Microfoundations of Macroeconomics
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Lecture – 16
Search and Unemployment 1

Welcome back. We are going to start a new session and this session will be interesting because we will be talking about search and unemployment. in India, we are facing a very high unemployment rate right now as reported by the newspapers and it comes out that during this environment it will be good if we talk about the unemployment model and how the search behavior plays a very important role.

And this is a new addition to the macroeconomic literature. earlier we used to compare unemployment with inflation, but now we are looking into an environment where we will be seeing that with the change in technology when we are trying to bring new technology into the picture then how the searching firms which are looking for the labor and how the skilled labor when he or she is looking for a job behaves.

When there is an interaction then how the bargaining takes place between these two agents if we talk about the bargaining then bargaining will be from the demand side how the firm is asking the labor to be and what will be the offerings from the firm side and from the supply side the labor how the labor is seeking extra incentive from the firm.

it is a very interesting concept that we normally call in macroeconomics search and employment. Why search and unemployment is important because the labor market has gone for a transformational change after 1990 and then you can say post-1930s we have seen continuous improvement in the standard of living and the working lifestyle. We have also seen that when the firms engage in the hiring they also incur some amount of cost.

the idea is that if the firm is looking for a new worker whatever is the requirement, whatever costs they incur, how much they can bargain with the labor. And when the labor is entering the market and if he knows that there is some kind of social security benefit, unemployment benefit attach to his job search, he will always look beyond the unemployment benefit.

from the macroeconomic point of view, it is very important to note that such type of understanding is important in deciding about the unemployment benefits that the countries offer. in some countries when you have high unemployment benefits there we find that it acts as counterproductive I would say it does not help the labor as such and as a result the production from the demand side al I would say the firm side, when they produce output and supply.

But from the labor side when they demand labor it also hinders the market because there will be enough bargaining coming from the labor and labor has a choice that whether he or she would like to work for a more number of hours or given the wage rate whatever firm is offering whether they accept it or not. in a broader context if we look at it then it has a lot of implications on the labor laws and also on the unemployment benefits that countries offer.

in a welfare state, it is a very good analysis to understand to what extent the support should come from the government, to what extent the firm should go for a bargain with the labor, to what extent the labor should be bargaining with the firm. for these ideas, the economists involved in these topics were also awarded the noble prize in 2010. we will be highlighting from both sides.

first we will be looking from the supply side which means that when you have the supply of labor decided by the labor itself that is at what rate he or she should work. we will be first trying to understand that dimension then we will be moving towards two-sided analysis. In two-sided analysis, I will bring the firm into the model and we will have the bargaining solutions and then we will see at what level we decide about the rate of employment and also about the magnitude of unemployment.

we will be arriving at the macro figures again, but for those of you who are new to this literature you should know that this particular model is having a similar understanding as we had in one period model where we are talking about that there is labor and this labor has a choice that how many hours this labor should supply in the market and how many hours you should utilize that for leisure.

in this setup also the labor is having an option, but that option is linked with certain benefits so we will be discussing it.

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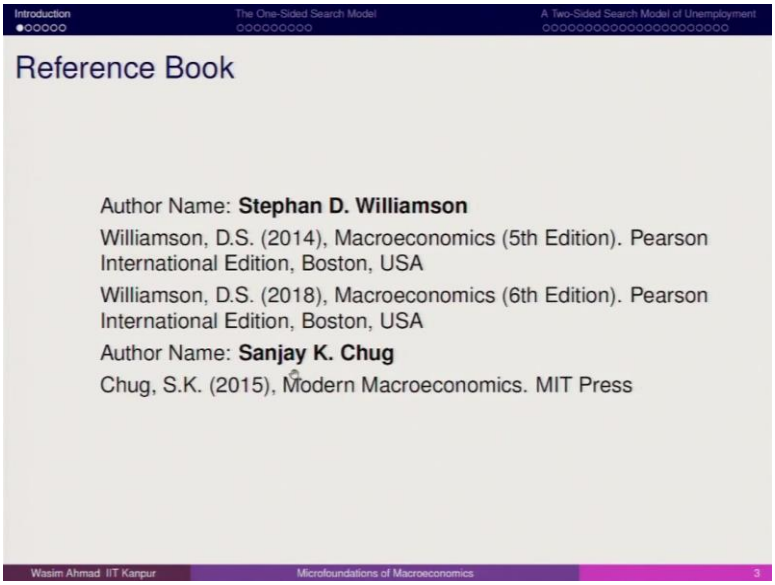

the reference books remain the same. here we have the Stephan D Williamson I am referring to and Sanjay K Chug this particular book also has a good treatment of this theory.

