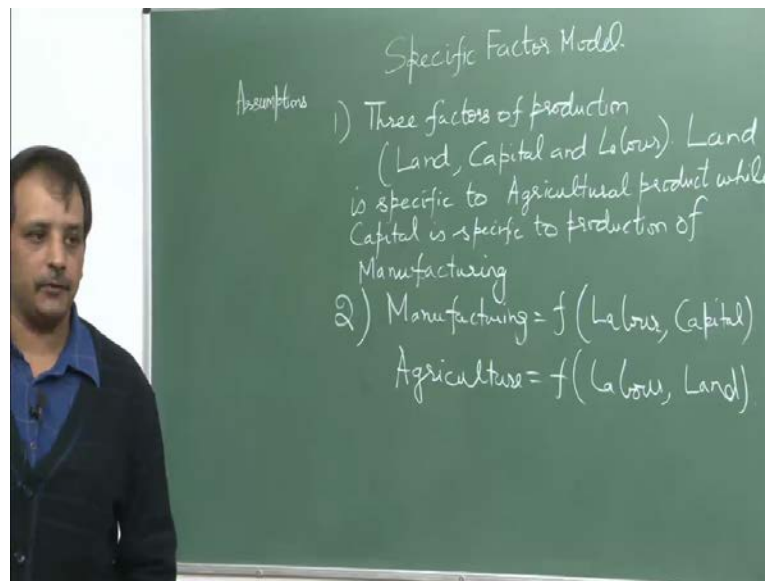# International Economics

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Lecture No. # 28

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Good afternoon. today we are going to discuss the specific factor model. And this model accounts for how trade, have an impact on the income distribution. So, trade brings unequal returns to the factors of production and this is, this will be quite clear once we discuss the main results of the specific factor model. So, here unlike the Ricardian model, there are three factors of production one is labour, the second is land and the third is capital. Now, this capital is specific to the production of manufacturing, although manufacturing product uses both labour and capital. Capital is specific to manufacturing and land is specific to the agricultural product. What is mobile; is this labour which is present, which is used for manufacturing as well as agriculture

So, there is one mobile factor and then there are two immobile factors. Now, how can you understand this, you can understand this in a way where you are analyzing only short run phenomena. Remember, in the short run if you read micro economics, in the short run, some factors are fixed, right. So, here in the short run you have capital which cannot

move is specific, specific to manufacturing and land which is specific to agricultural sector.

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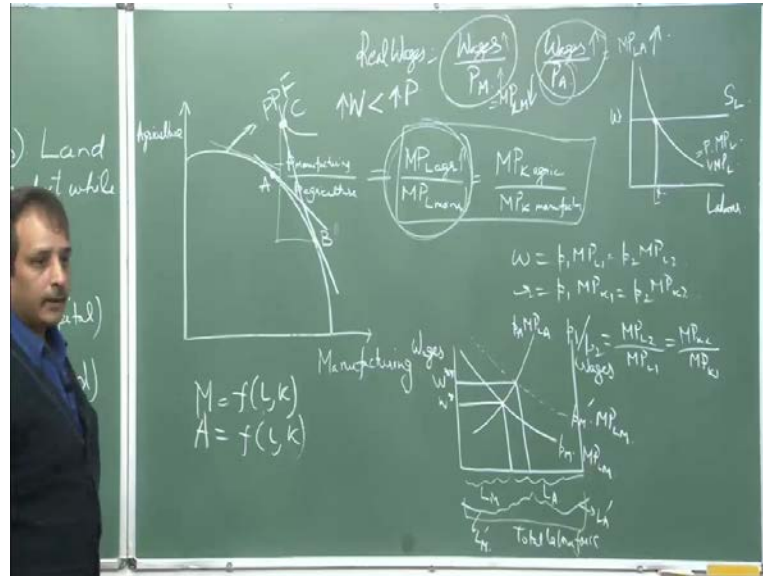
Now, the PPF is again for the specific factor model, is concave to the origin this slope is given by price of the manufacturing product divided by price of the agricultural product and (no audio: 03:06 to 04:10).

