Macroeconomic Theory and Stabilization Policy
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Lecture – 10

What I am going to do today is very important, it is a important from the point of view of knowing the Keynesian model. I give you very simple version of the Keynesian cross model, where there was no government, but Keynesians model and Keynesian policies cannot be discussed without having government in the model. Because, what can said basically is that, there are times in the economy, may be in the short run or medium run when the economy is so down, that you need active government intervention to pull the economy out.

Like, somebody is ill and you need a doctor, a specialist to suggest medicine and other things to bring him out of it. So, the economy, it requires a doctor and an important act or important contribution towards that end comes from the government, private sector does contribute, but government. So, without talking about government, no Keynesian model is complete. So now, I think I called that case a, did I call the case a without government, so I want do the case b today, which is more of a Keynesian model.

But, case a had some important insides, multiplier, the goods market clearing condition turns to be the same as a classical model, savings is equal to investment, we have some important results there. But, case b is what we are going to begin, case b is with government, so the saying is that, as soon as the government, how does G enters. When the total output of the economy would have to be thought of why, as now the private goods and government goods, which are also known as public goods.

So, government goods, public goods and private goods, together make up why, but on the demand side, right hand side of the goods market clearing condition, you now have explicitly government variables. Earlier, if you look up case a, it was only private variables, consumption expenditure and investment expenditure, two items. But now, we would have government, now when you have government, there are two major changes that will take place in that equation, not only that government expenditure will be added as part of the demand.

Because, government spending means, demanding some services are supplied and required in the , that kind of an assumption is there, G government expenditures. But, there is one more thing that will happen, with government you just do not have government expenditures, government just does not spend money on roads and other infrastructure items, services like the defense services, police, the MP's, MLA's, the bureaucrats.

But, in order to spend that money government requires money, income and therefore, you will have tax and in this model, it would not be sales tax indirect axis. In this model, indirect axis are usually consider in macroeconomic models, where companies producing something and a tax is imposed on it, when you goes to sell it. But, here in macro models what we have is, we have income taxes, so direct taxes you can call. So, if you recall, in national income accounting methods, I said there are some variables that you can obtain from national income, and I name them personal income, personal disposable income.

Then, at the end I said, it is one variable which is closest to the macro model and that is disposable income. So, what I would required now is the disposable income coming into the picture. So now, if you have disposable income, common sense would say the following things that, you are essentially therefore, talking about that as a at an individual level and also at the macro level when people earn something, they do not necessary use that money.

They cannot use that money, because first they will have to pay the taxes and the taxes that I am talking about the direct taxes, property taxes, extra duties of income taxes of various types. Companies pay one type of income taxes, personal income taxes there at the individual level like the one I pay or you would pay tomorrow when you have the job.

So, one thing is, consumption will therefore depend upon the income net of taxes, after the taxes have been deducted, whatever income remains with you, now you can spend. So, essentially we would get into the concept of disposable income, but disposable income is just not national income minus direct taxes. If you open up disposable income, you realize that there are important variable we constitute, income or disposable income.

And it was there since personal income also, is that government transfer payments, is the lot section of the society depending upon the age group in the society, have been told that

in countries like a Germany and other place in Europe, there is growing this increasingly larger share of the retired people. Because, the people who have born around the particular time and after that, there was birth control probably, so the growth rate of birth rate there was down.

So now, it is the countries are reaching a stage, where lot more people have retiring, now in that country does it mean that, the retire people do not need it any more, do not spend any more, of course not. So, they get a lot of transfer payments from government to survive, so in order to consider the disposable income variable, not only you need taxes, direct taxes what I mean, to be deducted, but also we need the transfer payments to be added.

So that, you have a proper estimate of disposable income, out of which the country will be spending or consuming. Having said that, therefore case b I begin, case a I discuss without government, case b I begin in the following manner. Let us see whether you feel comfortable or not and say any way.

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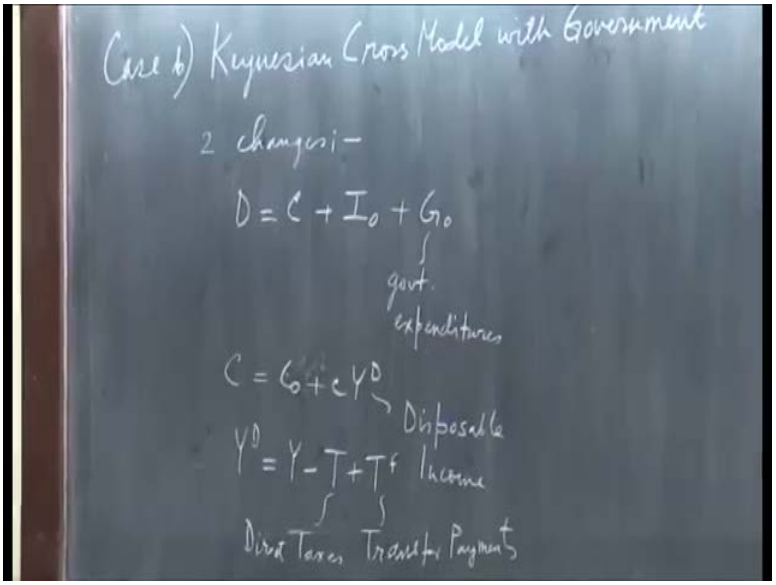

So, case b Keynesian cross model with government, the two changes that need to come, two changes have to be brought in one on the demand side, you will have C plus I which was autonomous investment, I retain autonomous investment, C plus I plus G naught which is government expenditures, this is the first change. Next, C will be a function of now not Y, but C would be a function of, there would be an autonomous consumption

plus C would be a function of disposable income, where Y D is disposable income and Y D is simply Y minus taxes, call that capital T plus transfer payments, I call that T f.