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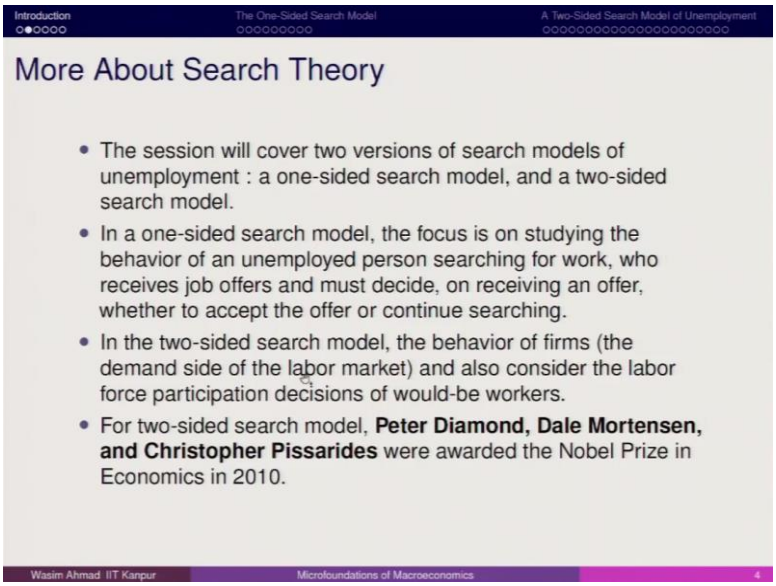

if you try to understand we will be trying to see the one-sided search model and two-sided search model. In one-sided search model, we will be trying to see how are we going to decide at what wage rate the labour should offer or should sell the labour, and in two-sided model as I said that there will be bargaining. here the focus is on studying the behavior of unemployed people searching for work.

It means that we assume that there is a representative consumer who has some skills suppose he is university qualified person, he is looking for opportunity so he applies for job and then he starts getting interview calls he attend those interview calls and then he finally gets the offer.

when the individuals are looking for work they also have some kind of understanding in mind, and then based on that they bargain.

for this unemployed person, he has two choices he can simply apply for a job and get the job offers, or if he is not satisfied with the job profile. Suppose, he got the job and the work profile is not very good then there is a chance that he can continue searching so here you have both whatever he gets the offer from the market he can accept and work. The second option is that he is not satisfied with the work profile or the wage rate.

He will be simply looking for further opportunities so continue searching. These are the two things that we are mentioning. In two-sided search model we will be looking at the behavior of firms also that how firms will be regarded. For two-sided search model Peter Diamond, Dale Mortensen and Christopher Pissarides have been awarded the noble prize in 2010. These two gentlemen basically the Mortensen and the Pissarides had a great contribution and diamond had also worked in this particular area for a long time.

The idea basically starts with the one-sided model so let us first understand the one-sided model then we will move here.

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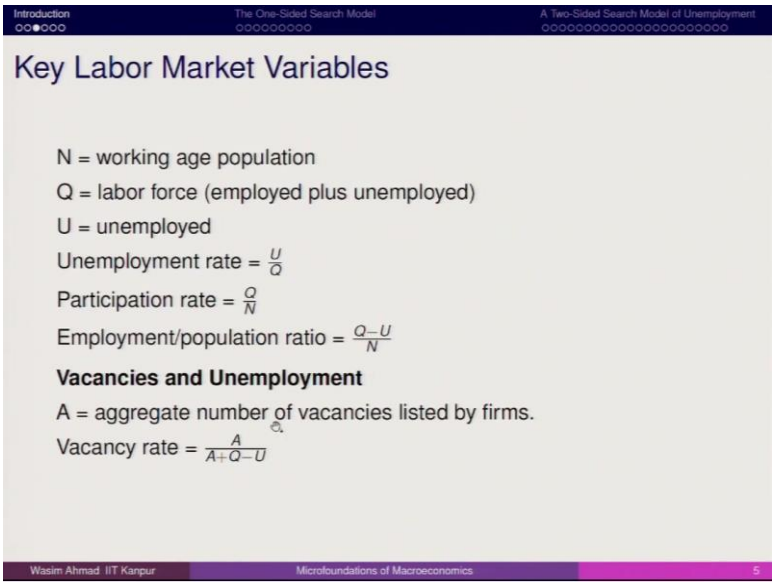

Here we are looking at the macro variables what are those macro variables? First is that in the economy you have a working-age population. So this we denote it by N then here you have the labour force. Working-age population in the sense that we are only analyzing or going to study

those individuals who are interested in working or are looking for jobs. So here we are talking about Q. So Q is what? It is the labour force.

