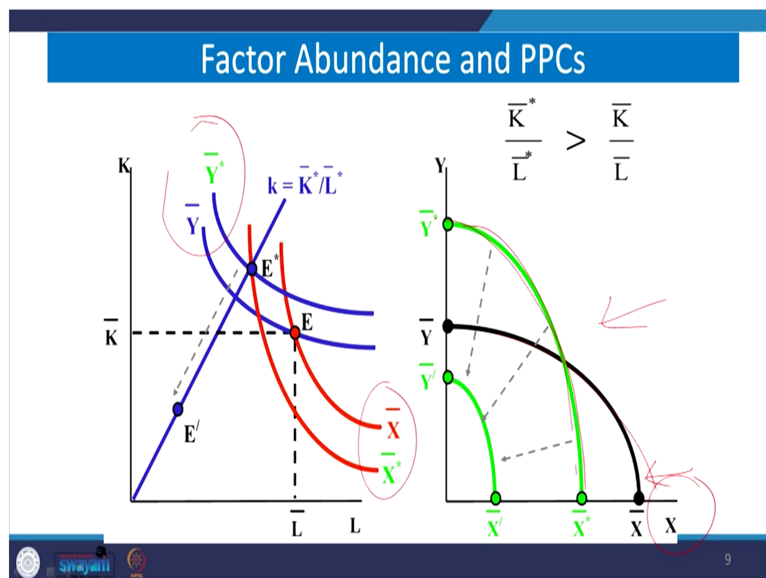

Whereas, the you know whereas, we can also define the abundance through the relative prices of the factors, if wage rate is lesser than that of rent they are paying. So, I mean the country is more abundant with a laborer.

Now, in this diagram easily you know identified that look at the X and look at the Y. So, we have already defined the previous diagram. So, accordingly the PPP a skill presented; PPP can be presented X is more tilted towards this X; I mean, towards X axis, I mean production of this Whereas, Y using more of you know more of capital intensive factors so, and can be interpreted it differently.

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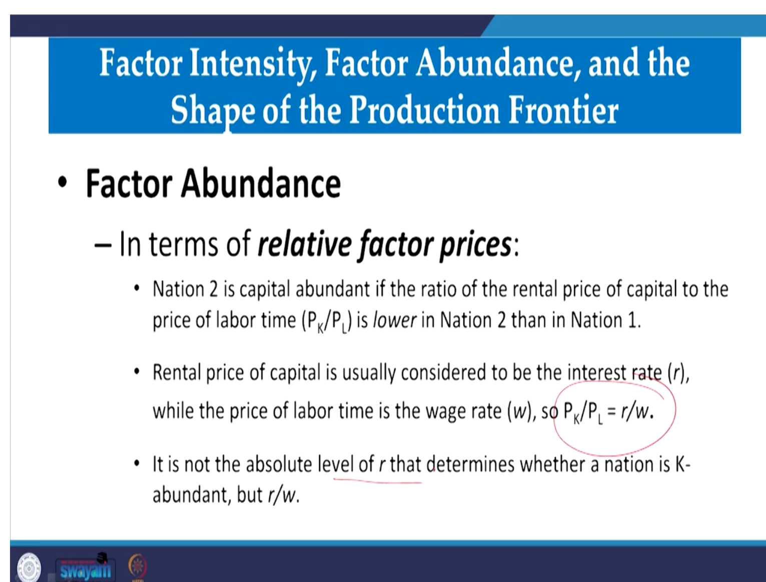

So, we will explain in the next couple of slides. So, factor abundance by relative factor prices as I said. So, it depends upon the relative you know prices in 2 countries maybe in terms of ways to you know rent or rent to wage ratio, if they are different then it will be defined accordingly.

Now, factoring abundance in terms of relative factor prices is this presented where it is not absolute level of r that matters, even similar to the absolute availability of physical capital we defined in the previous slide. So, it is the relative ratio prices of the factors that really matter.

Now, in this you know production possibility frontier where nation 1; nation 1 is more endowed with more X, but X we have already assumed to be labor intensive and nation 2 it is

more endowed with you know when the production of Y since there you know Y is more capital abundant.

