Strategic Trade and protectionism Theories and Empirics

Prof. Pratap Chandra Mohanty
Department of Humanities and Social Sciences
Indian Institute of Technology, Roorkee

Lecture – 14
Empirical Testing of H-O Theory

Welcome once again dear friends, this is I think becoming you know more interesting because we are going deeper to the understanding of international trade, especially the strategies which are derived from the theory. And, in the theory we largely you know focus on strategies of the neoclassical framework.

And, where we derived endowment is the factor behind trade, which kind of endowment, what quality of endowment, what prices of the endowment you know these are very very important aspects of international trade. Now, HO theory has already been understood which you know largely talks about differential endowment, specializes their product and the trade takes place between countries.

But, someone's added to the distribution of income and the you know flow of income to other countries. And so, accordingly the original theory gets you know multiplied with value. And so therefore, the you know 14 lecture of this derive I mean this is the 14th lecture which emphasizes further Empirical Testing of HO Heckscher-Ohlin theory; to make ourselves confirm whether HO theory is actually applied in reality or not.

So, there are many examples, but we will try largely for Indian context as compared to others to what extent HO theory is valid for India. Now, in this you know lecture we are emphasizing or we are explaining empirical testing of Heckscher Ohlin model. This is lecture number 14 and myself Dr. Pratap C Mohanty faculty member of Humanities and Social Science, IIT Roorkee; where we left in the last lecture its on a complete mapping of our discussion. The complete discussion of HO theory is presented here.

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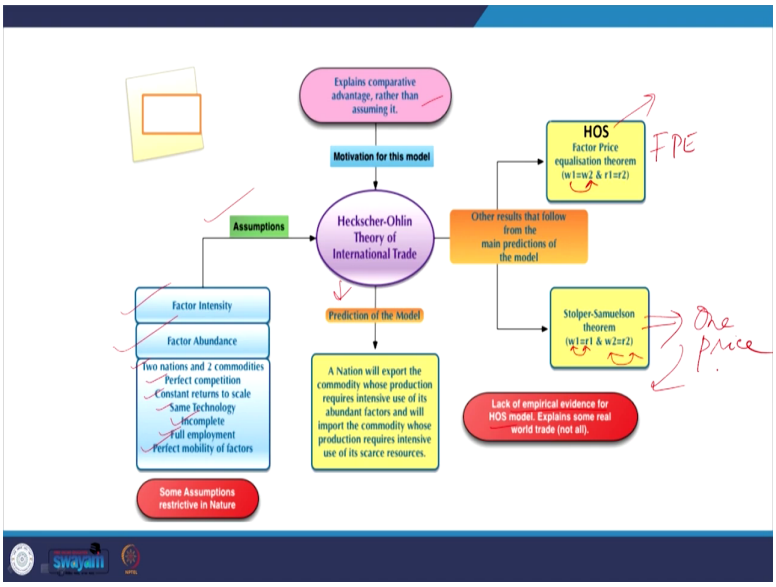

Now, first you stick to the circle, the center circle where its on i Heckscher-Ohlin theory of international trade. There are some assumptions we discussed, largely the assumption broadly on factory intensity and abundance. And, also same technology, constant on scale, perfect competition, 2 nations, 2 commodities and 2 factors world, incomplete specialization, full employment, perfect mobility of factors.

Those are the assumption we have already clarified in our previous lectures. And, we also emphasize to the fact that Heckscher Ohlin theory never negated the comparative cost advantage rather they explain the comparative advantage in a larger context you know. So, explain comparative advantage rather than you know assuming it and their prediction from the model is like this, you know it helps us explaining international trade in the modern world, where the endowment decides their exchange of goods and services.

Where exports are made based on the specialization which is derived through the endowment the is country poised with. Other aspects of HO theory HOS Samuelson where we started discussing about equalization, factor price equalization theorem; factor price equalization theorem.

And, which states that you know the wage rate of one country, wage rate of country 1 should be equalized with the wage rate of country 2 after trade. Similarly, the rent of 1 country should be equalized with country 2. And, whereas another addition to the HOS theories by Stolper Samuelson theorem which says that it is not just wage across the sectors and their remuneration are also equalized.

Wage is equalized with rent and wage rate in another industry are also equalized with rent in another industry. So, basically it is not just price of factors, price of you know products are equalized not just price of one you know factor is equalized the price of another in another country.

It is also equalized all across the factors, large they believe to the fact that or they tested to the fact that this will follow a one price model, one price framework. And, either it may be you know product may be factor, but there are lack of you know evidences for a HOS model; specially for this one price one price framework, we will try to verify from some of our examples.

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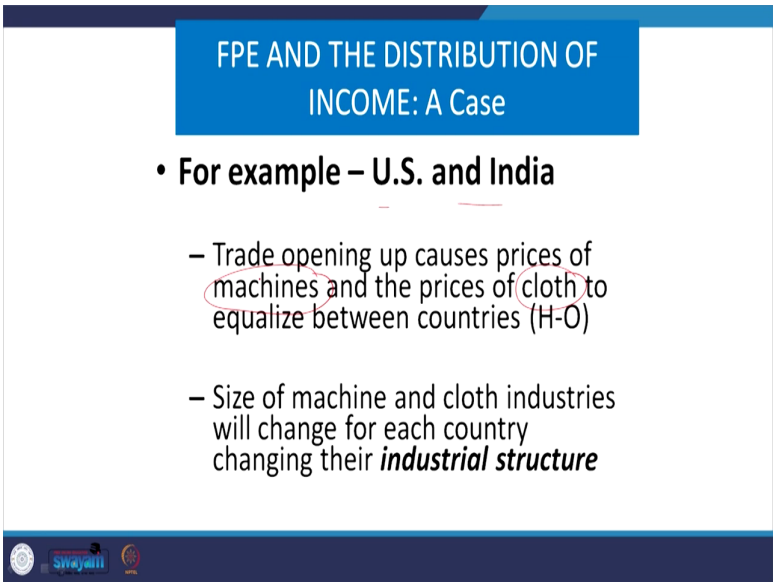

Let us go for it. A case we wish to present it for our better understanding between the trade of US and India. Now, if we read between the lines trade opening of cases I mean trade opening of causes prices of machines and prices of cloth to equalize between countries. This is what let us assume to the fact that we are referring to the cloth and referring to machines.

Machines we largely emphasize from you know the product from US and cloth from India and cloth we are assuming to be more labor intensive. Size of machine and cloth industries will change of each country and changing their industrial structure because of trade.