Here we count both employed plus unemployed. Unemployed may be looking for new opportunities or they want to remain unemployed. Here we have employed plus unemployed. Now for unemployed, we are denoting as by N. If I want to calculate the unemployment rate so here you have the number of unemployed upon the labour force.

$\frac{U}{Q}$ ratio is going to give you the unemployment rate then here you have the participation rate. The participation rate is decided by the labour force who is looking for opportunities and the working-age populations. This decides about the participation rate. Here you have the employment-population ratio say here it is $\frac{Q-U}{N}$ so here we have the employment population ratio.

Let us first talk about the unemployment rate, it is a critical factor for most of the economies. This decides about how many people are unemployed if you just take what is the share of unemployed in the employed plus unemployed. Maybe some people will be looking for very short term kind of or they might be switching jobs so those people are also added to this.

How many are unemployed out of the total labour force so that matters participation rate how many are willing to participate in the labour market. Here you have labour force upon the working age population so this is also macro indicator then here we have the employment upon the population ratio. Here you have $Q - U$ so how many are from the labour force we subtract the unemployed and the working age population.

This gives you the ratio of employment to population. Now here you have the vacancies. So A is the aggregate number of vacancies listed by the firm. Here if you suppose the number of firms operating in the economy post the job of around 10,000 so 10,000 jobs are represented as A. Vacancy rate is what? The vacancy rate is nothing, but the number of vacancy listed by firm upon the number of vacancies plus here you have the labour force employed minus you have the unemployed.

This is what becomes the important factor so it is just the ratio of the number of vacancies posted by firms plus the labour force subtracting the unemployed. This ratio matters a lot so if you have A increasing you see the huge adjustment with Q and U and these two are important factors. Here it means that employment plays a very important role here so this is what we have Q – U.

The number of vacancies if A is increasing which means that the vacancy rate is increasing it is bound to have a positive impact on the unemployment and there is a curve that shows the relationship. In macroeconomics we always talk about a very popular curve called the Phillips curve and the Phillips curve shows there is inverse relationship between the unemployment and inflation, but here we will be seeing a similar curve, but with a different variable.

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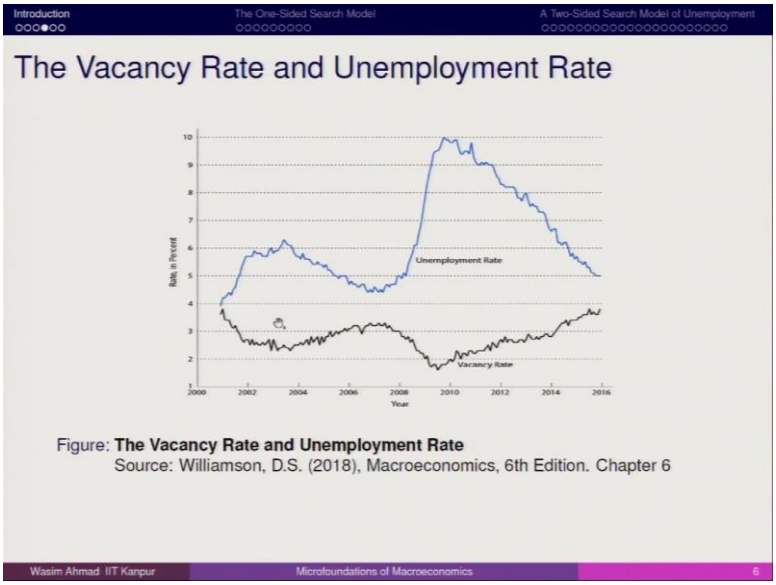

Here what we see is that if you just think about the vacancy rate so this is the vacancy rate, this is the unemployment rate. We see that when we have the vacancy rate going down we see an increase in unemployment. Here also when we see an increase in the vacancy rate the unemployment falls whenever we see unemployment rising vacancy rate falls. You have some kind of inverse relationship.