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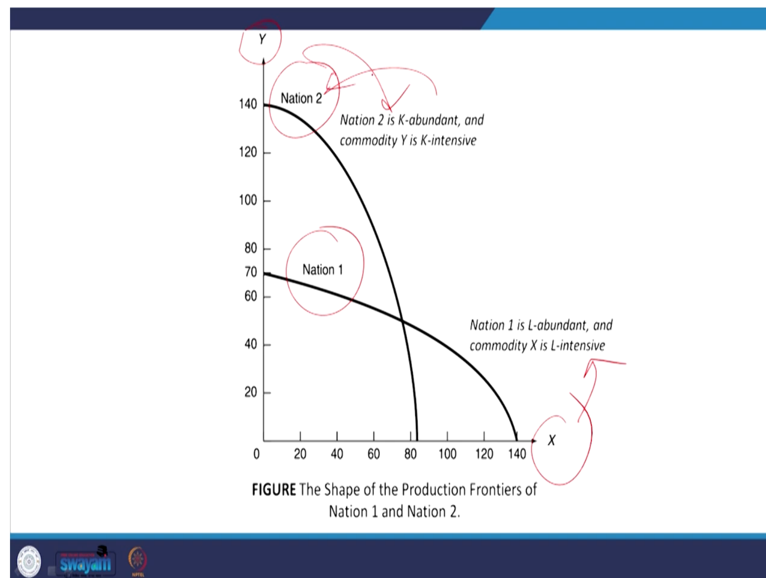

And so; that means, they are more endowed with capital. Nation 2 is more endowed with more capital so, therefore, they are producing you know more of Y varieties as against expertise.

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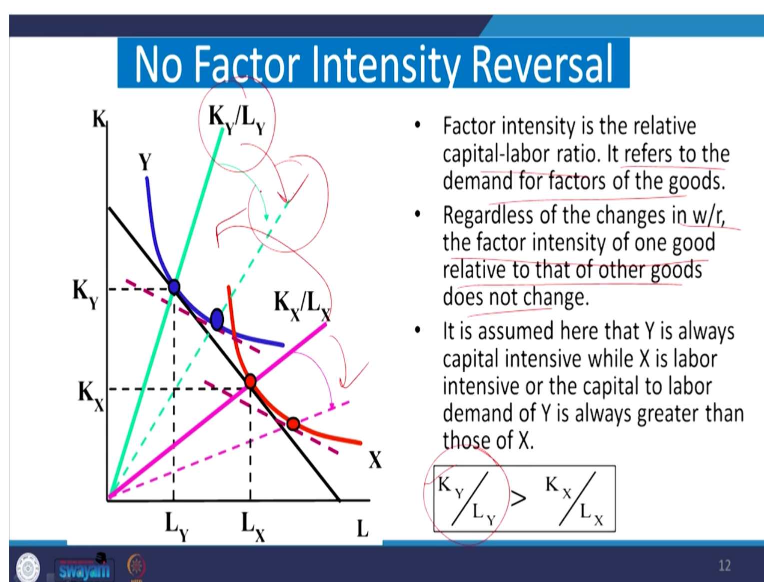

So, what another assumption very important also we will take it this one in our you know empirical testing section as a criticism to the theory, where we will I mean the assumption is that the factor intensity reversal should not take place while understanding this theory. What do you mean by this? A same product cannot be labor intensive one country and you know capital intensive in another country, ok.

So, factor intensity is the relative capital labor ratio we have already discussed refers to the demand for the factors of the good, regardless of the changes in w and w r the factor intensity of 1 good relative to that of other does not change. So, intensity does not change and that to we cannot another interpretation is that the intensity cannot be reversal. He cannot be just changed on the way we are explaining the Heckscher-Ohlin theory, if it is K by you know Y is more capital intensive it should be maintained throughout the theory discussion.

Here we have already explained if there are any changes also; I mean, if there is a shift like this. So, still this should be defining higher capital relatively as compared to labor. Similarly, here if there will be shift, but this line cannot be shifted to this to explain the Heckscher-Ohlin theory and Heckscher-Ohlin theory will be misleading its interpretations.

