Microfoundations of Macroeconomics

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Flexible Prices 1

Welcome back. So, we will be now starting with the new topic. So far we have discussed with the different types of models in macro, but now we will be formerly introducing ourselves into the core area of macroeconomics where we will be not just discussing about the macroeconomic phenomena. So maybe the output decline interest rate rise, price increase, price decrease, how it is impacting the monetary policy.

How monetary policy is impacting the fiscal policy those dimensions we have covered already and I hope you all of you are aware about how we have at least understood the idea behind the macroeconomic phenomenon that we should be studying, but in this particular session we will be looking beyond the conventional macro. We will be also trying to see the interaction among different schools of economic thought.

So, I have already mentioned about the macroeconomic schools different types. So, here you are already aware about the neo classical and then you have; so we started with classical which believed in flexible wages and prices then we move to the Keynesian school of economic thought. In Keynesian school of economic thought we have already found that there is a role of the government.

So, Keynesian school of economic thought emphasize on the short run characteristics of the economy where they emphasize on the role of fiscal policy how government intervention can bring macroeconomic stabilization or can ensure macroeconomic stabilization and then once we have the macroeconomic stabilization taking place then the interaction of monetary policy can be introduced into the model.

Now given this background we also looked at that particular school of economic thought which talked about having both Keynesian and classical dimension in the short run and long run context and they try to look at that how we can incorporate these two schools of economic thought basically the Keynesian which I mentioned about the government, but I forgot to

mention that Keynesians also believed in non flexible wages and prices which also it is called sticky wages and prices.

According to them in the short run it is very difficult to have a quick adjustment or quick adjustment into the equilibrium wages and the prices and because of that reason they emphasize more on the staggered prices or maybe you can say about the sticky prices where we do not find flexible wages and prices. Now looking beyond this what neo classical of economy school of thought recommended that can we have a some kind of a coherence between these two rigid school of economic thoughts.

So, they focused on understanding the behaviour of the macroeconomic agent in the context of rational expectations or also in the context of microeconomic foundations which we have already examined in the context of one period model, two period model so that is the idea and then we had the new classical and then we have I would say new Keynesians those who believe in that we introduced the idea of what we call it as the freshwater and saltwater belonging.

So, freshwater belongs to the neo classical and then you have the freshwater coming from the Keynesian. Now with this background I hope it is clear that what are we going to talk about. So, now we will be looking at the new classical school of macroeconomics where they emphasize that it is not just the government policy, there are avenues through which we can understand the stabilization process in the economy.

So, for the first time we had undergone through understanding the business cycle dynamics from the supply side perspective if I am saying about business cycle dynamics from supply side perspective then it employs that how with certain changes in the behavioural pattern of either the top management of the company or maybe the good technology, good weather, good I would say or very suitable innovations all these things contribute to the productivity of capital becomes critical.

So, in this particular session we will try to understand that and for those people who are not aware about the business cycle. So, business cycle is a phenomena under which we try to study different phases of the macroeconomy wherein we say that when economy is achieving high growth rate so we say that economy is an expansion phase. When economy is going or having the or it is exhibiting some kind of downward trend in its GDP.

Then we say that economy is on downward trend so that we call it as the contraction. So, expansion and contraction and then you have the slowdown and recovery phases that we call it so normally expansion and contraction it is also in the language of business cycle it is called peak and trough, but recovery and slowdowns are also the phases through which we try to understand the macroeconomic phenomenon.

So far what conventional business cycle school of economic thought believes that the business cycle dynamics are more linked with the demand side factors. So, what we have already understood $Y = C + I + Z + M - X$, but for the first time the new school of economic thought try to add dimension into the business cycle theory by introducing the concept what we call it with the supply side factor.

How demand and supply of labor, how equilibrium in the labor market can play instrumental role in understanding the macroeconomic picture when it is aligned with the productivity shock. So, when we have a shock into the system either it is positive or negative normally it is considered that when you have productivity shock it is bound to be positive which means that it is creating avenues for the researchers.

It is avenues for the consumers to have better income, better wealth, consumption in the current and future. There is a role of anticipation, there is role of expectation so we will be talking about that. So, let us start. So, I hope this background will help you understand the particular chapter in a better way.