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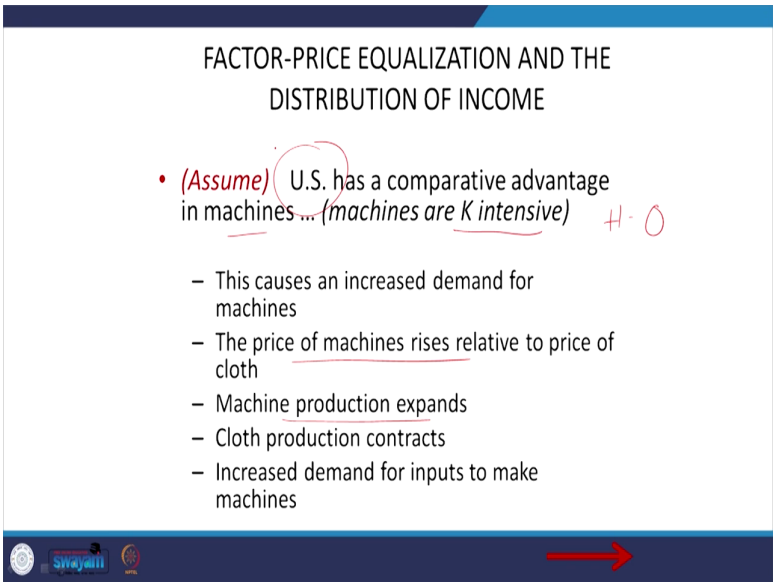

Now, let us further assume in these two sector, in the US has comparative advantage in machine which I have said. So, and it is capital intensive as per the HO framework. So, this causes an increased demand for machines because of their specialization and that will help in reducing the prices of machines. The price of machines rises relatively to that a price of cloth because you know there are over demand for machines.

So, relative prices of machines will rise and that price will you know rises as compared to the cloth. So, machine production expands, cloth production contracts specially in US and because we are referring now to US case. Increased demand for inputs also those who are engaged for the production of machines are now being demanded. So, those factors are actually demanded.

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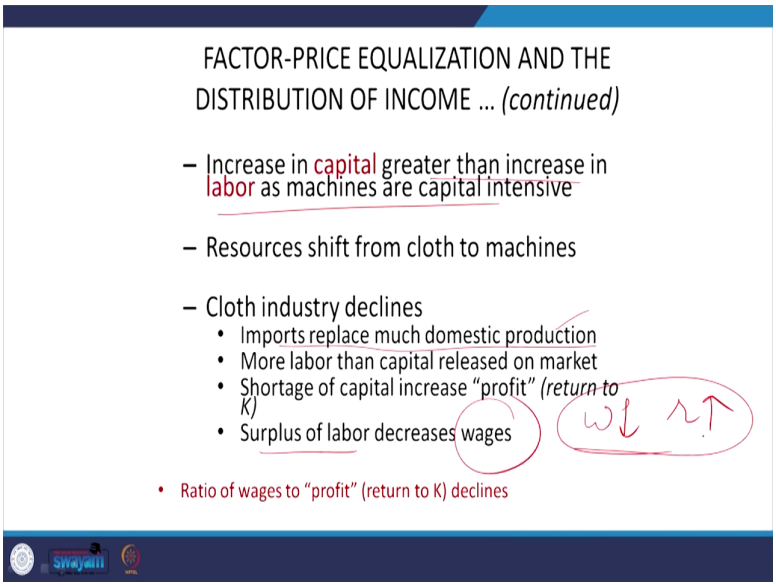

So, factor prices are expected to be higher. So, increase in capital greater than that of increase in labor as machines are capital intensive special anyways. Resources shifted from cloths to you know machines in US and the cloth industry declines because of the fact that you know they are specializing more on machines. So, imports therefore, they are largely you know emphasize on machines and they export it and in return the import cloth.

So, imports replace much domestic production since they import from US import cloth from India to US. So, now US domestic production cloth actually reduce, this is what it replace domestic production. So, more now more labor then capital release on market. Now, who are more release because they are not engaging labor, here we are assuming clothes to be more labor intensive. So, since they are not producing labor they are not producing cloth so, laborers are not demanded too much.

So, they release more laborer from that cloth industry and so therefore, but the demand more capital. So, capital shortage increases profit also return goes to those sectors which engage more capital. So, there are surplus of labor in US so, surplus of labor leads to for in the wages in US. So, in one case wage rate falls in US whereas, this comparatively increases anyways.

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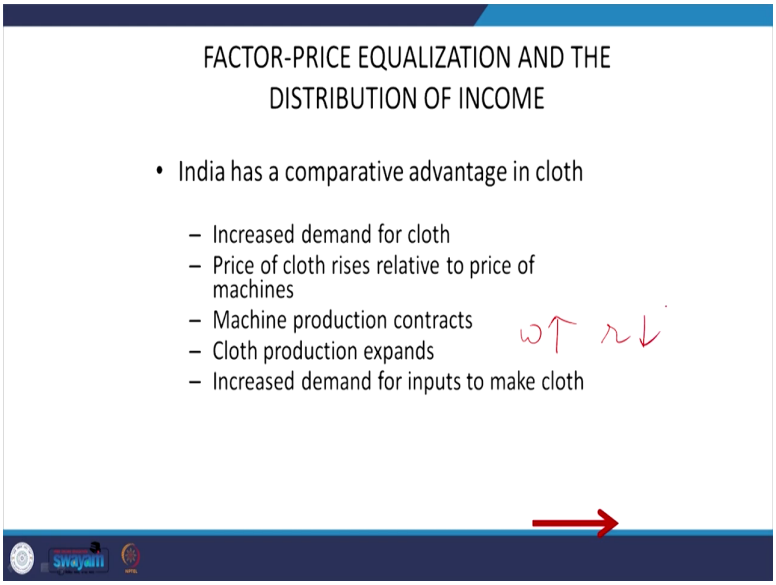

Now, let us move to you know to check India case, similarly India case can be explained. Now, India's comparative advantage in cloth as we already assumed. So therefore, there is increased demand for cloth over the time because you know more demand are coming from you know US. And, the prices of cloth will you know relatively rise has compared to machine.

So, machine production contracts in India. So, cloth production expand; so, demand for factors which are engaged in cloth specially wage rate increases in US in India wage rate

increases and relatively rent falls. This is just the reverse, if you just check it previously here we said this and here we said just the reverse.

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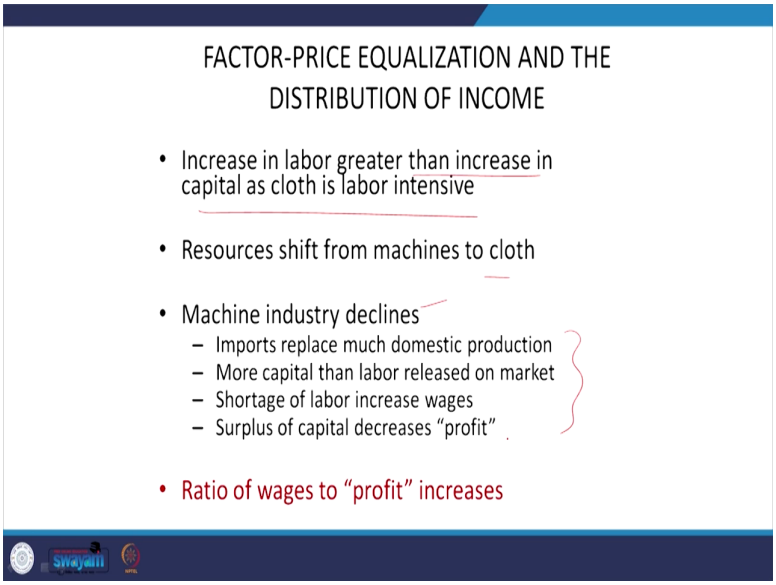

Now, based on this w is actually rising unknown countries, simultaneously it is falling in another country and for rent accordingly arguments are followed. So, increase in labor greater than the increase in the capital as cloth is labor intensive in India. So, resources shift from machines to cloth in India, machines industry declines in India. So, we have already discussed these things in our you know previous slide, the same argument as followed.