So, the shape of the PPF is again concave to the origin. So, if you are moving from left to right, if you increase the production of manufacturing, you have to decrease the production of agriculture. Now, see what happens if you increase the production of manufacturing. If you increase the production of manufacturing, capital is specific to manufacturing, but then if you require product more production or manufacturing you would require more of labour, right. But more of labourers will only come if the production of agriculture goes down. So, you see a shift of labour or labour moving from agricultural sector to the manufacturing sector, right.

Now, see what happens, it is a little deviation from the fact that this manufacturing is capital, it uses capital and labour, this uses land and labour. The general cases say for example, one good uses capital labour another, another good also uses capital labour, but one good is say, capital intensive, another good is labour intensive. We are not discussing that. We are discussing a peculiar case, where one factor is specific to this,

another factor is specific to agriculture land is specific to agriculture, capital is specific to manufacture.

Now, something happens in the economy and I will explain what is what. Is that something which leads to an increase in production or manufacture? So, when there is an increase in production or manufacturing, it will require more of labour and more of labour will be forth coming from agricultural from the decline in production of agriculture.

Now, when the labour moves here, you know what happens? There is something called the law of diminishing marginal productivity. If you increase labour, the marginal productivity of labour goes down and there when the labour moves out from there the marginal productivity of labour, there in the agricultural sector goes up. So, here in the manufacturing marginal productivity of labour goes down and there the marginal productivity of agriculture goes up. Now, if you focus on this, <mark>this</mark> is going down, this is going up can you, let me know, what would be the net effect? They increase.

So, remember, if you remember, if it is concave to the origin and if you move from left to right the slope of the PPF increases. So, this here it increases because of the impact that it has on the MP l's. Now, at this stage it is very important to explain the general case, the general case is that if there are two products one.

So, I am now deviating and I am not talking of specific factor model. Now, general model, general model will have manufacturing as a function of labour and capital and agriculture will be a function of labour and capital. So, again I am saying, it has nothing to do with the specific factor model, only that I want to explain that in that case also you will get a concave shaped PPF, this is a production possibility frontier. Why will you get a concave curve? Because here if you have to get this concave curve, you have to say something more about manufacturing and agriculture, that something more is that, this is capital intensive agriculture is labour intensive.

Now, if it is capital intensive see what happens, something happens in the economy manufacturing goes up output of manufacturing goes up. So, now manufacturing is capital intensive, right. So, it will require more of both factors, but it will require more of capital when the production of agriculture goes down, there will be a decline in production, there will be a relieves of labour and capital, but the amount of capital which

is required by manufacturing will not be forth coming from the agricultural sector. So, do you know what will happen to the prices of capital? The prices of capital goes up okay. So, if the prices of capital goes up the price of the manufacturing product goes up.

So, therefore the relative prices go up, as you move from left to right. So, that is the explanation of the concave PPF in the general case, there you have to assume that one product is capital intensive, another is labour intensive here it is capital is specific to manufacturing land, is specific to agricultural sector. So, in the exam there are questions. What is the shape of the PPF in case of the Ricardian model and what is the explanation?

So, then you have to write, may be a two mark question you have to write that the marginal productivities are fixed constant therefore, the relative prices is a constant. So, therefore, you get a straight line downward sloping curve in case of the Ricardian model. In case of a specific factor model again you get a concave type of PPF and in the general case also you will get a concave type of a PPF, right.

Now, let's see Yes.

(( )) Left to right, the change in manufacturing products is more than change in agricultural product.

No-no now, we are not saying anything about how much this product increases. How much is a decline in agriculture? But what we are saying is that, when you increase the production or manufacturing then because it is capital intensive, right. It will require more of capital, which is not forth coming from agricultural sector because agricultural sector is labour intensive, right. So, then the relative prices of the capital goes up as a result, the price of the manufacturing the relative price of manufacturing also goes up.

 (( )) (( )) You do something for agricultural (( )) right to left.

Yes.

(( )) Land is costing.(( )) So, then again I am saying, labour and capital, labour and capital, which is common to both. So, here the general case, where you have, either you can choose land or and capital land and capital, but it is more natural to assume labour and capital for both. So, when you are moving from right to left, if you increase the production of agricultural sector agricultural good because agriculture is labour

intensive, it will require more of labour which is not forth coming from the decline in production of the manufacturing.

So, the relative wage rates go up w by r, ratio goes up. So, w by r ratio goes up. The price of agricultural sector, relative price of agricultural sector that is price of agriculture by price of manufacturing goes up or if this goes up, this ratio declines so, you move you come here.