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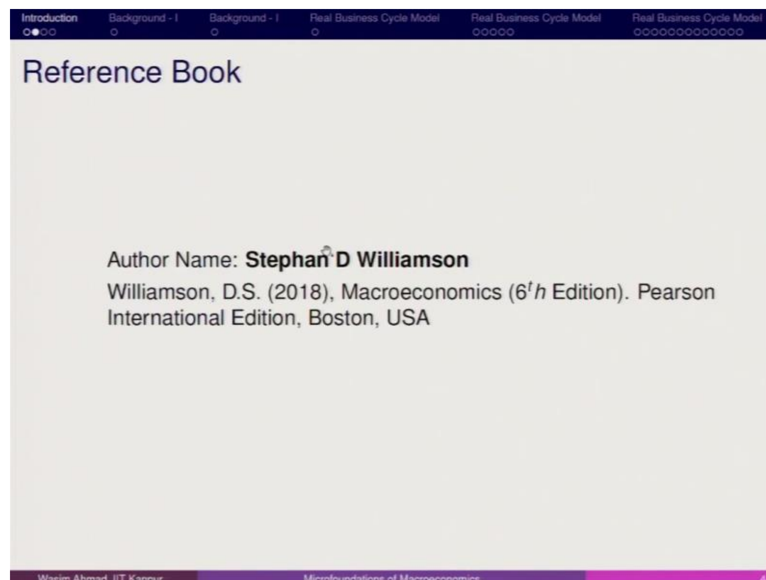

So, we are following the same here we have the Stephen D. Williamson here the book remain same the macroeconomics.

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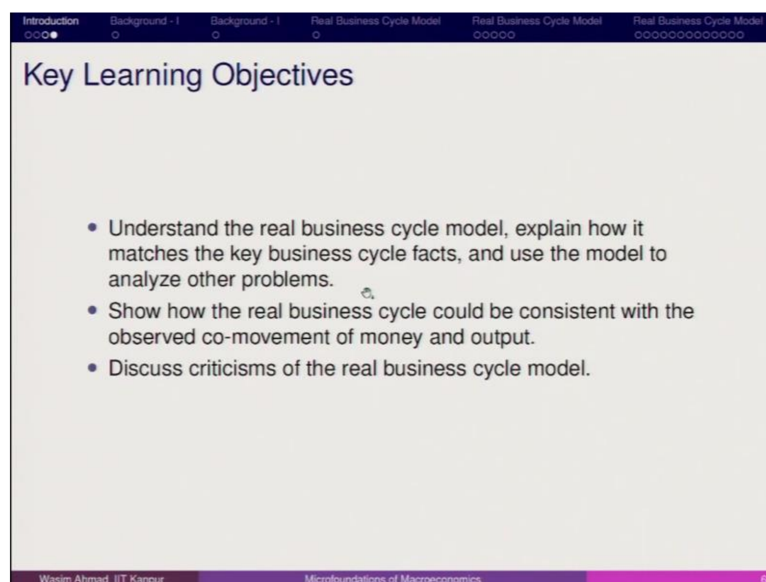

And here we try to understand the key learning objective I mentioned that it tries to explain you about the real business cycle model and it also tries to explain that how we can analyze the real business cycle dynamics when we try to bring changes maybe you can say comparative statistics that how we can deal with, how the real business cycle model could be consistent with the observed co-movement of money and output.

Discuss criticism of the real business cycle model we will be talking about certain I would say drawbacks or shortcomings. So, let us start.

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Monetarists vs Keynesians

- During 1960s, Monetarists and Keynesians had great difficulties in digesting whether monetary policy is more effective in the short-run or fiscal policy.
- Monetarists argued that it is the monetary policy that can stabilise the economy particularly during short-run.
- Keynesian argued in favour of fiscal policy in stabilizing the economy.

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So, first we are going to talk about the monetarist and Keynesians. So, once I talk about monetarist and Keynesians then you must be having a idea that once I talk about monetarist it talks about the dominant role of monetary policy in the economy and they believe that monetary policy brings stability in the economy and those in the very short range it may not be very impactful, but yes it creates stability in the economy.

And one of the major roles of the monetary policy is about the price stabilization so that they mention then here you have the monetarist argued that it is the monetary policy that can stabilize the economy, Keynesian argued in favor of the fiscal policy which they believe that the role of the government is important. So, this was in 1960s era when monetarist and Keynesians were having good interaction on the dominance of their schools of economic thought policies. So, that was the clear case here.