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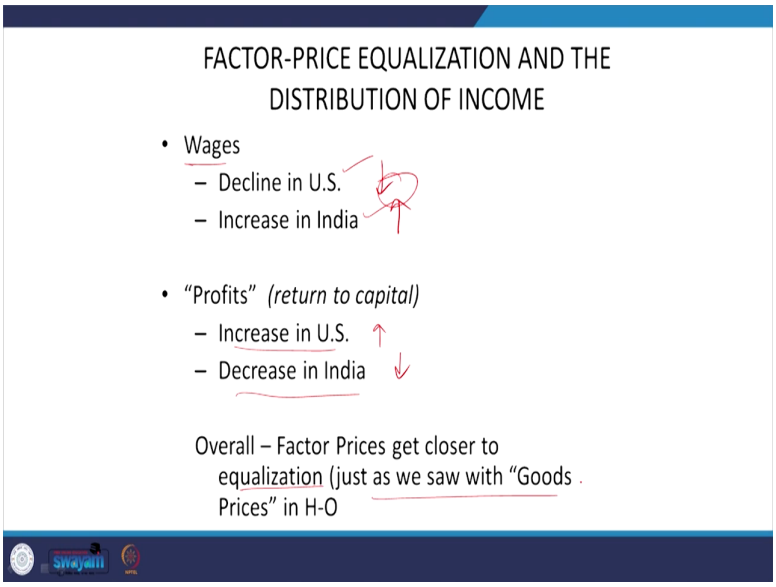

Now, what is the bottom line then? Bottom line of discussion here wages decline in US because, they are not demanding cloth to be produced, they are importing it; whereas, just the contrast in India it increases. Also look at profits, profits earn by the capitalist by the you know you know the sectors which engage capital then profits increase in US and decrease in India.

Here decline, here increase here you know increase and here it is decline or in reserve if I mean I mean we can explain convergence of prices. So, overally factor prices get closure; that means, whatever the factor price is they have in one country as compared to other this gets closure. So, there are possibility of equalization. So, just is we find in the goods prices.

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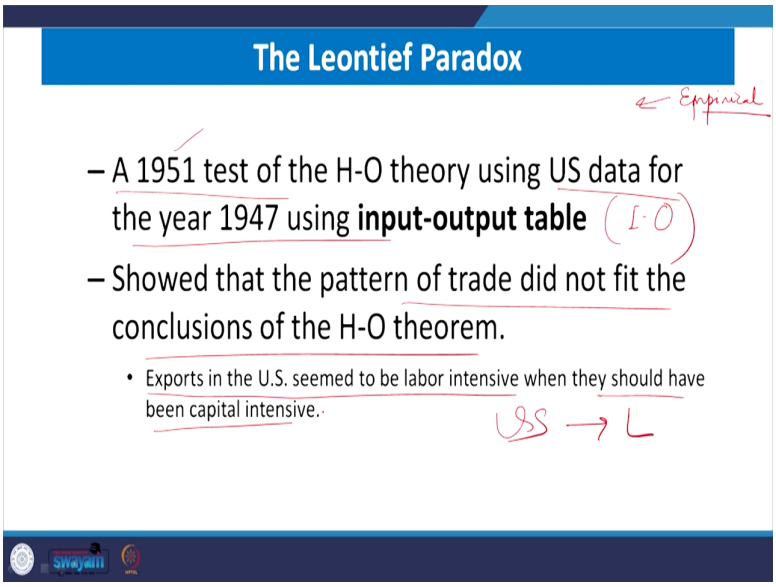

Now, let us wrap up for by saying the HO theory with certain historical context. A 1951 test of the HO theory, now we are actually counting down some of the empirical testing, empirical testing of HO. And, simultaneously based on the testing we will talk about certain paradoxes, certain criticism to the Leontief paradox or to the HO theory in terms of Levantine paradox.

Leontief identify he is actually a statistician, economy statistician who tested HO theory in 1951 using US data for the year 1947 with the help of an input output table IO table. In the IO table US actually I mean based on the US data Leontief identified so, many facts. And, those facts are actually contradicting to the HO model and they showed that the pattern of trade did not fit the conclusion of HO theorem, that is for the HO theorem US must export capital intensive product, India must export labor intensive product.

Or the countries which are kept you know endowed with certain varieties of factor will specialize and export to another country. And, in return we will import another variety which are scarce in their country. But, in their calculation of Leontief model or in Leontief calculation using the you know US data of 1947, the result came in 1951.

They find that or they observe that exports in US seem to be more labor intensive. So, rather US actually exports more labor intensive product and they should have been, but actually they should have been capital intensive which is contrasting to the HO theorem.

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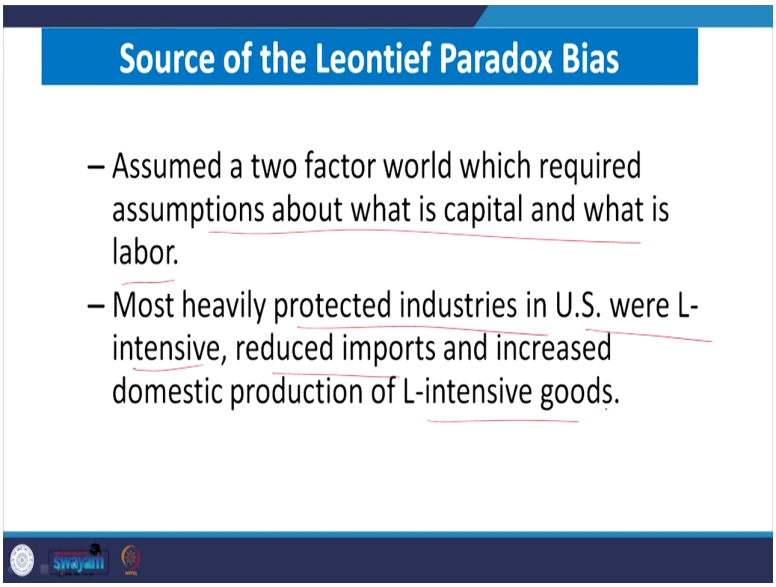

And so, they assumed a two factor world which require assumption about what is capital and what is labor. I mean what is the source of this paradox and why we are saying it is a paradox? Because, you know at least against it seems as if you know US should actually export you

know capital intensive product, but actually they are exporting labor intensive product; it is a clear paradox.