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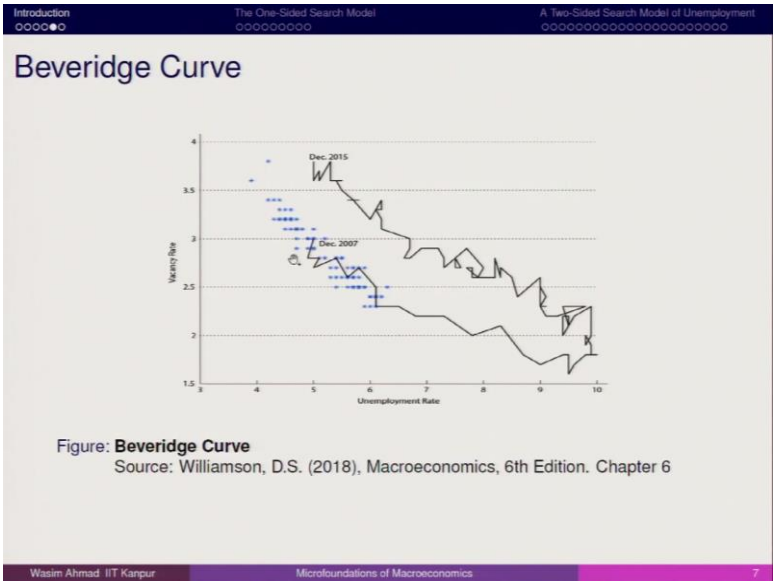

And this inverse relationship is represented by something called the Beveridge curve. The Beveridge curve shows the relationship between the vacancy rate and the unemployment rate. The sloping down or the downward sloping or relationship or the inverse relationship between these two is represented here. You can see that during 2008-2010 when we had the global financial crisis in the US we had a very high rate of unemployment.

And this was accompanied by a low rate of vacancy so this is what we are seeing here as t economy recovers you have a higher vacancy rate and this leads to a decrease in unemployment. The inverse relationship is represented here and this is what matters. This Beveridge curve is the contribution from this particular theory that shows the inverse relationship between vacancy rate and unemployment rate and it is very obvious that when you have vacancies then unemployment is bound to reduce and vice-versa so you can think about the relationship.

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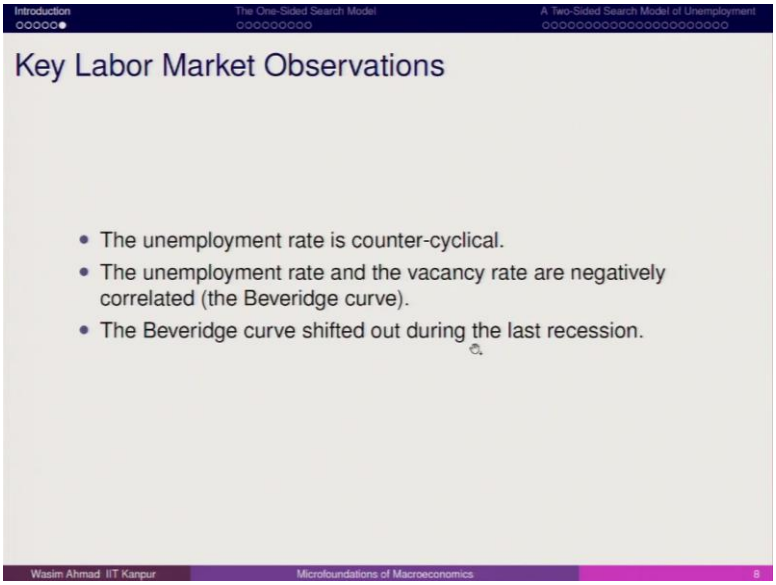

This is the summary that I have already told which means that the unemployment rate is countercyclical. The unemployment rate and the vacancy rate are negatively correlated or inversely related, the Beveridge curve shifted out during the last recession which means if you see a very decline in the vacancy rate you have the unemployment rate going up. So this is what we mentioned about.