Now, let us come back to the specific factor model, I talked about that something happens in the manufacturing sector, which leads to an increase in production or manufacturing output that something is trade and you have already known that. With trade the relative prices go up because it is only when the exporters realize that, they are getting higher price for their product then only they would try to export. So, what we are saying is that this manufacturing is the export sector, agriculture is the importing sector. You can always think of cases, where agriculture is the export sector and manufacturing is the importing sector like in Latin America whether you talk of Bolivia, you talk of Ecuador, they are rich in petroleum, they are rich in natural gas.

So, the factor which is specific to the agricultural sector that is land is the export sector. So, there the land is the export sector, the other is the importing sector we are considering manufacturing as the export sector and agriculture as the importing sector. Now, if trade has to take place the relative price of manufacturing has to go up. Why? Because it in that case only exporters will supply will export the good, only when they get higher price for their manufacturing product. Then only, they will export the goods. So, then you move from here to say, a point like this you were here, earlier you get a higher price for your, for the good that you are producing, you reach a point like B band, then you reach a point like C, because you can export some part of the manufacturing and import some part of agriculture.

So, you are on a higher indifference curve, you were here earlier, you reach a higher indifference curve, you get higher level of satisfaction, this is happening because exporters are getting higher prices and importers are importing product at a lower price. So, now they can consume more, you can produce more, you are on a higher indifference curve, that is what happens here also. Our focus of attention is that with this trade. How

does it have an impact on labour? How does this trade have an impact on capital? How does this have an impact on land?

So, if you have to answer, that you have to, you have to see what happens to the wages. What happens to the rate of return on capital? What happens to the rate of return on land? Now, as far as wages are concerned (no audio: 17:00 to 17:34)

Now, see this. Remember labour is mobile? So, if one sector is giving higher wages, you know what will happen. The labour from here would move from here, from this sector to that sector, if the wages are here higher in the other sector, the labour will move from this sector to another sector. So, at the end you will have the same wages across the sector.

So, wages will be equalized and how are wages determined remember? Wages are determined wages are equal to the prices into MPl's wherever, the value of marginal productivity is equal to the wage rate. This is how wages are determined. Now, you have to recall from your micro economic theory, there is something like a demand curve for labour, the demand curve for labour is called the VMPl. Demand curve for labour is the VMPl, this is the VMPl, this is the demand curve for labour and because you assume perfect competition in both product and factor markets.

The supply curve of labour is perfectly elastic wherever, the supply of labour cuts VMPl, this is the amount of labour that a firm would employ. This VM Pl is the demand curve for labour. So, the theory of production will devote certain pages on why is this a demand curve for labour and this is equal to P into MPl.

So, this is again this bit of information is again put here, where on the y axis you have wages on both sides. And then you, because you have two sectors and wages will be the same in both the sectors, initially L amount of labour will be employed in the manufacturing sector, the rest of the labour will be employed in the agricultural sector. Now, see what happens with trade. The price of manufacturing goes up.

So, if the price of manufacturing goes up, as the price of manufacturing goes up, the labour shifts from agriculture to manufacturing sector. So, now there will be more labour working in the manufacturing sector and less labour working in the agricultural sector

and the wages would go up from W star to W double star. So, wages will be equalized in both the sectors, but wage W will go up.

Now, what is important is what happens to the real wages, that is wages by price of manufacturing and wages to price of the agricultural sector. What happens to these now, remember price of manufacturing has also gone up, wages have also gone up here wages have gone up price of agricultural sector has remained same.

So, one thing is clear that the marginal productivity of labour in the agricultural sector goes up, all right marginal productivity of labour in agricultural sector goes up and this we had already analyzed that, when labour moved out from agricultural sector to another sector, you had less of labour, less of labour means marginal productivity of labour in the agricultural sector goes out.

So, this is this goes up, but remember what happens to the marginal productivity in then the in the manufacturing it goes down because now, the you have more of labour coming in, more of labour coming in means diminishing marginal productivity. So, this. So, when this ratio goes, goes up marginal productivity of labour in manufacturing, this goes down. How can it go down, how can it go down? When wages are also increasing, price of manufacturing is also increasing, if the increase in wages is less than the increase in prices absolutely and you can, you can see from this diagram also you can see from this diagram also the increase in prices is this much, the increase in wage rates are only this. So, the increase in wages is less than the increase in prices.