And, this is the strongest criticism to the HO theory and what is the source of this bias; since they assume that two factor world with assumption or what you know assume a two factor world which required assumption about what is capital and what is labor. And, there are assumption of capital intensiveness and you know labor intensiveness for two countries.

So, there is no such you know variation in their model, most heavily protected industries in US where labor intensive. Protected industries are actually labor industry as you know derive by Leontief, reduce imports since our labor intensive they do not depend on other countries. So, that reduce you know imports and increased domestic production of labor intensive.

So, specially in the protective industries these cases are not valid. So, only human capital in today's capital. So, that will the assumptions are very limited, sorry only physical capital are considered to be the capital, but its not physical capital that matters, it is the human capital. So, like you know education, jobs, training skills, you know knowledge these are you know various aspects to define capital in detail. But, just physical capital may not be completing therefore, paradoxes are derived.

So, these are you know emphasized by you know these economist which says that paradox is derived. So, HO theory cannot be just universally applied so, cannot be defined as a law.

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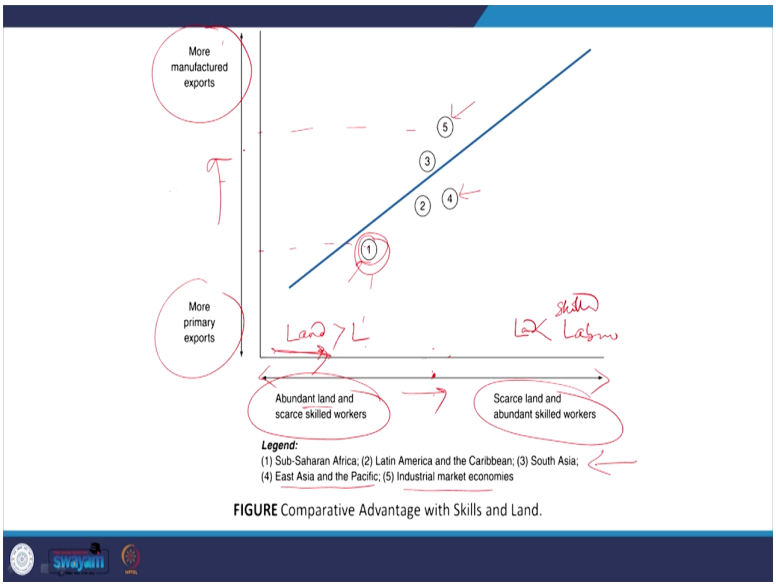

FIGURE Comparative Advantage with Skills and Land.

Now, more clearly is more evidences are also derived by other economist specially in Krugman's and work, Krugman Osfield work. We have seen that with the you know examples of Sub-Saharan Africa, Latin America, the Caribbean's, South Asia here these are written. South Asia 1 stands for Sub-Saharan Africa, 2 stands for; 2 stands for Latin-America and Caribbean's, 3 stands for South Asia and 4 stands for East-Asia and the Pacific 4 4 here stands for East-Asian Pacific.

And, 5 stands for industrial market economies, this is 5 and 1 stands for Sub-Saharan Africa. Now, on the horizontal axis this is an arrow both side arrow where we are saying abundant labor and scarce skilled workers. Here we are saying scarce land and abundance skilled you know workers.

So, abundant land in first here we say abundant land. This side less I mean land and this side it is I mean this side is more land; this country is poised with more land and more land and less labor, more land and less labor. This side we are emphasizing landless as compared to labor. So, the countries are actually mapped accordingly.

Now, on the vertical axis so, we are explaining we are trying to find out what contribution in which type of production they produce based on these endowments in different countries. Now, here they are saying you know manufacturing exports here it is primary exports may be agricultural varieties related for exports.

Now, based on this mapping a competitive advantage which skills and land is made where it has been observed that the low countries, the countries like Sub-Saharan Africa here. Sub-Saharan Africa is more poised with land as compared to you know labor, skilled labor. And, they are primarily exporting what? Primarily exporting you know primary or very you know basic goods.

Whereas, if you look at industrialized countries 5, they are more abundant with skilled labor, this is not labor skilled labor. The more abundant with skilled labor, but their land is scarce like you know European countries OECD countries. So, they export more of manufacturing goods. So, but labor are more engaged in manufacturing goods. So, what they export? Manufacturing goods to other countries and you know.

So, what kind of comparative advantage are actually followed based on this and it is a clear mapping. So, there is a upper sloping when we have countries with more skilled labor, they are more engaged in manufacturing goods. So, now, the bottom line of this slide, now these diagram suggests that capital just cannot be defined by physical abundance of capital rather it can be defined a skilled labor as well. Skilled labor would be more engaged in the manufacturing production and accordingly exports are defined.

So, HO theory is very limited in that sense. Now, what else, what are the other criticisms of HO theory empirical evidences which are made?.

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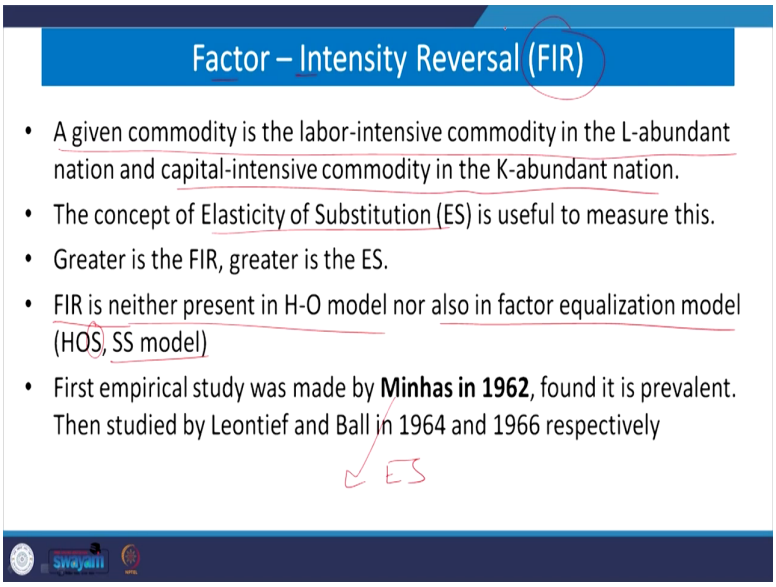

One of the finest article by Indian economist Minhas in 1962 on the basis of elasticity of substitution, elasticity of substitution I think it is mentioned here of the factors engage in different sectors. Now, factors which are engaged in different sectors to what extent they are elastic and the nature of changes based on the productivity or the based on remuneration to what extent they actually change? What is the marginal changes of factors being engaged in different sectors?.

Now, this elasticity of substitutions they the percentage change of substation with respect to the given you know engagement in the sectors identified by Minhas. He emphasized and defined a very different result as compared to the fact mentioned in HO theorem, they contradict the HO theorem. They said that labor a product which is defined to be labor intensive in one country simultaneously that is you know capital intensive in another country.