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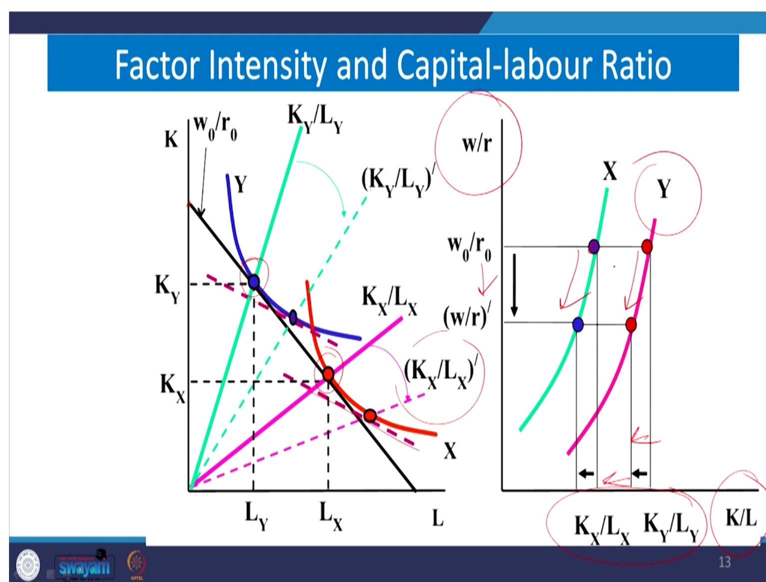

Now, given these explanation we have you know mainly we have largely explained here that the factor prices are same in the pre trade, and the MRT; Marginal Rate of Transformation between 2 are same.

So, now after any kind of shift. So, there will be also shift you know in other cases I mean other product. So, we may lend up with you know lend up with again equal transformation equal; I mean, MRT and its ratio should be may be same in other context. Now, what we try

to see the fact that Y is here is made out with we have already assumed more of capital has come to labor. So, it is reflection, if it is you know utilizing less of this.

So, relative prices of there should also fall, not just you know capital of factor intensity explained with capital labor as a ratio it should be explained with its factor prices. So, this would be monotonically connected. So, it means that if this is falling, this must be also falling, if this is falling this must be also falling in order to explain the theory correctly, ok.

So, Heckscher-Ohlin theory what it talks about largely? It says that based on the assumption, it says that a country is who is a country endowed with certain variety of factors will specialize in the production of that type of variety of product and we will export to another country in lieu of getting another product here which the country does not have you know relative abundance of resources.

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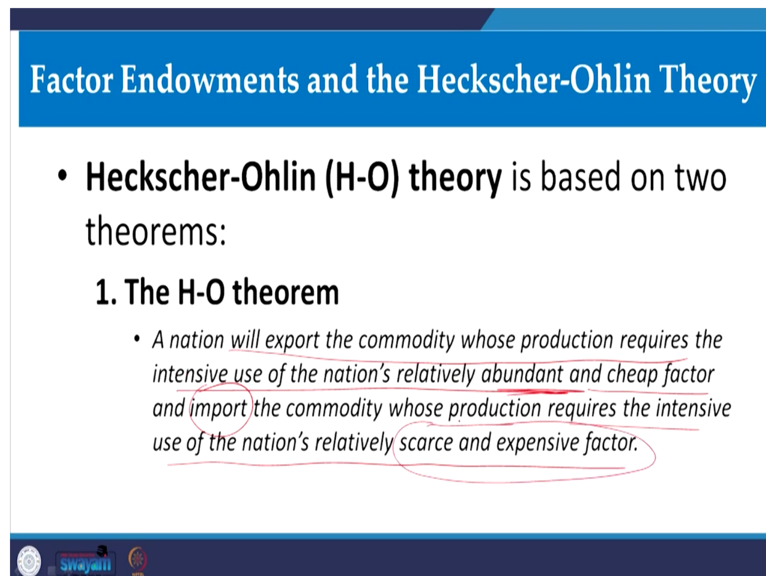

So, a nation will export the commodity whose production requires, the intensive use of the nations relatively abundant resources or cheap factors and import in lieu the commodity, whose requires intensive use of nations relatively scarce resource and expensive. So; that means, the country is going to import where it has scarce resources or expensive factors and the country is going to you know export the product or the commodity which it has relative abundance, not just abundance a relative abundance of the cheap factors that is the whole idea of Heckscher-Ohlin theory.