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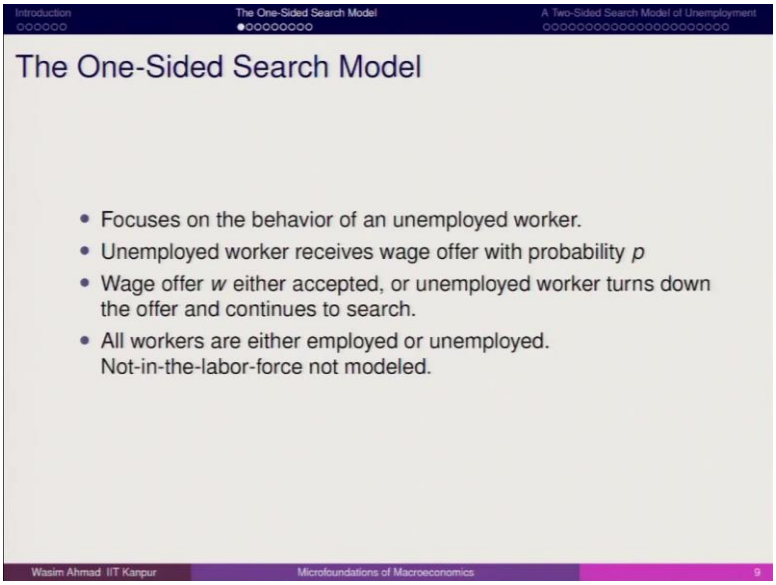

Now let us start with the one-sided search model. When we say one-sided search model I have already explained that this talks about the supply side of the model. Here we focus on we set the model first. So here we are first going to talk about the unemployed worker. Here we are seeing that unemployed worker receives wage offers with probability p.

His payoff is dependent upon the wage rate and we assign the probability that this is the most likely scenario. The wage offers *w* either accepted or unemployed worker turns down the offer or continues to search. So as in the previous slides we have already mentioned this that this unemployed worker is having option that either he can accept the offer or continue looking for a new job so he should apply for further opportunities and complete the formalities.

All workers are either employed or unemployed. Here I am talking about working age population. In the working age population some people may not be interested to work and they may have the inheritance so they may not be part of this model so the portion of population who is part of the labour force we are considering about that and this model is applicable to that population.

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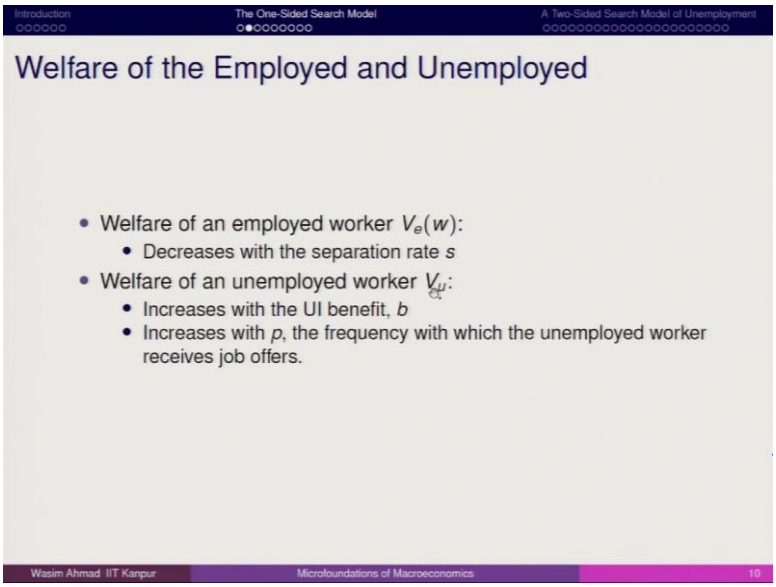

Here we have the scenario that if the worker is going to work then he gets the wage rate which means that this is the value of the employment so if he gets employment then he will get the wage rate. Now here the separation rate is the rate at which the workers are getting out of the job. The separation rate is increasing which means that more people are unemployed. If this particular worker is getting employed it means that it is decreasing the separation rate means people are now connecting to the job separation means the separation from work to the labour.

If labour is experiencing a higher separation rate it means that this labour market is having high attrition you can say. The welfare of an unemployed worker so unemployed worker here you have to note two things. One is that this unemployed worker is having insurance so the

government gives incentive that if you are unemployed for certain months or certain periods then you do not have to worry about.

The government will take care of your daily needs which means that some subsistence allowance will be given this is very common in first world countries and in the case of emerging markets it is not well known that much and especially in large economies it is not that much considered as an important factor, but in most of the first world countries even developed countries it matters a lot.