But, HO theory we said that you know one product by stricter assumption should be labor intensive in one country and another product to be capital intensive in another country. So, now this is a given commodities labor intensive in the labor abundant nation and the same community is capital intensive in capital abundant nation. So, they observe that you know the product not just cannot be I mean just cannot be defined cannot be just defined as labor intensive in one country, the same product can be capital intensive.

But, in the assumption that the same product should be labor intensive in both the countries which is not validated. Says that the factors choose their best options in their engagement and then the skilling part as we just discuss are also responsible for their switching over effect. So, the concept of elasticity of substitution is useful to measure this and it is called factor intensity reversals. The intensity of the factors are actually reversed.

The intensity I mean not necessarily confined to in a very you know rigid framework, the factor can be intensively using another industry. So, therefore, a commodity is labor intensive in one country, the same commodity can be capital intensive in another country which is contradicting to the HO Heckscher Ohlin model. So, FIR that is Factor Intensity Reversal is neither present in HO model nor also factor equalization model by HOS or also neither in the Stolper-Samuelson model.

So, in all the I mean FIR contradicts all models so far discussed. Actually, it is quite obvious you know the fact the commodity cannot just be; cannot just be you know intensive in all the countries. I mean labor as I just said manufacturing I mean in the high income rising or the high income countries are engaging skilled labor in their manufacturing sector and they produce using the skilled labor. And, they are the next exporter of those varieties and that is due to skilled labor not just due to machines.

So, the very definition of defining labor or the capital each erroneous in the HO model. So, the first empirical study as I just said it was made based on this intensity reversal and it was found prevalent. So, later on also again reemphasized by Leontief ball in 19 you know 64 and in also 1966 respectively.

So, the FIR factor intensive reversal is clearly a objection to the HO model, a clearly a contradiction to the HO model because, the propagation is not valid. So, its also contradict or the two model HOS model factor price equalization; it is not necessarily going to equalize the prices as mentioned in this one.

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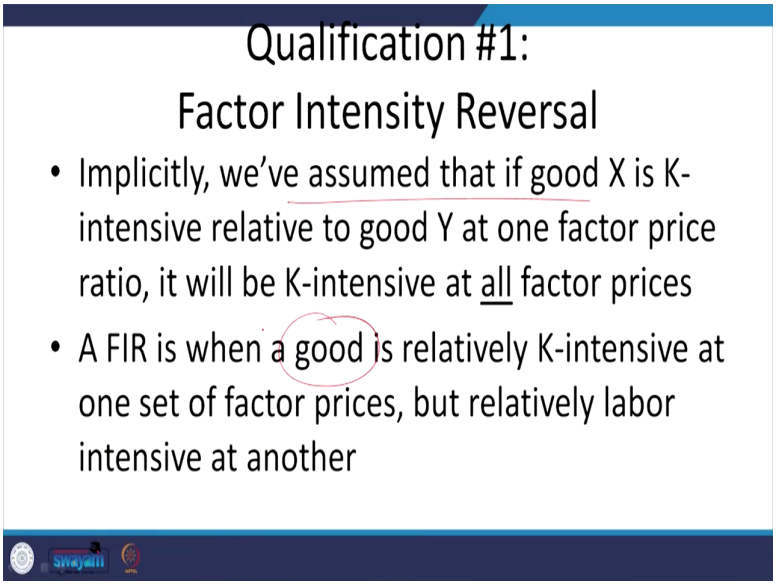

So, what are the qualifications for reversal? We wanted to say implicitly we have assumed that if a good is actually capital intensive relative to good Y at one price ratio, it will be capital intensive at all prices .

So, FIR; a FIR when I mean FIR is when a good is relatively capital intensive at one set of you know factor prices, but relatively capital intensive at another. So, the same good which are

said is actually in one case it is capital intensive, in another country or another case it is also labor intensive. So, therefore, the intensity reversal.

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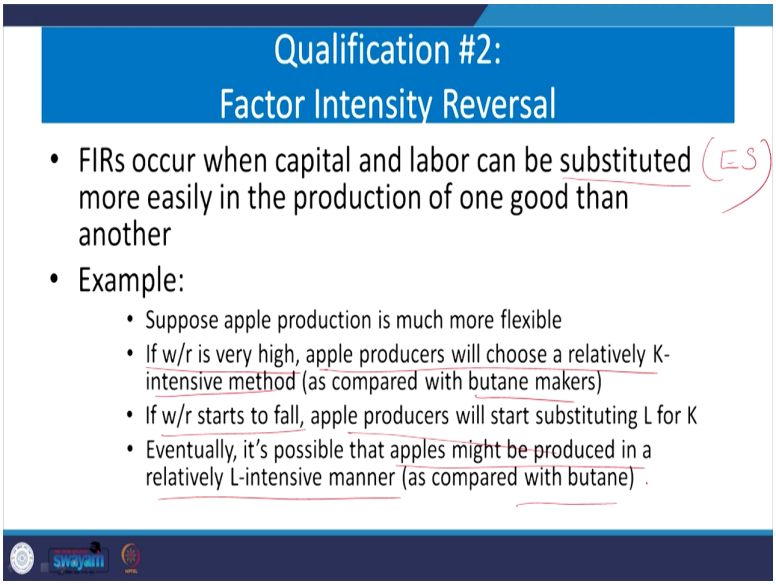

So, other interpretation of FIR are the following: FIR occurs when capital labor can be substituted and that will be measured through ES Elasticity of Substitution. And, then those substitute more easily in production of one good than another. For example: suppose apple production is more flexible, similarly may even clear that which also you know if it is more flexible then people or the manufacturer will utilize the available resources accordingly.

And, if that those some of the prices are getting cheaper so, they will also reverse the factor engagement. And, that will lead to some kind of; some kind of you know further adjustment. So, factor intensity reversal not necessarily you know I mean is necessarily contradicting the existing model because of this change.

Now, if w by r is higher high apple I mean basically if wage rate is higher apple producer will choose relatively capital intensive method as compared to butane is one of the organic you know product. If it is using you know more of capital intensive one, if w r starts fall then apple producers will actually substitute.

Now, one interesting result of this model which says that if prices are you know changing, there are lot of expectations of also using those factors interchangeably. So, expectations will actually again dilute the very postulations of HO model. So, eventually what we wanted to say is the following, it is possible that apples might be produced in a relatively labor intensive manner as compared to butane.