So, T are taxes and they are direct taxes and this is transfer payments, two changes having, C is not linearly related to income, it is now linearly related to disposable income. Because, the disposable income is the one out of which you spend or safe, you do not spend out of income any more, you have to pay the obligation meet the obligations you have to pay the taxes to the government.

And then, transfer payments constitute part of the disposable income, retire people spend out of transfer payments. The funny thing is that, I do not want to model it here, I once upon a time I ask some retire people about their pension cheques, pension cheque amounts also beyond after a point are taxed. They are also taxed, but I do not want to model it here, in India pension cheques of a retired person after a point, after a particular threshold level, they are taxed. But, I do not want to, I am keeping it without taxes plus transfer payments.

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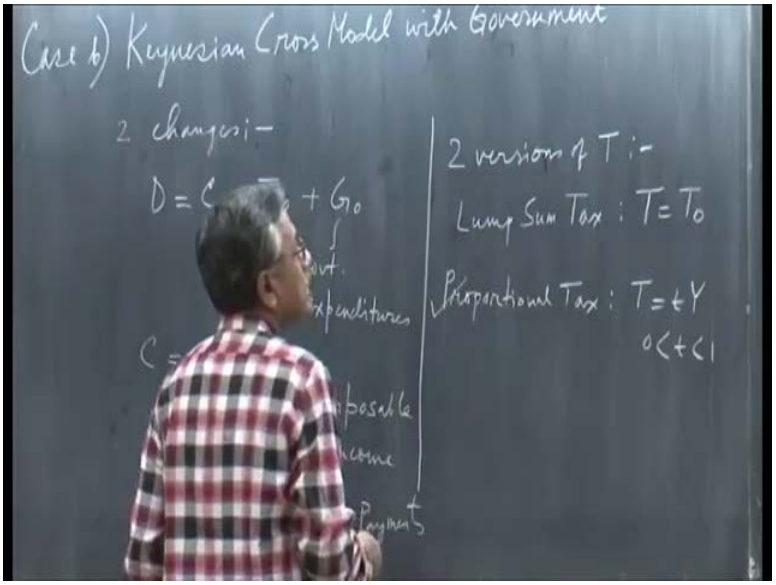

Now, the question is T, in macro model taxes direct taxes are typically model in these there are 2 versions that are available 2 versions of T, one is lump sum tax. That is, ((Refer Time: 11:06)) fixed amount government collects from everybody and in the economy which does not change with the income level, fixed amount you have to pay, lump sum tax in which case T is equal to T naught.

And another system that I have seen are the proportional tax, in that case T is equal to small t Y, where small t lies between 0 and 1. And therefore, taxes are proportional to income, this is another typical assumption in macro models that I have seen, which is our model either of the two ways, lump sum tax which is like an autonomous variable fixed, it does not change with income level or you can have proportional system, T is equal to small t Y.

Now, having said that, therefore what I have is the following thing, what shall we do, which one would you like. Let us use the proportional system, lump sum tax you can work out yourself, so let us use the proportional system, let us use this, one this one.

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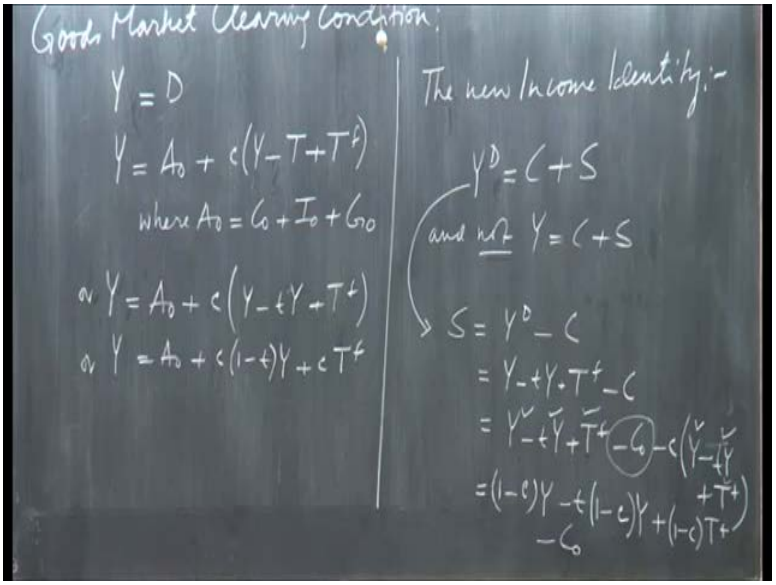

Therefore, the goods market clearing condition becomes Y which is equal to D, therefore Y is equal to A naught plus c into Y minus T plus T f and where, A naught is equal to C naught plus I naught plus G naught. Now, let us assume government expenditure also to be autonomous fix, it does not depend upon the income of the country, it decides what it wants to spend. And government is also think of something like the moon with respect earth, what it does the moon matters towards, but we do not control the moon, moon is on it is own, the sun on it is own, we do not control it.