Here he gets the unemployment benefit b. In the case of India you can link it with the rural employment schemes where the individuals are given opportunities that their employment will be insured for a certain number of days at a certain rate or a certain level of wage. You can think about the employment guarantee schemes under which when people are not involved in firm activities then they are given employment at a certain wage rate.

You can think about that here we are having the unemployment benefit of this particular worker and this is some amount suppose for example b. Now here when we talk about p which means that the frequency with which the unemployed worker receives job offers. Anyway we have already discussed this so here the most important factor to look at is that if he is going to work he gets the w wage rate.

If he is unemployed then he is having the unemployment benefit of b and p is the probability that he gets employed.

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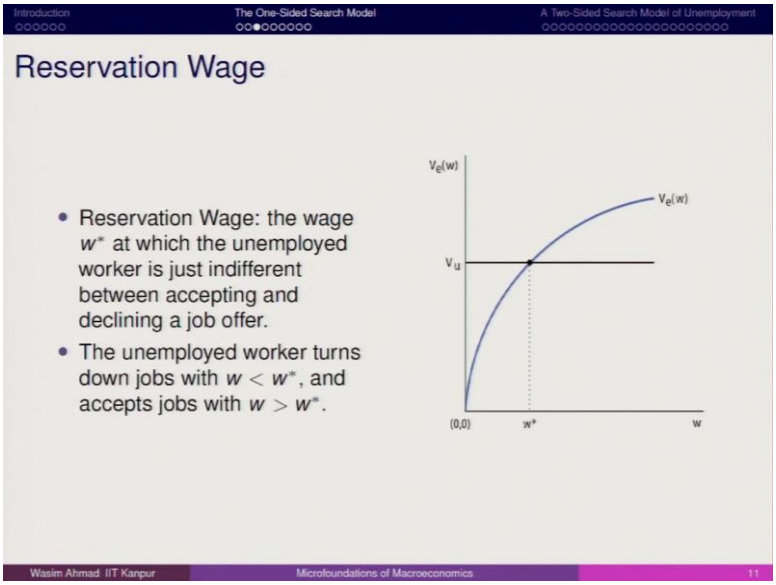

Now here we used the term called reservation wage. Reservation wage is the wage below which the labour will not accept the job. If the company is offering a job offer or the wage rate then this representative consumer is not going to accept the wage rate until and unless it is above the reservation wage. Reservation wage in the sense that this is equivalent to the unemployment benefit more or less it is almost equivalent.

So below this, the labour knows that anyway I am insured so I will have that level of income for sure. It is better that I should ask for, I should bargain and I should look for a higher wage rate then only this particular labour will have an incentive to work. Here we have increasing trend so this is the b that amount that we have, this is the employment wage rate.

But at a very higher wage rate this representative consumer will experience the diminishing marginal utility from that kind of job. So that is what we are saying we can also link it with the previous exercise one-period model in that we had assumed that at a very high wage rate there are high chances that labour will opt for leisure and he would not like to work and this is what it shows about.

The unemployed worker turns down a job with w less than $w*$. So which means that if $w*$ is the reservation wage. So if the $w*$ is greater than the wage rate which is offered by the firm so if this is the reservation rate and if it is greater than the wage rate offered by the firm he does not accept he turns down the request, but he accepts the job offer only when he is having the w greater than $w*$ then only he will be accepting.

So this $w*$ becomes the equilibrium I would say wage rate for this particular labour who is looking for employment given the unemployment benefit that this particular labour has. Here we are seeing the x-axis as wage.

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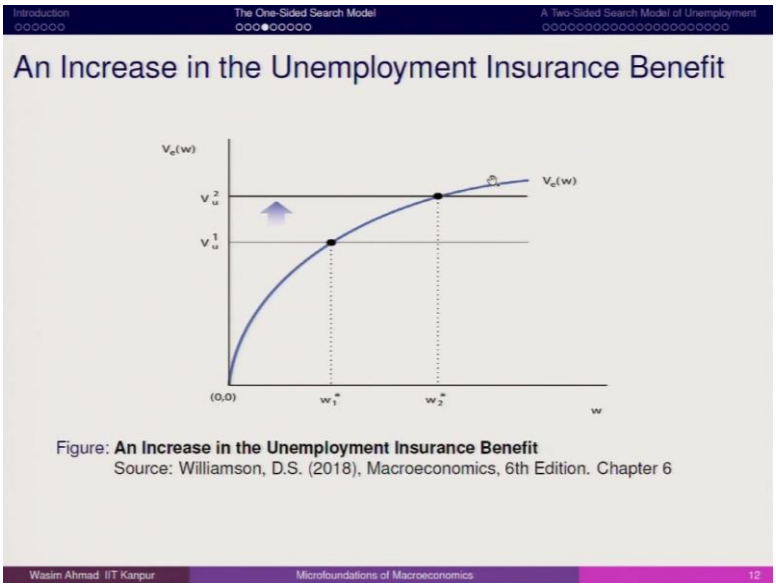