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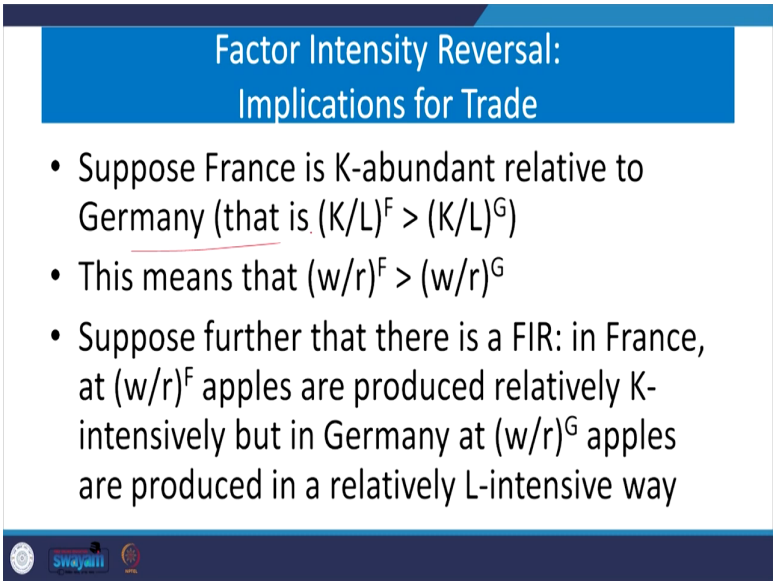

So, suppose France is another example we can go for it, France is capital abundant relative to Germany. So, accordingly the ratio of uses are made and so, we have already discussed these how intensiveness is defined.

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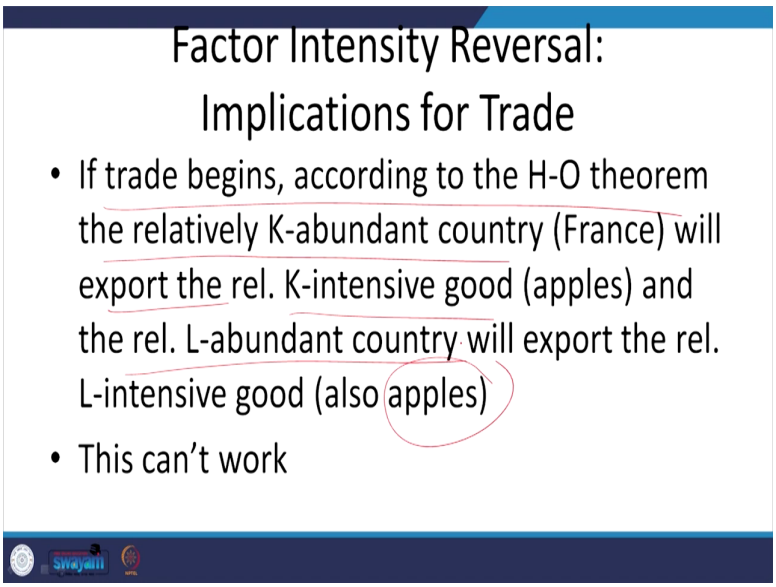

And, the factor intensities reversal are discussed. If trade begins according to HO theorem that the relative capital abundant country will export relatively capital intensive good. And, relative abundant country will export relative labor intensive good which is actually contradicted with the examples of apples which I just said. So, therefore, you know Heckscher Ohlin theory does not work when FIR are present.

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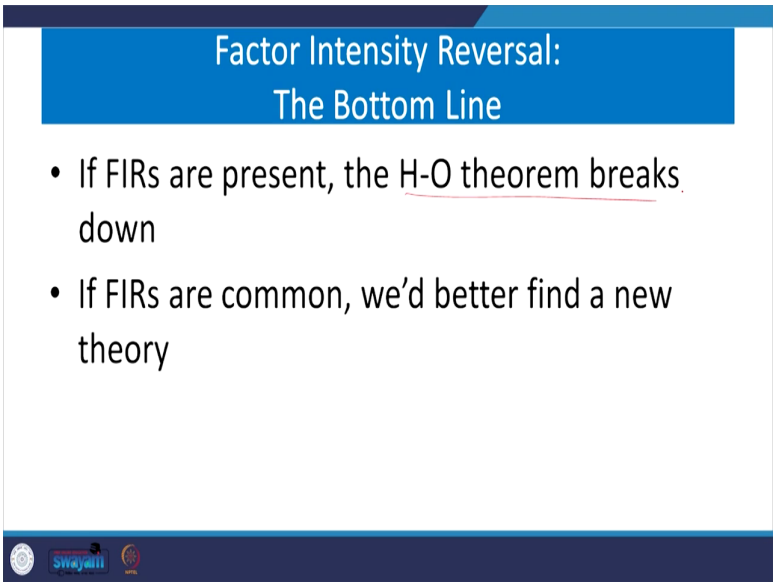

And, what are the bottom line then? If FIR present HO theorem breaks down.

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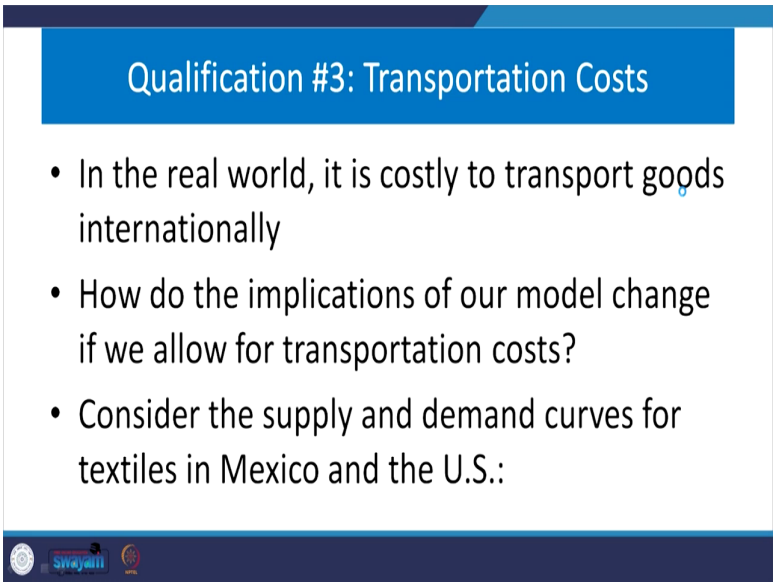

And, if FIR are common we would better find a another theory which will complete the HOS model in our you know next week we will be discussing in detail about you know many aspects of other problems as an advanced portion of HO theory by including many other factors. So, in the real world we have neglected the cost of transport in the international you know trade framework.

So, how to actually incorporate it if you are you know including transport case, then how the model gets changed to should be emphasized? Let us take the case of supply and demand aspects of Mexico and US specially in textile sector.