But, what the sun does matters to us, what happens to the sun matters to us, that kind of a thing. So, government expenditure, the autonomous variables A naught or autonomous variables, C naught plus I naught plus G naught and here we have a complication now, C

is equal to Y minus T plus T f or you can see, what you will get, you will get Y is equal to A naught plus C into Y minus t Y plus T f.

So, you will have A naught plus C into 1 minus t Y plus c T f, this kind of a relationship you will have now alright, so Y is equal to A naught plus C in to 1 minus t y plus c T f. Now, before we move further, if you remember last time with the government I came I worked out, I worked through the equilibrium condition this one and came to the relationship s is equal to I, I want to obtain a similar relationship.

So, before I do that algebra just recall that just remember one of the things, now what will be the income identity, the new income identity, very good it will be now Y D is equal to C plus S. Because, you consumer out of disposably income, so it save order disposable income and not Y is equal to C plus S this is very important not Y is equal to C plus S. So, now, Y D is equal to C plus S you can see therefore, S is equal to Y D minus C.

And therefore, Y D is equal to Y minus t Y then plus T f minus C, so this is equal to Y minus t Y plus T f and C is how much, where is C that one is C there C is equal to minus C naught and minus C into Y D, which is Y minus T. That means, polty Y plus T f, now you can club terms here Y and minus C Y can be together it will 1 minus C into Y this term and this term, then minus t Y minus minus plus C t Y. So, what will it be, it be minus t Y and minus minus plus C t Y.

So, you have to do if you have to do minus T I am correct minus T into 1 minus C Y I am correct here, 1 minus C Y then minus T Y and minus C into minus t Y plus C t Y if you take a minus out then it will be T factored out it will be 1 here, and it will be minus C there, next your T f and T f and here you have minus C t F. So, it will be plus 1 minus C t F and remember do not forget this one is done do not forget this term, so that should be added minus T naught.

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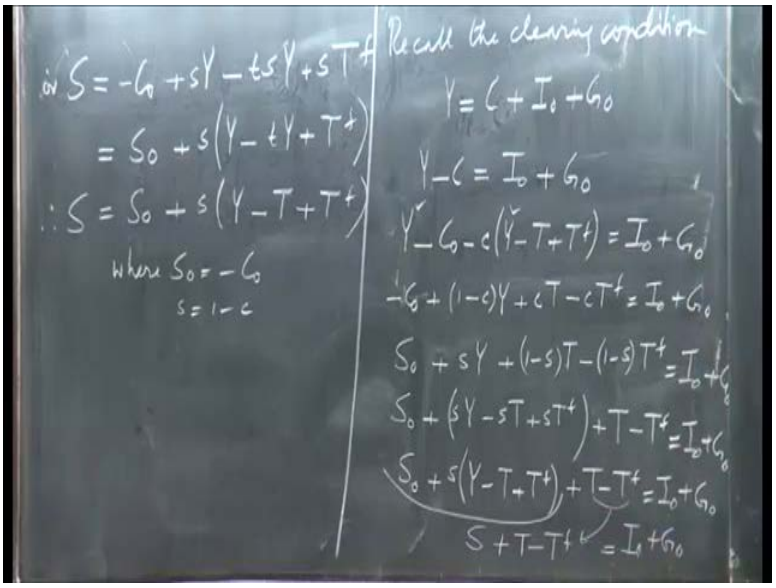

Now therefore, S is equal to 1 minus minus C naught S is equal to minus C naught first I right, then 1 minus C into Y 1 minus c is small s remember, marginal propones it you consume plus margin save is equal to 1. So, 1 minus C is small s plus small s into Y minus t into small s Y minus minus T into small s Y plus small s T f that is what you have. So, this is equal to S naught plus the factor out small s you have Y minus t Y plus T f or is equal to S naught plus small s Y minus capital T plus capital T f.

So, this is the savings function therefore, you have this has the savings function S naught and S naught is equal to as you know S naught is equal to minus C naught, and small s is equal to 1 minus small c clear or not. So, that is the savings function now what I need to do is to use this particular equilibrium condition, which is called the goods market clearing condition, and give it a parallel interpretation similar to S is equal to I and let us see what happens if I try to do that.

Now, this condition has come from here, so what you require recall the clearing condition, and what you have essentially is Y is equal to C plus I naught plus G naught this is what you have. Now, Y minus C is therefore, I naught plus G naught Y minus C is minus C naught minus small c into Y minus T plus T f is equal to I naught plus G naught.