Now when we have the increase in unemployment benefit then this is going to have an impact on the wage rate also. So here you have the unemployment insurance benefit b. If you have a b here increasing then I see that there will be a parallel shift of this particular line.

Here it is moving horizontally, it is moving up which means that we are moving from V_u^1 which is the first equilibrium point and it is moving to V_u^2 what we see that the wage rate also increases. It also moves rightward which means that now earlier the labour was ready to accept the wage rate. This one was the wage rate I would say reservation wage rate, but now the reservation wage rate has also gone up.

Now individuals will be looking for a job or accepting job offer only when the firm is offering a wage rate higher than this. In turn what it means is that if the government is continuously increasing so let us understand the macro picture. Here the idea is that if the government is continuously increasing the unemployment benefit then in turn what happens that this is going to have a very adverse impact on the labour market because for the firm it will be very difficult to hire because labour will be simply looking for very high wage rate that may not be available for these workers immediately which means that these people are again dependent upon more unemployment benefits.

It creates an extra burden on the taxpayer because taxpayers are financing these unemployment benefits. In most of the countries it is the tax paid. If you are creating the job opportunities and if the wage rate is not surpassing this increased reservation wage then you do not have any unemployment reduction. This is the underlying idea behind and increase in the unemployment insurance benefit that we mention about.

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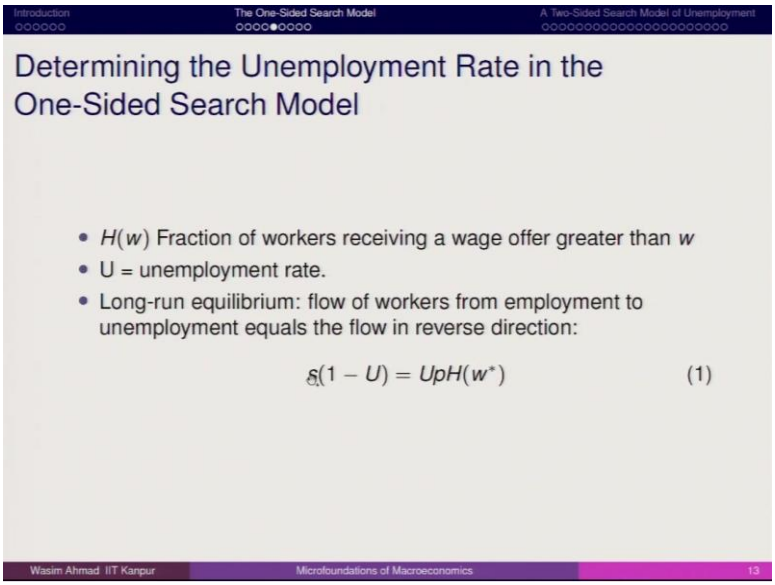

Here you have determined the unemployment rate in the one-sided period. Here you have suppose $H(w*)$ as the fraction of workers. Once I have the $H(w*)$ as the fraction of workers receiving a wage offer greater than w then this is what we have. So $H(w*)$ is the who is going to get the offer greater than w in the sense that the unemployed worker is going to get the higher wage which means that now he is looking for the greater opportunities which means that there is a high chance that this representative consumer will be accepting the offer.

Here we have the unemployment rate. Now, this if I am saying that U is the unemployment rate which means that the $1 - U$ are having jobs and s is the separation rate. This shows that the flow of worker moving from employment to unemployment and this shows that U is unemployment and p is the probability of getting employed and $H(w*)$ is the wage rate that is being offered greater than the reservation wage.

This shows that the individual moving from unemployment to employment. The right hand side is indicator that shows that how many individuals are moving from unemployment to employment and here it shows that the individuals are moving from the employment to unemployment because U is the unemployed worker than $1 - U$ gets the job and he is in job. S

is the separation rate so here it shows so when we are going to determine about what is the extent of unemployment in the economy in one sided search model then this is what we get.