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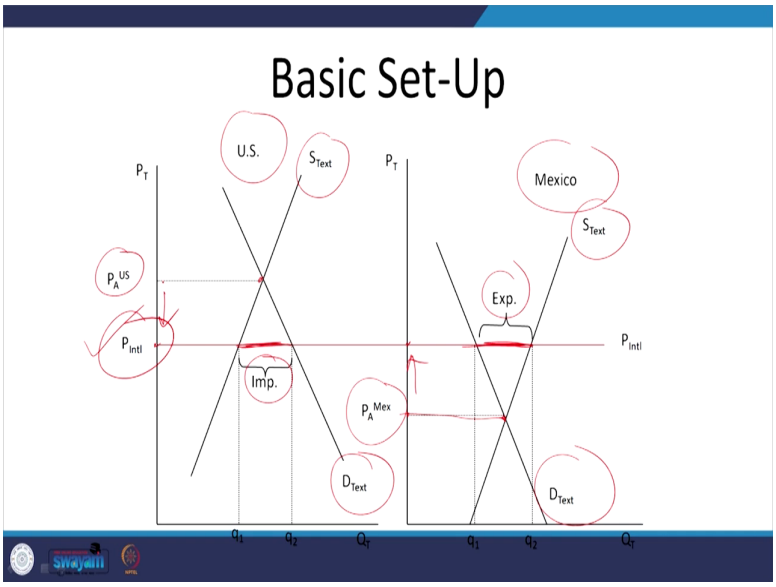

This is the basic you know framework in a diagram. Now, this is look at US, this is Mexico; I hope it is visible and where we just try to look at a partial equilibrium setup. This is purely a partial equilibrium where only sticking to textile demand and textile demand in both the countries. This is textile supplier and textile supply in both the countries.

Now, based on the domestic you know availability of resources or the endowments, the country primarily setting an equilibrium price. Now, in Mexico so for a textile is concerned we have already discussed the prices is here, their domestic price is here especially in the autarky situation the prices is here maximum Mexico's maximum price. Whereas, as compared to US the text prices are set is here is the autarky price because, of trade because of trade.

Now, based on this you know situation based on this situation we can infer one thing you know Mexico is specializing in the production of for textile, because next it is a labor intensive you know country specially in textile sector.

And so, there will be trade possible and prices of this one will fall and price will rise and they will reach to a level that will equalize price and that price is called you know called international prices. And, where the import demand by US are perfectly match by the export supply by Mexico. This is vertical distance vertical, I mean this horizontal distance must be equalized in order to have an international price to be defined and that will be sustainably defined.

And, it will be continued as an international equilibrium price. Now, once we shipping the transportation cost to this model, the situation will be will be different.

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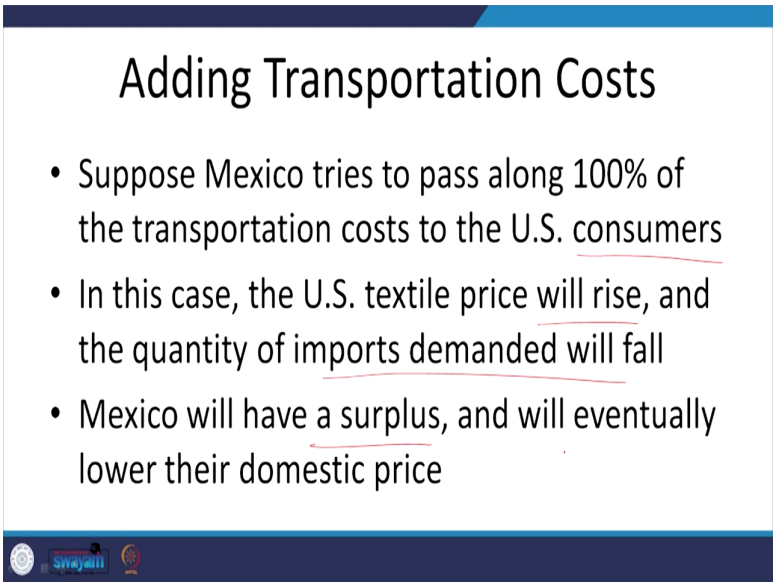

Now, suppose Mexico tries to pass along 100 percent of the transportation cost to US consumers because they are exporting. And what will happen? So, in this case US textile price will rise and quantity of imports demanded will fall. So, they will price will relatively rise and fall, Mexico will have a surplus because they will get you know you know higher return even and will eventually, I mean because those products are not sold.

So, their products are not getting you know purchased by US. Eventually, they will reduce the price level and the price level will be maintained at a certain point.

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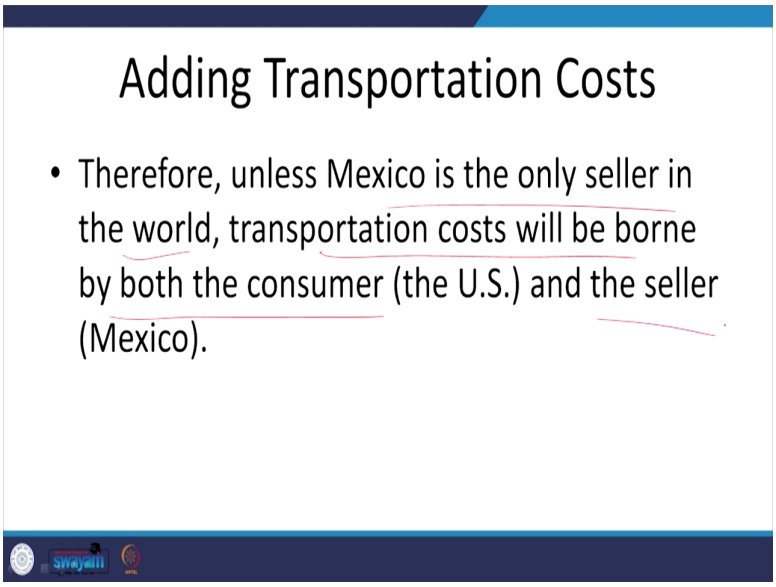

Now, therefore, unless Mexico is the only seller in world transportation cost will be borne by both the consumers, not just US also the sellers. Because, you know if just borne by US then prices will fall and it will be in the long run problematic for you know Mexico to supply their products. There will be less demand. So, the graph will change accordingly. Now, international prices may go off.

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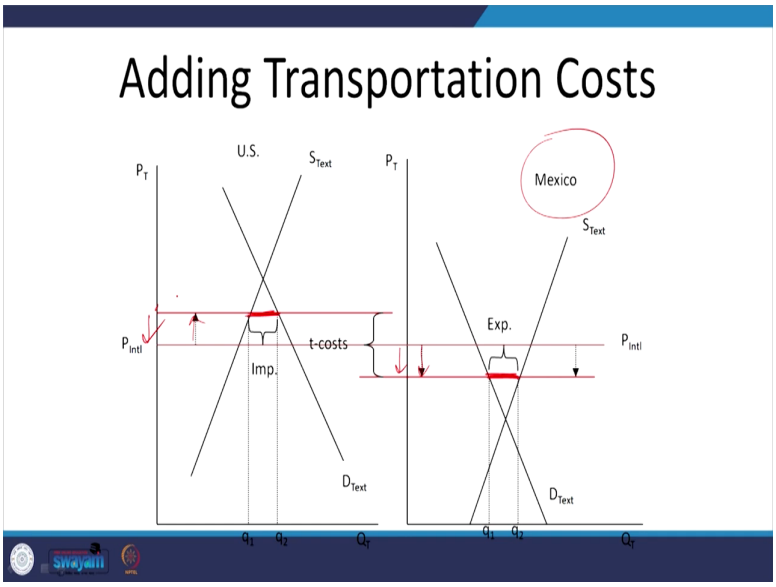

Now, these the I mean initially we say that adding a transportation cost if it is borne by this. So, prices will actually rise. So, that will look at these whereas, you know prices will now since transportation cost are less prices will fall, now less products are actually demanded. So, is less products are demanded; so, less products will be supplied by Mexico to US. So, it will be forcing down for Mexico to reduce their price further. So, in the international level price will fall and the price will be maintained.