Therefore, minus C naught Y and this plus 1 minus C into Y this term and this term goes minus C into minus T is plus C T which is plus C T minus minus is minus C T f is equal

to I naught plus G naught minus C naught is S naught plus 1 minus C is small s Y plus C is 1 minus small s into T minus C is 1 minus small s into T f is equal to I naught plus G naught any problem.

Now, this will be equal to S naught plus small s Y minus small s T minus minus plus small s T f this term will come. And what will be remained here is that 1 into T is plus T and minus 1 minus T f is equal to I naught plus G naught clear therefore, S naught plus what is this S into Y minus T plus T f is disposable income. So, this is entirely the savings function S naught plus small s into disposable income is a savings function plus T minus T f is equal to I naught plus G naught.

So, what you have is a very important result, this part is essentially saving this is plus T minus T f these two coming from here that equals to I naught plus G naught, this is a very important result S plus T minus T f is equal to I naught G naught it is a very different one compare to what you have seen earlier it is a very different one.

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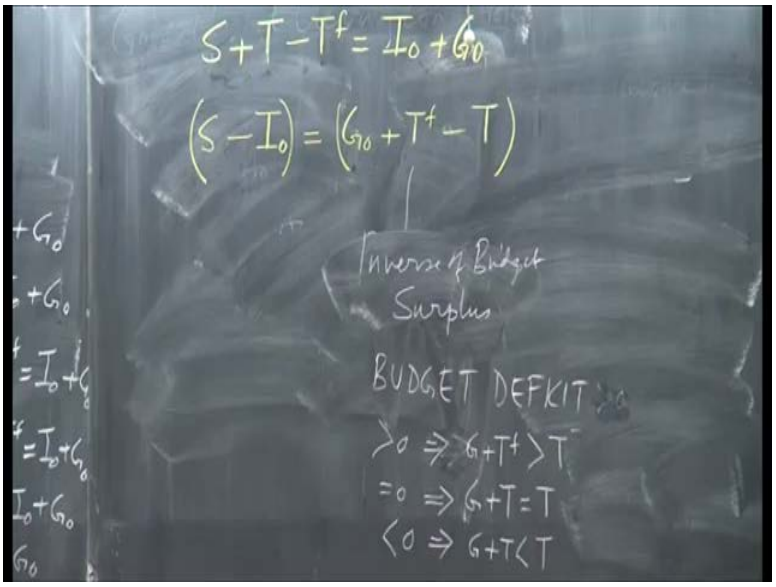

S plus T minus T f is equal to I naught plus G naught no longer S is equal to I which you had in the classical model, which you also had in the simple Keynesian cross model without government in the previous class. You do not have it any more, this is the one you have, now it looks very nice, it is looks like a very simple model of we have and from there we have an algebraic relationship. But, these relationships to me provide a quite a bit of inside into the working of the country or the economy.

Look here I naught is a private sector variable, S is a private sector variable and these are government variables. So, now, if I want to rewrite this equation in terms of governments budgets, what do I have very interesting what you have, you bring I naught on this side. So, you have S minus I naught and here you have G naught plus T f minus T this is what you have [FL] what is this saying, this says government total expenditure the amount as spend on the [FL] services plus the money that I transfer to the private economy for people to leave.

Which I have from them from the path the current I am giving them out to them total government expenditure minus taxes are the direct taxes I that I collect as the revenue. Suppose I ignore indirect taxes which is not there in this model, the taxes that we pay indirectly when we buy a good and goes to the government, if you look at the direct tax revenues. And if you think about this as a government budget deficit or surplus whichever way you want to interpret, this variable can be interpreted as something like budget, some people call it budget surplus.

Actually it should be written the other way round budget surplus, surplus expenditure minus income I have done it will be a negative of that. But, anyway suppose this budget surplus is positive does it mean really positive means it is actually this is like a budget negative of budget surplus, this is the inverse of the budget surplus I should put it this way, this is inverse of the budget surplus you can call that budget deficit. This is the inverse of the budget surplus are like a say you can call that budget deficit, inverse of that will be budget deficit.

That means; if this is the positive number there is the positive budget deficit G plus T is greater than T; that means, the government is spending more than the direct taxes it is collecting. So, budget deficit positive essentially in twice that say budget deficit if this one is positive, then it will imp lice that G plus T f is greater than T budget deficit is equal to 0 implies G plus T is equal to T and budget deficit is negative implies G plus T is less than T.

That means, negative budget deficit being budget surplus, government is spending less, so it has a surplus budget you agree with me or not. Now, look at this, this is simple of course, budgets deficit or budget surplus look at this, if the private sector says more than

private investment if this side is positive. The right hand side must be positive true, otherwise how will that equation balance.

If left hand side has plus 4 as a number that equation means right hand side also has a plus 4 number. Which means if the private economy saves more than what private investment demand is government has the liberty to spend more than what it collects a direct tax table. That means, what it is doing is the following one can argue that if other way around, if government spends more than what collects as tax stability, if the right hand side is positive.