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The Rise of Neoclassicals

- During 1970s, Rober Lucas, Thomas Sargent, Neil Wallace and Rober Barro were more in favour of microeconomic principles of macroeconomy.
- They argued in favour of introducing micro-dimensions to preferences, endowments, technology, and optimizing characteristics of firms and consumers.
- They also emphasized on macroeconomic modelling with classical framework (flexible wages and prices).
- By 1980s, it became clear that there is a scope to introduce fiscal policy under the classical framework.

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By 1970s when we had the invention or I would say introduction of rational expectations so once the individuals or the economist started talking about the role of rational expectation in macroeconomic formulation with what we have mentioned about the policy ineffectiveness proposition that is directly linked with the Lucas Critique. So at that time the economist those who are leading this particular argument or new dimension where Robert Lucas then you have the Thomas Sargent then you have the Neil Wallace and then you have the Robart Barro.

So, these economist had so here we have a T missing and here also we have the T missing. So, Robert Lucas, Thomas Sargent they were more in favor of macroeconomic principles of the economy. What do you mean by macroeconomic? So, this is what this course is trying to understand the new classical perspective that you can introduce the macroeconomic dimensions about utility about production function, about market, about firms.

And about the endowments, technology and then you can try to optimize consumers and firm and arrive at the macroeconomic implications of these optimization tools. Now that about the area in the field of macroeconomics that we call it as it is linked with the general equilibrium models and with further advancement in the tools and techniques. Now we have something called the dynamic system of general equilibrium.

So that we call it as the DSG model and if you try to analyze the shock into the general equilibrium model. So, it becomes dynamics stochastic general equilibrium model where we try to work out with the large set of agents, we try to define in the same manner in the new

classical way what we call it as the consumer firms endowments technology. So, all these play very important role.

They also emphasized on the macroeconomic modeling with classical framework. So, new classical they emphasize that in order to understand the long run characteristics of the economy it is always good to talk about the flexible wages and prices and how we can think about the classical framework. So, I hope these two lines are important and these two lines are also directly linked with the course that we are doing so microeconomic foundation.

So, this is how they try to understand. So, in recent literate if you go through and read about the macroeconomic dimensions then you will find that the dynamic stochastic general equilibrium based models. So, DSG based models are quite popular in the literature in recent studies if you go through or if you browse through the generals on macroeconomic topics then you find that the theoretical foundations are playing very important role.

And these theoretical foundations are critical for the I would say not just the understanding of the macroeconomic phenomenon, but also about the prediction. So, sometime we also try to see so if you want those of you are interested in understanding further or extending this idea further or looking for new developments, you should read journal of monetary economic. So there you find lot of these models talking about.

By 1980s, we found that there are widest paid acceptance of this particular school of economic thought and people started relying more on these mathematical models and then it became quite evident that even the role of government will be easier to understand in this setup. So, in order to understand that how the new classical school of economic thought contributed to the real business cycle it starts from here.

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Real Business Cycle Model

- Real business cycle theory was introduced by Finn Kydland and Edward Prescott in the early 1980s.
- Kydland and Prescott asked whether or not a standard model of economic growth subjected to random productivity shocks (that is, "real" shocks, as opposed to monetary shocks) could replicate, qualitatively and quantitatively, observed business cycles.

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Now let us deal with the real business cycle theory. During 1980s or I would say early 1980s Finn Kydland and Edward Prescott they had given this idea that the business cycle theory can be understood not only from the perspective of demand side, but there should be a supply side perspective also to explain this phenomena so they added this dimension.

So, their basic question was that whether or not the standard model of economic growth subjected to random productivity shocks. So, when I say about random productivity shock then normally in the long run theories that we have what we call it as the solow residuals which means it is just the total output or aggregate output divided by the input with the given elasticity, how much you are getting and how much is the residual output that you have.

So, this productivity shock comes from there and it becomes really important to see how we can analyze. So, can random productivity shock replicate qualitatively and quantitatively and can it help understand the business cycle. So, that was the idea behind Kydland and Prescott and these two gentlemen are known for at this particular contribution and if you want to go through about the further dynamics of the real business cycle.

More mathematical treatment you can refer their paper that appeared in 1980s and then you can also have a look at their basic foundations. I have tried to simplify and I have followed the book of Williamson to give you the basic framework how we can understand this in a better way.

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- Business cycles are caused by fluctuations in total factor productivity.
- Factors that increase total factor productivity include good weather, technological innovations, the easing of government regulations, and decreases in the relative price of energy.
- There is no role for the government in smoothing business cycles – cycles are just optimal responses to the technology shocks.
- Model fits the data well.