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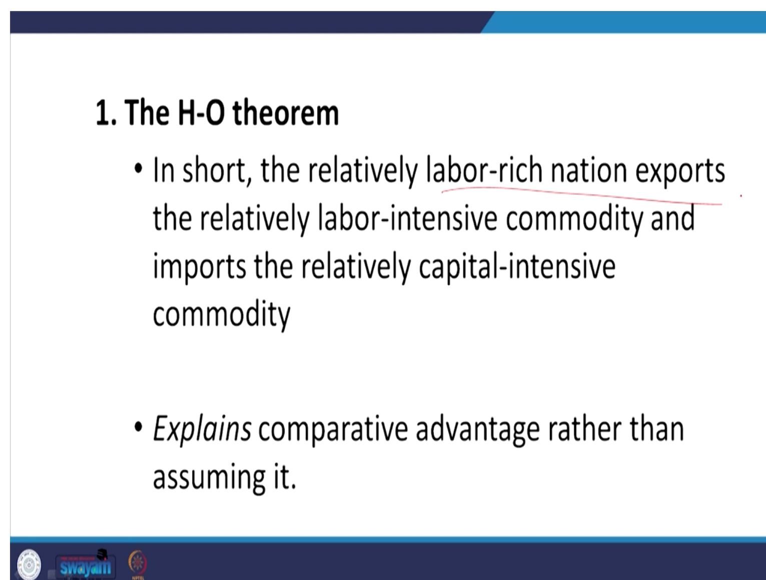

And Heckscher-Ohlin in sort a labor is nation will export you know relatively labor intensive commodity and vice versa. So, explains you know comparative advantage rather than assuming it, we have only explained that it is again emphasizing the comparative advantage theory.

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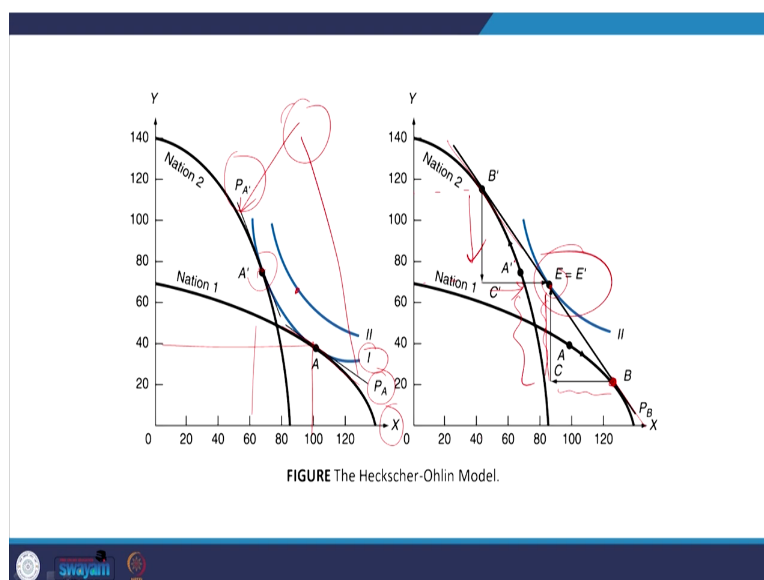

So, now here what we define nation 1 is more endowed with you know; nation 1 is more endowed with X type of production Y and the trade will actually there will be possibility of trade if there will be equilibrium consumption. Look at the consumption mapping here if the consumptions level are equal then what is going to happen. So, basically they are not going to demand more on another country.

So, in this case what is going to happen, what will happen and look at the factor prices factor prices the ratios are different these are not same. So, they are different and the level of demand though level of demand are same or at the same level defined at a same level. So, but since you know the factor prices are different there is a possibility of exchange.

What the country will do? The X the commodity; I mean, the country 1 will export to another country since the relative prices will rise further and since relative price is less right now, it

will rise and since another country relative prices is higher that will be reducing. So, there will be equalization of prices with this perpendicular with the tangential line and the country will landed up with a higher position explained with E prime.