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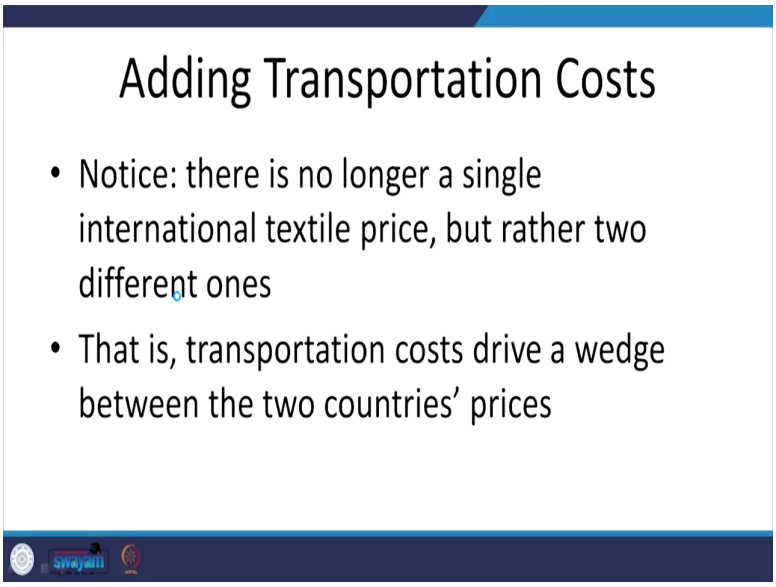

So, therefore, adding transportation cost is not making such a bigger obstacle, if it is borne by both the countries; this is what we discussed.

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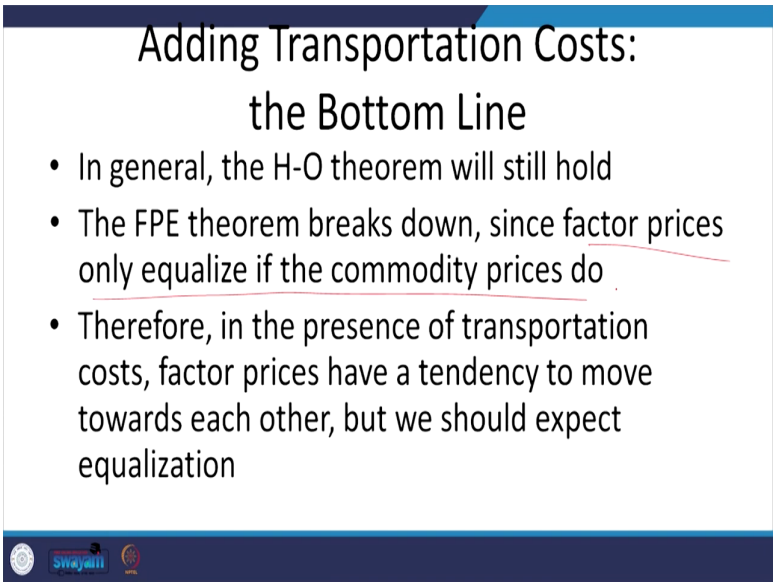

In the bottom line HO theorem will still hold because price is still going to be equalizing. The you know factor price equalization you know theorem breaks down because factor prices only equalize if the commodity prices do. But, if commodity prices are different factor equalization are not going to be equalized. So, therefore, there will be some problems.

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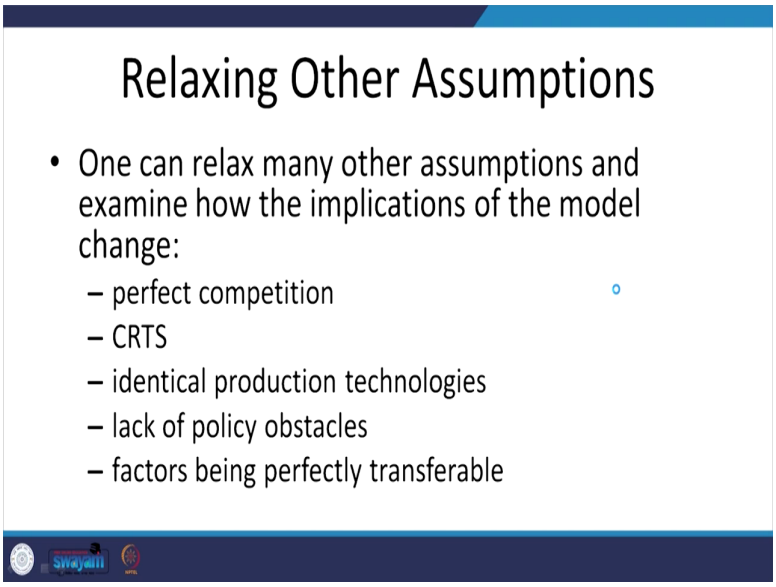

So, relaxing what other suggestions are made it is not just the Heckscher Ohlin theory with assumption in order to make or make large in a you know HO model to be in a larger context, we are supposed to relax many other assumptions which I have already discussed and these are in short mentioned.

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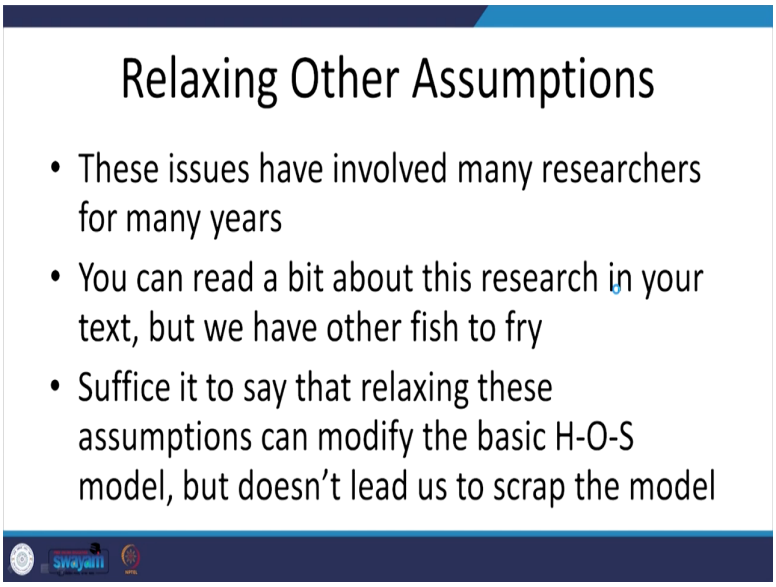

Other assumptions are actually relaxed in our advanced model in the modern or new classical models which will take it forward in other classes. With this I think I have we have understood the concept very clearly and we will take it forward other you know models in our next successive classes.

Thank you so much.