So, here they explain that the business cycle the total factor productive shock plays very important role in determining the business cycle phases. So, what are the factors that play that explains or I would say what are the factors that explain the total factor of productivity it includes good weather then you have a technological innovations so maybe you have the startup culture, you have a new firms coming, collaborating, innovating.

You have lot of emphasis on innovations government is putting effort to bring new innovations into mainstream. Easing of government regulation so maybe you are not allowing the technology import, but if government goes for revision of those policies then it helps the firms to import more, decreases in the relative I would say price of energies. So, anything that benefits the production process.

So, maybe you can think about earlier labor were doing their manual jobs for creating output so they might be producing 100 units of output, but now because of this productivity shock they are able to produce 1,000 units of output so that could be that there is new machinery, new technologies so marginal productivity of capital has also gone up. So, once we have the productivity increase so if you remember your one period model in that we had discussed about this comparative statics where you mentioned about that if a productivity shock increasing it is good for the labor also because labor also sees increase in income.

And there is a further increase in consumption and this also creates opportunities for the labor to work for more number of demand for labor also increases because once you have the marginal product of labor getting higher firms are inclined to hire more. Now in this setup

when they define about the business cycle explanation they do not explain or they do not go for any kind of government intervention.

So that is the idea behind that here they focus only on the monetary policy that if your monetary policy with the same assumption that the money supply is neutral. So that argument they take it forward and then they work out with certain data sets and they find that whatever prediction they had it fits well with the data so that is what. So, whether when you have productivity shocks whether the investment, consumption so $Y = C + I + G$ wages, prices all these are pro cyclical or counter cyclical.

Pro cyclical in the sense that if a money supply increase one or two variables are increasing, showing the increasing trend or direct relationship, but rest of the variables are showing inverse relationship so that we call it as the pro cyclical, counter cyclical so this is how we try to understand counter cyclical it is also linked with the fiscal policy when you have monetary policy when you have slowdown in the economy you pump up more.

So that also shows the inverse that your GDP is going down you are augmenting the expenditure, you are augmenting the money supply. So once we have augmentation of these two variables then it creates a scenario of what we call it as the pro cyclical or the counter cyclical. So, those arguments are also added here.

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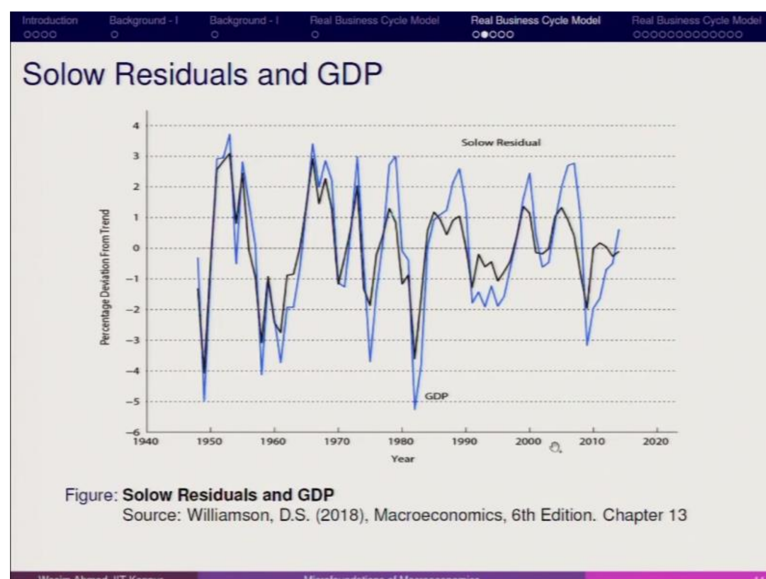

So, here you have the simple description of solow residual and this is the GDP. So, you can see that since this was the main motivation of these real business cycle school of economic thought

how they had gone for. So, what they mentioned that you will find some kind of coherence or very small deviation between GDP which is output and the solow residual because solow residual which means that with the change of capital and labor whatever input technology that you are using you are able to at least decide about how much output you can have.

So, the moment that we have here with regard to solow residual and the GDP it reflects the same. You can also see the period that we have the Y axis and it speaks in volume about the role of inputs in driving the output. So, this is the idea behind this.