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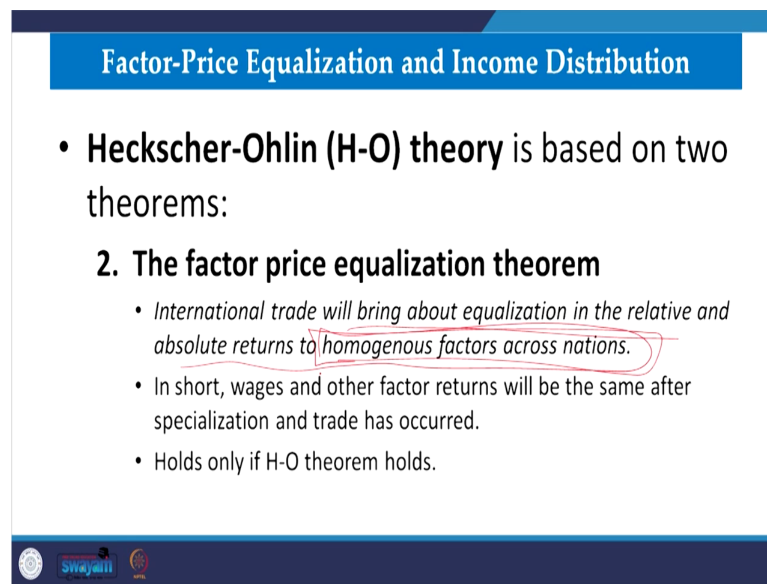

So, this is all about you know Heckscher-Ohlin theory largely explained with you know factor price equalization which says that it is not just the products are exchanged and there are possible to have you know specialization. So, exchange benefits are there, specialized in benefits are there it will simultaneously lead to equalize the prices which we have seen here.

In the previous diagram we have seen that price issue earlier was different by P A and P A prime; now, it is only one you know tangential line, there is a possibility. How much the export or import depending; I mean, this much is a now exported by country, country you know country you know 1 and importing this much and arriving at a higher position because

they are getting variety of products. And whereas, country to export this much of you know Y from near about 120 till around you know 70 any lieu of 42 around 90.

So, and this depends upon their prices you for sure how much extent or exact extension they are exporting, but sure they are adding it. So, in both the cases they are landing in a higher you know equilibrium situation and both are beneficial; so, there is therefore, there should be trade.

So, Heckscher-Ohlin theory largely talks about you know export and import and could procure relationship which is you know majorly based on available to resources and those are you know the, and the available to endowment. Actually, boils downs to higher you know level of satisfaction explained by the commodity indifference curve and this also equated the factor price ratio across the nations specially in two nations. So, therefore, it is called factor price equalization theorem as well.

So, international trade will bring about equalization the relative and absolute as to homogeneous factors across nations; so, this is important. Homogeneous in the sense you know absolute into homogeneous factors have factors across nations. So, the homogeneous; I mean, the same variety of factors across an nation will get benefitted out of it.

But, the differentiated factors or the different factors might be again differentiated, but largely they are actually you know equalized relatively that is very very important. We will take out take taken in the specific factor model regarding these clarification further, wages and other factors returns will be the same after specialization trade has occurred. So, holds this is this holds only if Heckscher-Ohlin theorem holds.

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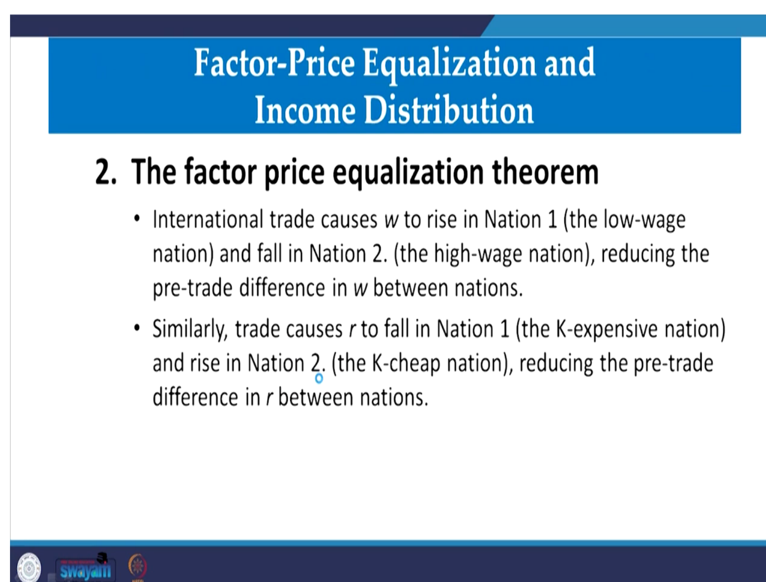

So, we have already explained this. Now, second part of Heckscher-Ohlin theories basically in terms of factor price equalization, first part is actually you know there will be there will be a higher trade between two you know countries, we have already explained this theory. So, Heckscher largely we are discussing Heckscher theorem and terms of specialization and exchange, now we are also discussing factor price equalization.