So, if someone asks you what happens to the returns to labour? In this type of setting, it is ambiguous because on the one hand the labour, the marginal productivity is gone up in the agricultural sector, but on the other hand the marginal productivity of labour in manufacturing has gone down. At the end, it will depend on how much are you consuming the manufacturing product. How much are you consuming the agricultural product? So, its ambiguous. So, the returns to labour . So, so the gist is the returns to labour in the specific factor model are ambiguous, that is result number one of this model what about. So, now we come to the returns to capital, can you intuitively think what will happen to the returns to capital returns to capital.

Now, you had capital now, it is been supported by more of agriculture coming in. So, can you let me know that if labour is coming in and you have capital. What will happen to

the marginal productivity of capital? It is not capital coming in it is the labour which is supporting now, capital more of labour coming in. So, what happens to the marginal productivity of capital goes up, goes up right. And we will mathematically also prove that if labour goes up with a the marginal productivity of capital goes up because now, supported by more of labour. So, that is what happen the returns to capital the real returns to capitalist goes up.

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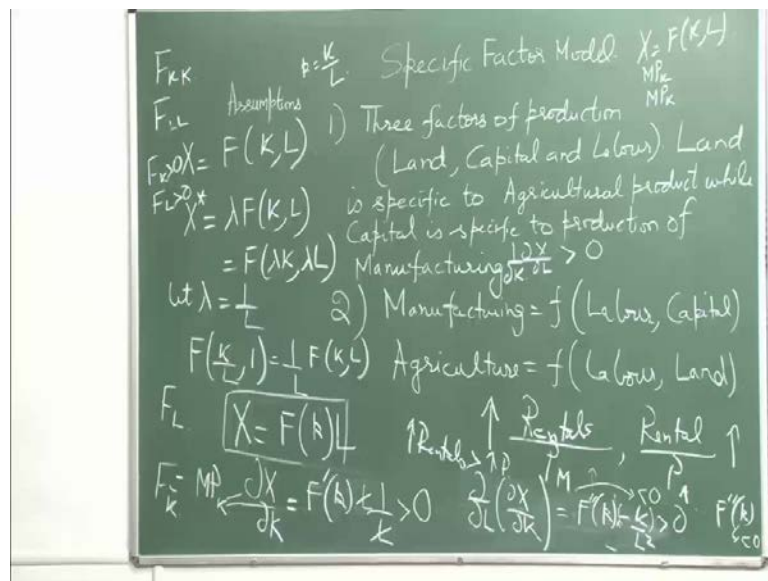
What are the real returns to capital, What do you call it rentals? Rentals to price of manufacturing by rentals to price of agriculture, the marginal productivity goes up, there is no change in the prices here right this also goes up. But remember P m has price of manufacturing has gone up, the marginal productivity of capital has gone up.

So, when can this happen, when can this happen here, you said that this has gone down because the increase in wages are less than the increase in prices here, if this has to go up the returns to rentals are greater than the increase in price of manufacture and this Fenestrate and Taylor gives certain numerical, numericals to prove this, this thing you can have a look at it, but what is important is the marginal productivity of capital. This is, I am just restating the law of diminishing marginal productivity that with an increase in labour the marginal productivity of labour goes down, but the marginal productivity of capital it goes up with an increase in labour.

(( )) In manufacturing sector that is marginal productivity in the capital is appraising (( )) in the manufacturing.

In the manufacturing sector, but but yes, but remember this rentals are going up, right. And there is no change in price of agricultural sector, right. So, this ratio also goes up.

Sir, why going up?

Well you, you know about the law of diminishing marginal productivity that when you increase labour output increases, but increases at a decreasing rate. So, the new classical production function assumes that marginal productivities are positive, but declining, but another thing which is also true is that, when you increase labour in an industry the marginal productivity of capital goes up because capital is now, supported by more of labour. Okay. Try doing this exercise where you have X as a function of K and L, right find out marginal productivity of capital, find out marginal productivity of labour and then if you differentiate the marginal productivity of capital with respect to labour you will see a peculiar result, not peculiar, but an obvious result that this MPk increases with an increase in labour. How?