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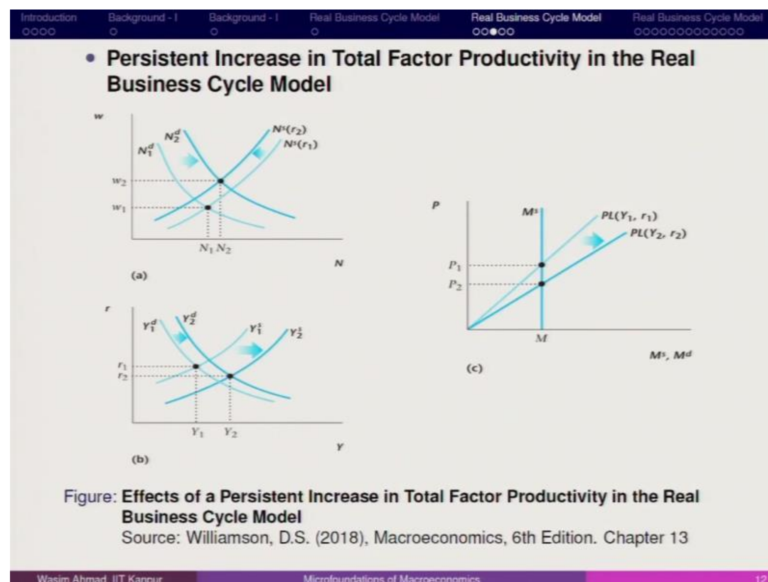

Now let us explain the business cycle model first and in business cycle model it becomes real important to see that how the model works in real life. So, the idea is simple that when we see increase in productivity when total productivity increases what do we see immediately, immediately we will see that there will be demand for labor shifting rightward because you firms are quite high enthusiast about the production process, about the outlook.

They are optimistic and given that because of the employment capital the productivity of labor has gone up. So they do not mind hiring more labor so this is how it looks like what typically happens that because of this shift that we have rightward this shift leads to rise in wages because if a demand for labor increasing you have a supply of labor will also increase because labor will be looking for employment.

From search theory also you can say the labor market tightness will increase which means that we have more matching taking place. So, if you have that kind of situation then here you have

a w_2 rising. So, once we have w_2 going up so which means that wage rate increases and this wage rate increases accompanied by the labor supply increase so this part is clear. So, let us focus on only N_1^d and N_2^d.

Now we are talking about here so once we have the production process increasing you have more employment of labor, labor is producing output. So which also means that your output supply will increase so this is how it is leading. So, here you have a Y_1^s and Y_2^s. So, rightward shift of the output supply it is leading to what it is leading to earlier we were at r_1 now we are at r_2.

And this creates a scenario wherein the rate of interest is lower your output is increasing. Now this rate of interest lower is also having two types of implications. So, one implication that we have to understand with regard to wage and labor I am saying that demand is shifting up it means that the labor is also having some anticipation, anticipation in the sense that they are thinking in terms of the intertemporal aspects that if the productivity is going up it is bound to increase the current income higher.

And in the future income is also going to be higher because wage rate is going to increase. So, once productivity is going high it is creating some kind of favorable scenario for the labor because labor expects that now they will have better standard of living this we had also seen in case of one period model this case. Once we have the rate of interest lower than since the productivity has gone up so firm also does not bother about how much they have to invest.

So, even when you have the rate of interest lower this incentivizes the firm to go for more investment which means that investment also become pro cyclical. Here we are saying about the consumption also become pro cyclical because the labor is expecting that the current and future income will go up. So, as a result the consumption will also go up. So, that we have made now we have also made about the investment.

One of the reasons that you have to understand that if the rate of growth of productivity if it is not same. So, in this period here you have the increase in productivity. So, if you have increase in productivity and if the increase in productivity suppose in this period it has increased by 100

in next period it is increasing by just 50. So here you have decreasing. So, if the rate of growth is not same then the anticipation about the future will also be compromised.

So, what will happen that the labor will also think about that whether they have to go for more of consumption in the current period or in the future period so there will be confusion, but since rate of interest is lower this representative consumer will think about the current consumption and maybe he will be thinking about the future consumption. So, current and future consumption scenarios may not be as smooth as we are seeing.

So, because of that there will be a leftward shift of the labor supply and this is directly linked with the interest rate that you have. So, once you have the interest rate lower then you tend to think about that yes you have to think about the labor supply so labor supply is moving left and this is how it is linked with how the anticipation plays very important role. So, in the beginning I mentioned about rational expectation.