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Factor-Price Equalization and Income Distribution (across Nations)

- H-O-S Theory: after Samuelson received Nobel prize in 1970

2. The factor price equalization theorem

- International trade brings about equalization in the relative and absolute returns to homogenous factors across nations.
- Thus, international trade causes a redistribution of income from the relatively expensive (scarce) factor to the relatively cheap (abundant) factor.

Now, factor price equalization simultaneously emphasized by in detail as emphasized by Samuelson. So, this theory also called Heckscher-Ohlin; Heckscher-Ohlin and Samuelson theorem and he has published and his paper and receive a Nobel prize in 1970 because his contribution largely to discuss you know income distribution which is very rarely defined in international trade theory and emphasized specially in this theory.

So, international trade theory we have already discussed brings you know equality in the relative prices of factors and specially to the homogeneous factors. Factors which are you know homogeneously defined whereas, if factors are very differently defined it is too difficult to attach how much there will receive it. They are ambiguity to the distribution of income and it also gives you know better income international trade causes redistribution of income from relatively expensive to the relatively cheap factors.

So, expensive means what? So, which were expensive now no longer going to be expensive because of the fact that you know the country which does not have that that type of resources will actually will not emphasized or specialized in that particular product. Whichever has I mean the country since has you know certain factors, which are scarce we will try not to specialize since these factors is are scarce and very expensive.

So, after trade, so those product will actually be you know exchanged or important to the country. So, therefore, those factors which are defined to be scarce are no longer you know you know no longer continuing with the same rate or higher rate. So, in after trade there are high possibility to the fact that the cheaper factors will be demanded more because of more exchange the, you know scarce or the expensive factors will be less demanding.

So, therefore, the rate will be lesser in the concerned country; so, this will lead to redistribution of income. This is one of the very important contributions of Samuelson in association with Heckscher-Ohlin because without the Heckscher-Ohlin proposition, Samuelson will not have you know contributed its extra addition to it.

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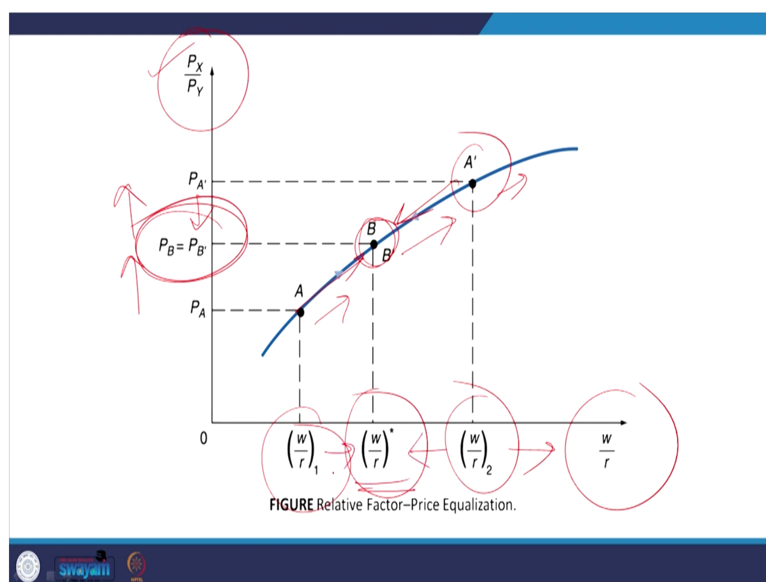

FIGURE Relative Factor–Price Equalization.

This also says that you know factor; so, diagrammatical you can explain that you know the prices of the factors and this difference is will lead to the ratio of the factors, ok. So, higher the prices due to trade the relative you know prices of the factors will change, this scarce factors and its product its prices will be actually lower where the abundant factors in prices will be higher. So, relative prices will be expected to be higher. So, that will lead to the relative demand of this factors as well. So, wage rate as compared to rain will also rise; so, it will be rising.