Which means the private investment must be less than private savings because, some of the savings are now channel through banks may be a known banks into the hands of the government, whose how is government fund financing it is extra expenditure in this simple model, it is financing the extra expenditure G plus T f is greater than T means it is not collecting in a direct tax revenues. So, automatically it means according to this equation is that the left hand side is also positive, which means private savings is more than private investment.

So, where is the private savings going it is not going to the investment, private investment is going to the hands of the government. On the other hand if here you have a surplus and negative number it should be a negative number here, unfortunately surplus is being shown in this equation as a negative number. If it is the negative number here then it should be the negative number, which means that a private savings is less than private investment, government is spending less than tax revenue.

That means, part of the tax revenue is therefore, getting channel to some root into the private investment, through bank to intermediate god knows what. So, now, you would understand what the classical position is why classics is dislike this kind of a model Keynesian model, where role of government is very important. Because, classical matrix autonomous says that if government spends it chocks private investment, what it basically means is gives government spends, the government spends the direct tax revenue, otherwise it would have gone to the investment.

And if the government has the budget deficit the terrible news, not only it is helping the private sector, it is eating up the private savings. If it is positive it has to be positive, which means savings is more than private investment, so extra savings are not available

to private investment, they are channel to bank etcetera non banks into government. That is why classical metrical autonomous take a political position also, this is economic which is trying to explain that, is that a government too much of government needs into the private system.

That is another private sector to go where as in a capital system you say what, it is the private sector which thrice is the free enterprise, individual interest which are pursuant pursued you have the best possible result. Not state control that is whether capitalist in the communist you would find, but in the capitalist you do have mix system to a private sector, and public sector side by side and what this equation is already telling you, there are too much of government spending etcetera will lead into private saving and private investment.

Look at this equation now go back and study this what I have said, pay attention to what I have said by looking at this equation I hope the algebra is correct, check the algebra also. So, this is what I wanted to do there are many important things now coming up about the macro economy, and this is where classical metric economy should all the time fight with a Keynesians, if the Keynesian would say government role is the essential in some time periods. But, the classical metric economy it is dislike the presence of the government and too much of government.

Now, comes the diagrammatic part, and life would not be too much of a fun anyway these equations we keep and let us see whether we can have some diagram. So, S plus T minus T f is equal to I naught plus G naught should be coming out in the diagram let us see whether it comes.

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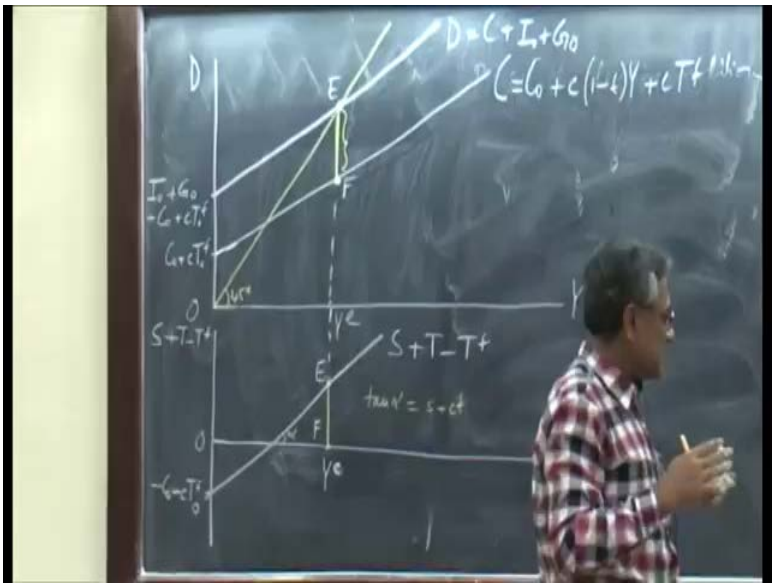

I will would still prefer to draw the diagram consumption function and savings functions against Y variable, and not Y D I was still prefer that the older access that I had in the previous class what I had I still would prefer this Y and D and I will tell you what I have here, a little bit later. I am in tell you what I have here, first of all note the following things, the consumption function we need to draw, what is the consumption function now recall the consumption my goodness.

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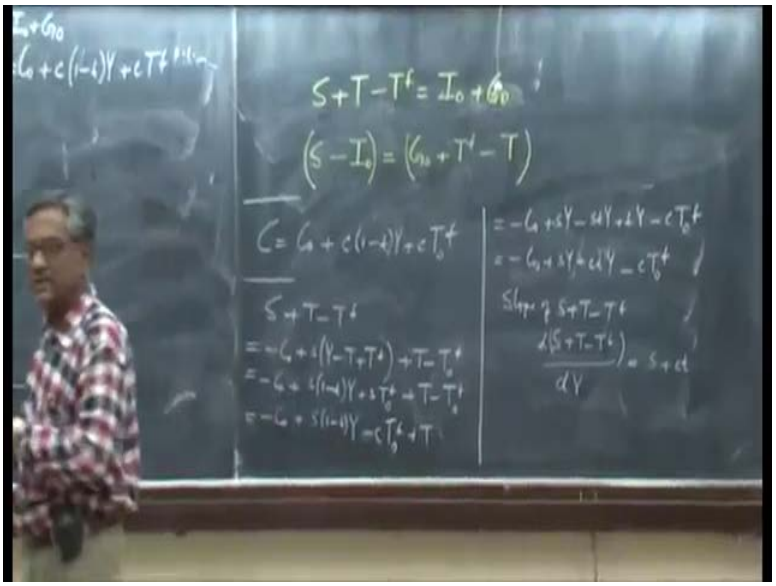