Rational expectation plays very important role here. So, here we have one, two clear now about three once we have the money supply fixed and once you have the low interest rate this will further create the scenarios, but since the role of the Central Bank is to maintain the price stability. So, they will be simply going for increasing the money supply which further will increase the demand for money.

So, more or less price will not be the same, price will decrease. So, once we have the demand for money shifting so $PL(Y_1, r_1)$ so it is coming from the previous lecture where we derive the demand for money there we are seeing that with given money supply it is fixed and it is reducing so which means that with the productivity shock the role of anticipation becomes very important. So, in the beginning when the labor was quite enthusiast about these things.

Consumption became pro cyclical, investment became pro cyclical because you have the rate of interest lower, the demand for money supply also increase and this money supply increase has impact on the prices also because then you have the role of anticipation playing important role. Now this anticipation role is critical to understand the real business cycle dynamics, but overall the understanding is that with the productivity shock the labor market reacts in the same way output reacts in the same way.

The rate of interest also react in the same way so all have the pro cyclical characteristics and this is what we try to derive.

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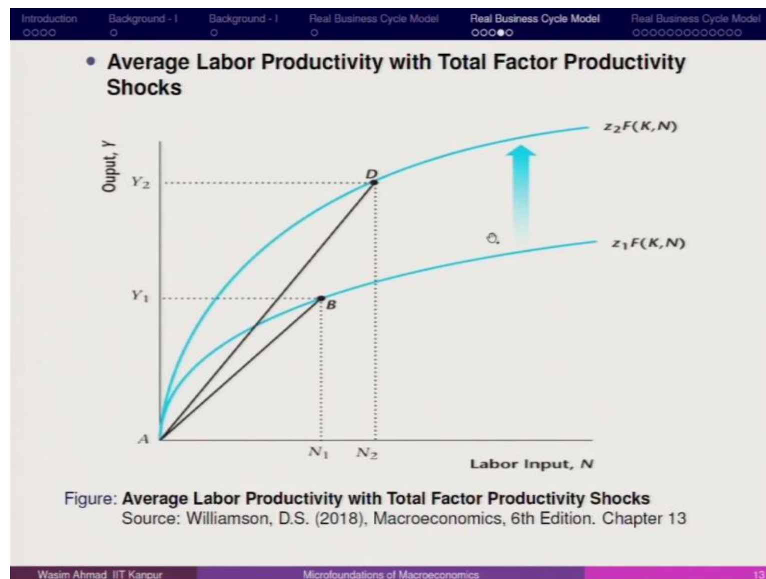

Now overall with regard to productivity I would say production function here we are at A to B and here you will find that once we have the productivity shock so this leads to better output production. Once you have better output production you will find that slope of A to B it become more steeper which means that here this is leading to more of increase in output, but given the proportion of increase in output we are not seeing that much increase in input, but it is increasing which means that productivity shock it is bound to increase the employment in the economy.

It is bound to have the better scenario of wages and that is what we try to understand with the labor market or total factor productivity or real business cycle school of economic thought.

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- **Data Versus Predictions of the Real Business Cycle Model with Productivity Shocks**

Variable	Data	Model
Consumption	Procyclical	Procyclical
Investment	Procyclical	Procyclical
Employment	Procyclical	Procyclical
Real Wage	Procyclical	Procyclical
Average Labor Productivity	Procyclical	Procyclical

So, overall what came out so they also emphasize with the data that if they can predict with the data that whether it is working or not what they found that consumption became procyclical, investment became procyclical, employment became procyclical, real wage became procyclical and average labor productivity became procyclical, but there are certain dimensions that are worth understanding in case of real business cycle school and which are also some of the shortcomings of this model.

So, I hope it has made you understand that how the productivity shock can create a favorable scenario in the economy without thinking about the role of government, government is not playing any role here. It is all about flexible wages and prices with the change in productivity shocks how much you have adjustment in wages and prices and how much it is leading to increase in all other macroeconomic variables whether it is consumption.

Whether it is investment and whether it is employment. If it is increasing all it is good for the economy and it will stabilize the output it will also create favorable scenarios and moreover here the money supply increase it is more or less has to deal with the price adjustment so here it is becoming a really important to look at that how money supply it is getting translated into the current and future consumption of the household.

And how the expectation is playing a dedicated role. So, I will stop here and we will start from here the next session. So thank you so much.