Similarly, I mean there will be a point initially it will rise if it start with a higher point it will be actually decline, if the relative prices are already high so, it will decline to a level and there will be a possibility of equalization P B and P B prime will be equalized. So, w and w by r star or w or wage rate you know as compared to rent in country 1. And, and similarly to these since there are different, but after trade there are possibility of equalization, these two might be

converse to this particular point. There is one of the very good interpretation of this particular theory. So, therefore, Samuelson receive Nobel prize.

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Questions

Q1. A nation is said to have a relative abundance of K if it has a:

a. greater absolute amount of K
b. smaller absolute amount of L
c. higher L/K ratio
d. lower r/w

Ans: d

Q2. Factor Price Equalization means that,

a. All workers are equally productive.
b. If a country fails to trade, its skilled workers will earn no more than its unskilled workers.
c. Trade causes the return to human capital to be the same as the return to physical capital.
d. For countries to trade freely, they must tax factors of production so that firms in all countries pay the same factor prices.
e. Free trade causes identical factors in different countries to be paid more nearly the same than they were in autarky.

Ans: e

So, broadly speaking the Heckscher-Ohlin theory talks about specialization as well as exchange and so, exchange and they also added the demand for scarce factor as compared to the abundant factor and there will be distribution redistribution of income. So, the redistribution income of factors are very very important in any international trade context. So, we have discussed those you know Heckscher-Ohlin theory in detail as part of the new classical framework.

I hope it is understood, but we will crisscross check with these following questions. Here are the questions, you may raise your questions in our doubt class will have a doubt class keep a come detail note of your questions. There will be number of possibilities of doubts for sure

because you know this is a this is one of the urban theories in international trade discussions and this gives large number of you know strategic trade situations.

So, let us talk about one question here a nation is said to have a relative abundance of capital if it has it has a what, a nation is said to have where relative abundance at capital if it is what, out of 4 options. If it is greater absolute amount of K I do not think. This is right we have already said it has to be relatively abundant, smaller absolute this cannot be right higher labor to capital, if it is higher labor to capital then it will be called as you know you know relative abundance of cap labor. So, who I was saying it is you know capital.

So, last one is lower r by K; lower r by K means relatively they have higher K by L. So, therefore, so, this satisfies the question; so, d should be the answer. Similarly, if you check with factor price equalization related question another you know MCQ base question, this is big bit you know descriptive. So, which please have patience to read and you can easily get the answer which is hidden inside the text.

Now, the factor price equalization means that all workers are equally productive nowhere this is discussed. So, nowhere this is actually discussed in the theory, we cannot simply say that you know all the workers are going to be productive. If they are all the workers are productive then we may not arrive into Heckscher-Ohlin theory and factor price equalization. So, this cannot be accepted.

If a country fails to trade, it is skilled workers will earn no more than its unskilled workers if country fails to trade, skilled workers will earn no more than its unskilled workers. So, nowhere it is actually explained and that to a skilled workers will earn no more than, there is no reason behind if there is no trade, then the skilled workers may earn more than that of the unskilled workers. So, it is not accepted.

So, far as factor price equalization is constant and that two since there are seem fails to trade. So, no question of trade is taking place, first of all in H-O theory we explained trade must fast take place, is not it. So, trade causes the return to human capital to be the same case to the return to physical capital. So, human capital discussions are not made here, we are discussing

labor, human capital is a larger you know component which n capsulate education, health. So, these are not the features discussed in this theory. So, this is not defined; so, therefore, is not the answer.

For countries to trade freely they must tax factors. So, tax wise is nowhere discussed; production so, that farms in and that two if the tax relative price on the factors will be higher. So, we have assumed of the beginning in the theory that taxes as not acceptable; so, this is not the answer.

Similarly, last one if you check it, probably we will answer it may not be the answer may not be the answer let us check it. Free trade causes identical factors in different countries to be paid more nearly the same then they were in autarky. It says that identical factors homogeneous factor which I said in the theory they will be paid more nearly relatively the same then they were in autarky.

So, basically whatever they were in autarky they will be paid more. So, this is the answer for it. So, he is actually satisfying the factor price equalization. So, that there will be the redistribution of income and it satisfies the Heckscher-Ohlin and Samuelson theorem.

So, with this we have completed Heckscher-Ohlin model and a you know segment of income distribution of Samuelson theory in the next class we will talk about other redistribution through specific factor model and some you know realistic check of the latest changes in internl trade. So, any kind of doubt you can take off you know in other sessions. So, with this let me stop here.

Thank you.