The consumption function what is the consumption function C is equal to C naught plus small c into 1 minus t Y plus c T f am I correct or not I am correct or not, if you do not understand this let me know is this the consumption function now, consumption is the function of disposable income am I correct. So, let us draw this you can see there are two autonomous parts T f is also constant from transfer basis, you can put a naught there ((Refer Time: 36:05)) and see C naught plus C T naught f this can come here.

((Refer Time: 36:13)) So, you will have here C naught plus small c T f and you have seen 2 1 minus T as the slope along Y line, the what is the slope d c d y c into 1 minus t that is the slope not C slope is C into 1 minus T now against Y axis. So, this line would be something like this C is equal to C naught plus small c in to 1 minus t Y plus c T f this is the consumption line.

Now, what is the equilibrium condition saying, equilibrium condition is saying that S plus T minus T f should be equal to I naught plus G naught let us add the add a demands here D is measured. So, D is what C plus I plus G total D total demand is what C plus I plus G, so add I plus G which is I naught plus G naught to that, and then you have a shift to a line like this, where you have now I naught plus G naught plus C naught plus small c T f you can put a naught if you wish.

So, that what you will have, this is what you will have, this is the aggregate demand line which is C plus I naught plus G naught that is the aggregate demand line am I with this am I with this with you are you with this, am I means r u with what I am saying. Now, we need the 45 degree line which is like something like this 45 degree line, and this is the equilibrium point. Because, you require D is equal to Y and along the 45 like degree line D is always equal to Y.

So, where ever the intersect the 45 degree line you have the equilibrium, the question is what will be the diagram here. The diagram here logically say that I naught plus G naught that is this gap I naught plus G naught this one should match an S plus T minus T f the question is how do I draw the S plus T minus T f, S plus T minus T f that should be S plus T minus T f. So, ideally this diagram here on the Y axis you should have in this axis you should have S plus T minus T f.

But, the question is we do not know the S plus T minus T f, but the question is we do not know the S plus T minus T f line. So, let us to work that out, so plus T minus T f slide, so

let us work that out S plus T minus T f what does it mean, it means minus C naught which is S naught plus small s into Y D which is Y minus T plus T f which is equal to minus C naught plus T minus T Y. So, 1 minus S into 1 minus T Y plus s T f and you will have plus T minus T f and it will be plus T minus T f do not forget this.

So, this is equal to essentially minus C naught which is S naught plus S into 1 minus T Y plus you have s T f and minus T f what will it become s f T f and minus T f. So, minus 1 1 minus S it will be c T f minus c T f, it is the minus 1 here and you factor 1 minus T f out minus T f is 1 minus S 1 minus is C. So, it will be minus c T f and what will plus T represent, what will plus T it is plus T Y, so we have more algebra now coming is equal to minus C naught plus S Y and minus s T y and here you have plus T plus T Y.

So, minus s T Y plus T Y this 1 minus c T f am I correct C naught plus S Y minus s T y and then I am bringing T Y which is small T y minus c T f, now what it will be if you take T y faceted out 1 minus S alright. So, it will be equal to minus C naught plus S y plus C into c T Y minus c T f minus C naught plus s Y plus C T y minus C into T f, so what I have therefore, the slope of S plus T minus T f line is which will be equal to d s plus T minus T f d y will be equal to S plus c T that is the slope.

And T f naught I should put a naught here I am forgetting to put a naught these are constant terms. So, if you put a naught there, this and this is the intercept of that line, which is similar look at the consumption function C naught plus c T f naught the opposite of this will be minus C naught minus c T f naught, which we have here minus C naught minus c T f naught, just the opposite of it did you see that.

So, here this amount I should translate here that is the place where you have minus C naught plus c T f naught not plus is it plus c T f naught minus c T f naught, why is it minus there is an error somewhere minus C naught plus S into Y. So, s T f naught minus T f naught is minus 1 minus S it will be minus is the opposite of this it will be minus absolutely correct minus C f naught. And, now the question is this S plus T minus T f should show at this point, the same amount of height this is the height that it should have this is the height that it should have.

So, it should have this kind of the height here, which is this one, this is the height and this line this savings line will go through this from here and here more or less or right, this is the S plus T minus T f line, whose slope is small s plus T the slope is this angel

alpha this 10 alpha, this 10 alpha not S plus C T as the slope, earlier savings function in a Keynesian model with node T it was S t 0 it will become s small s. So, it will become 10 alpha is equal to S plus T minus if T is 0 it will be only S, earlier line was S only.