So, this also talks about the long run equilibrium part so here we mention about long run equilibrium.

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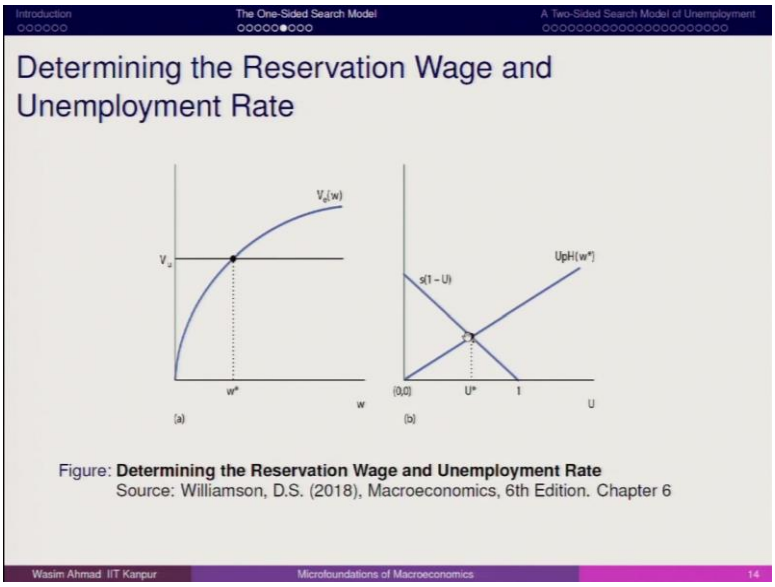

Now here we are saying that this is the wage rate that this representative agent is going to have so this is the equilibrium or I would say at this point this is the rate at which this particular person accepts the job offer if he is offered greater than this then he accepts otherwise he will not. If this is the equilibrium and the intersection of this the individuals moving from unemployment to employment this determines the level of employment in the economy.

This is the employment we have x-axis so which means that if it is further moving up then you have the unemployment going down if it is coming down then this will have further implications on the unemployment. Basically the intersection of these two determines the unemployment in the economy given the one sided side of the understanding of the labour that we have. We further have the comparative statistics on this.

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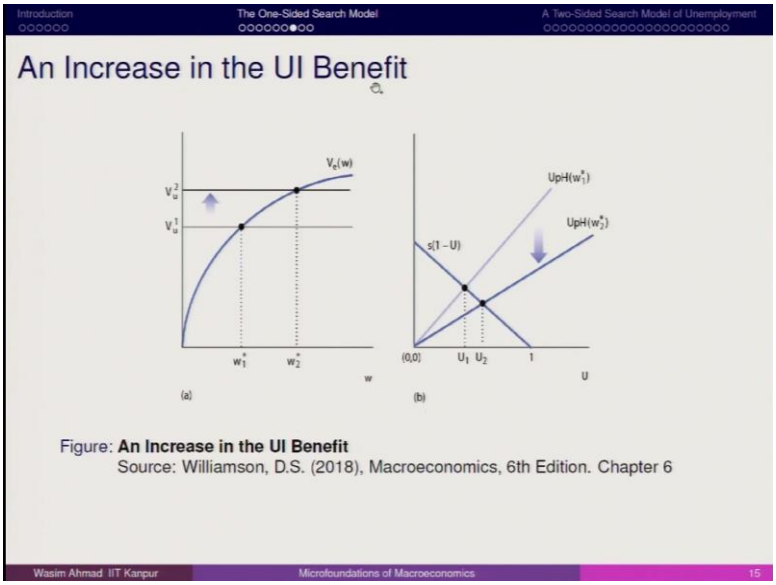

Here is an increase in the unemployment benefits. What happens here when you have an increase in the unemployment benefit? What we are seeing is that when it is going up from V_u^1 to V_u^2. What we are finding is that your unemployment is moving your people from unemployment to employment it is decreasing which means that here the rate of unemployment is going to increase because people will not be accepting the wage offer very quickly.

Overall, the one-sided model gives you an idea that what happens to the macroeconomic indicators like the unemployment vacancy rate. Those of you who are getting used to this particular theory for the first time it is interesting to see that as compared to the normal unemployment understanding that we have about the structural and frictional and cyclical. If you try to look at the individual levels it matters a lot and it helps you understand. We will continue from here in the next session. Thank you so much.