Let us, if you want, let us do that, but then you have to think that it is the capital is now, supported by more of labour and in the other sector that land that poor land is now, with less of labour. So, the marginal productivity of land goes down. So, that happens. So, here (no audio: 29:14 to 31:10)

Now, see it is a new classical production function. So, if you increase capital and labour by a factor lambda output also increases by a factor lambda you have, you have constant returns to scale, you have constant returns to scale.

So, let lambda will be equal to 1 by L. So, FK by L one is one by L, FK L that is the output, output is L, L times FK. So, X is L times FK differentiate this with respect to K. So, you get F dash k L the derivative of small k. So, small k is K by L. So, then if you differentiate it with K or say one minute let me change it little bit (no audio: 32:15 to 33:19) k.

So, lambda one by L, F K L that is output L times function small k, small k is K by L, differentiate this with respect to big K that is marginal productivity of capital, this by

assumption in the new classical production function is greater than zero. So, it is F dash k one by L because small k is K by L . So, if you differentiate with respect to big K you get one by L.

Now, what happens to marginal productivity of capital, if labour comes in right that is what we are trying to analyze you increase manufacturing. So, more labour comes in to support the capital. So, del X del K del by del L. So, del X by del K is F dash k. So, it becomes F double dash k the derivative of small, <mark>small</mark> k with respect to L minus K by L square you have a negative sign, but this is negative.

So, this is negative minus K by L square. So, you get this to be greater than zero and why is this negative? If you do an exercise further you find out marginal productivity of labour then you find out what happens to the marginal productivity, what happens to the you find out F k k you find out F l l this is F k you find out F l find out F k k, F k k will be del two X del K square F l l will be del two X, del l l square from these two you will get a result which will show you that f double dash k will be less than 0.

So, if this is less than 0 this is this is greater than 0. Now, see what is happening if labour is coming and you can always find out del X del L one by del K, what happens if capital comes in to support the labour, this will again work out to be greater than zero.

<mark>(( ))</mark>

<mark>Yeah, yeah, yeah</mark> into minus K by L square see del by del del X by del K F double dash k into the derivative of small k with respect to big K small k, K by small k, k by L. So, this is derivative of this del X by del K which is this with respect to labour we use the quotient rule. So, minus K by L square and I am saying this will turn out to be negative because in the new classical production function, you assume F k to be greater than zero F l to be greater than zero, right. F k k, F l l to be less than zero.

So, if you do that exercise, you will see that with an increase in labour this marginal productivity of capital goes up.

So, leave aside mathematics, but think intuitively that in the land if you, if the labour goes from there to the manufacturing sector. Land is now, left with less of labour. So, then the marginal productivity of land would goes down because it has it has less of

labour to work with and capital now, is supported by more of more of labour. So, the marginal productivity of capital goes up.

So, then rent which is the return to land by price of agricultural sector this goes down So, then the final result is of the specific factor model is that the specific factor in the export sector gains and the specific factor in the import competing sector loses with trade. So, these Latin Americans, they are the export sector is the land right and the extraction of petroleum and natural gas is done by a very few companies and they are basically multi nationals, which are operating in these Latin American countries.

So, then you if you see a trade its only those specific factors in the export sector who gains, but the others loses from this type of trade. So, then in many countries like Bolivia, Ecuador or Venezuela they are trying to nationalize the sale of petroleum and natural gas. So, even in Argentina they sees, you see attend, where they are trying to nationalize these things.

They do not want the multi nationals to operate because in that case they think that the gains are unequal, quite unequal. So, if you have if you know that this is the theoretical result then one should think that what should governments do, the government should compensate the losers and yet you should be in a position that the welfare goes up. If you are not able to do it then there will be surely some protests from the factors of production which who loses.

So, all in all Latin American, the factors which are losing always protest keep protesting and you see fall of governments in every two or three years because they think or because the returns to trade are unequal. And the governments who, whichever come they are not able to compensate the losers. So, now they are thinking that the option is to nationalize everything where they have the entire resources. Is that the right step? Is an open question, okay. So, I will end up here and we will continue with the other trade model, the Heckscher-Ohlin tomorrow and there also you will see that trade brings unequal returns to the factors of production. Thank you.