Now, S plus T minus T will have the different slope, which is steeper than the previous line, previous line was only savings. But, now plus term is added a positive term, the positive term is plus C into T; however, small it may be tax in the direct axis average rate is say 20 percent 0.2, and saving ((Refer Time: 46:47)) 6.7. So, 0.7 into 0.2 how much is this 0.14 which is not large amount, but it still added. So, the saving function line it should go back to the earlier diagram which I drew on Friday it was only S line.

Now, S plus T minus T f will be smallest plus small c t that is the line, and that is alpha the slope of the line. And these are the heights you can name the heights call this now [FL] E f and you can call this also E f if you wish, so there is the income level some Y star or may be Y e equilibrium income level, were you have equilibrium income level were you have S plus T minus T f is equal to I naught plus G naught, the goods market clearing condition.

The difficulty is to get this S plus T minus T f line slope, then you can draw intersect, and the intersects are consist with the earlier one. In the previous diagram it was C naught here only no T f term and it was minus C naught here, but now we have C naught plus c T f we will have minus C naught minus c T f just the inverse of it, the minus number.

So, this is what you have, has a new diagram Keynesian cross model diagram before I proceed further there was the consider break income I told you that the economy reaches break even income when income is matches consumption exactly and savings become 0. Now, note here that were is the break income because, we have disposal income now, and consumption and saving function disposal income, so where is the breaking even income is coming.

So, we can investigate that also and in find out what break even income would mean in this diagram I can say S plus T minus T f is equal 0, and we do not know what that point that corresponds to, we really do not know what that point corresponds to.

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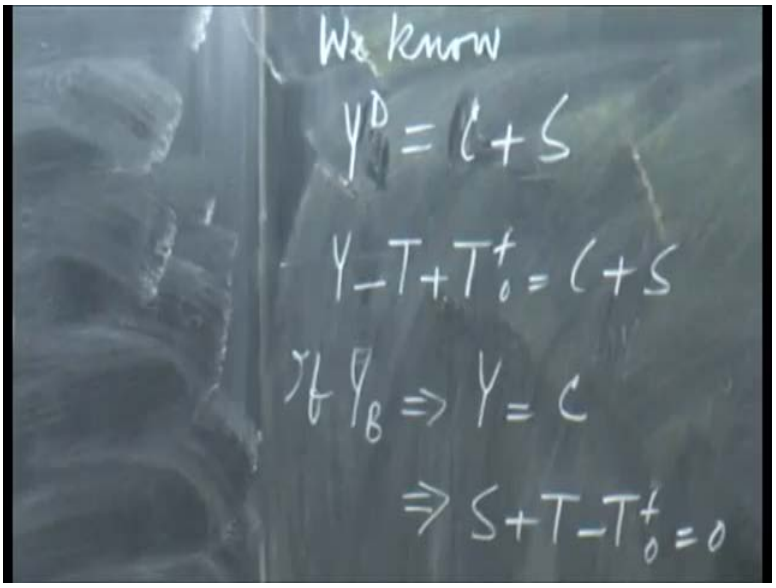

Now, we know one thing that Y D we know Y D is equal to Y is equal to consumption plus save we know that. So, it means Y minus T plus T f is equal to consumption plus saving, so if break even income if Y B implies that the income in the economy is equal to consumption, then it also implies this S plus T minus T f naught is equal to 0.

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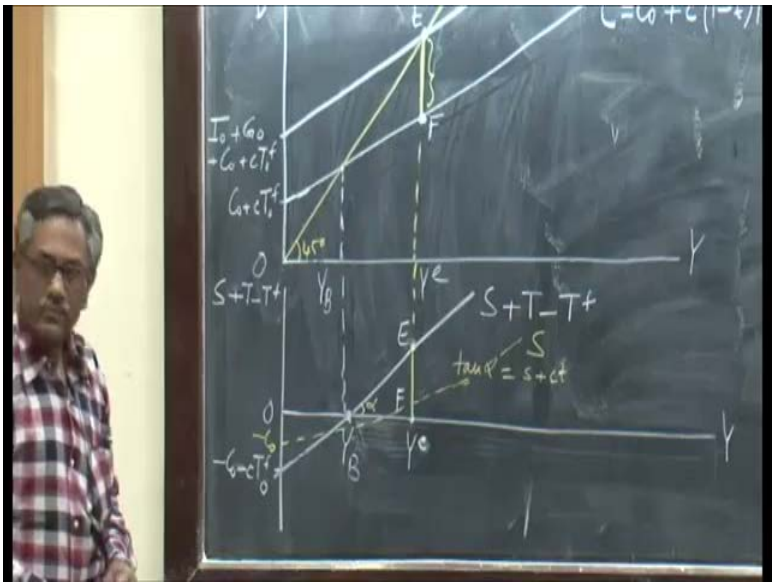

So, that is the point where you have break even income S plus T minus T is equal to 0 that is where Y is equal to C, so that point should correspond to y is equal to c point, my diagram is not great, but I hope you have understood what I am trying to say, that this

should be the breakeven point. But, remember in the breakeven point you do not have S is equal to 0 anymore, in the earlier diagram without government it was S is equal to 0, but you now have S plus T minus T f plus line is equal to 0, value is 0 it crosses x axis.

In the previous diagram it was the S line which cross the x axis, and Y B is the break even income, when C is equal to Y you see that, this was the case earlier also C is equal to Y, but here we had S is equal to 0, we had only the slide. But, now we have S plus T minus T f, if you draw the S line what it would be, the S line would be here, only minus C naught, so one negative term gone, so the intersect will be some were here above this, and it has the slope only small s which is less than this.

So, S line will be somewhat flatter like, it will go like this, it will be flatter, S would be this line, this will be the S line. And here, you will have only minus C naught and the slope of the S line is small s, so it is flatter that will be s line, is it not that true. And our S intersect that x axis will be to the right of the breakeven point, breakeven point I have mentioned like this, but I do not know I hope this is correct, sometimes I do not know, because sometimes text book are ((Refer Time: 52:45)) each other, one of them says this kind of things. Somebody might say break even savings is 0, [FL] if savings is 0; [FL] that means, y d is equal to c [FL] when y minus t plus t f naught [FL], so up to this point we will go today.

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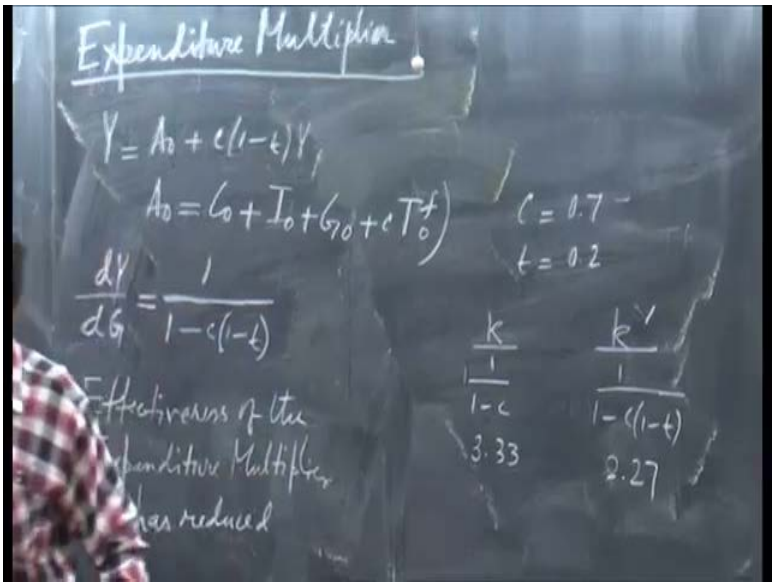

Now, having done this let us take the expenditure multiply, what will be expenditure multiply here, let us check out the expenditure multiply, what was the goods market clearing condition, Y is equal to A naught plus C into 1 minus t Y and A naught you can put all terms. Now, autonomous term even transfer payments, put them there all of our term, so what will be the expenditure multiply expenditure multiply, in very simple terms is the d Y d say any term you have say G d Y d G.

So, you will delta you do that and it will be 1 over 1 minus C into 1 minus t, check that out d Y d G, if you do were you allow one of the variable G to change. Then it will be d Y is equal to d G plus C into 1 minus t d Y, d Y club to gather will be 1 minus C into 1 minus t and it will be d G, so d Y over d G 1 over 1 minus C into 1 minus t [FL], so that is the expenditure multiplier. Now, if you look at this expenditure multiplier, if this one, now if this multiplier is compared to the earlier multiplier, if this multiplier is compared to the earlier multiplier.

What will it be, it has for shank, it has the effectiveness has gone down or the effectiveness has gone up, earlier it was 1 over 1 minus C 1 minus c is multiplied by a fraction 1 minus t, t is 20 percent. So, it will be only 80 percent of c is effective here, so 1 minus C that is fallen, so the denominator value has gone down gone up, so 1 minus a lower number is the bigger number, so what does happen is the effectiveness of expenditure multiplier has reduced.

The multiplier has become weaker why is it so, because every time an additionally income individual earn in the multiplier process, multi stage multiplier process, I had the geometric series in the previous class. Initially there is delta G increase in expenditure and an output a income, the following period C of that is spent, every time people want to spend C, they realize spend C of it, they have to spend C into 1 minus C of it, because t of it is taxed, so 1 minus t remains with them.

Every rupee they earn t amount is tax a 20 paisa, so 1 minus t which is 80 percent remains with them and out of 80 percent they can now spend, so there is the leakage in the system. The leakage is in the form of like you have the bath tub or a tumbler, there is a small leak, so what is this going out a little bit, so every time the economy earns of some extra income, they cannot spend that out of it.

They have to first whether taxes, then they get the disposal income with them and out of the disposal income, they can now spent huge problem, so the effectiveness of the multiplier goes down, because they spent less, lesser amount of goods will be demanded. So, lesser amount of goods will be produce in the next period, additional goods, so in the following period again even lesser amount of goods will be produced, because again whatever income is earned amount is something taxed out of it and taxes end remain with the consumers spend.

So, effectively what is happening is the expenditure multiplier effectiveness has gone down, is not that effective government spend 100 crores to boost the economy earlier. Say the multiplier let me given an example, suppose point C value let us take a number that will be better, suppose C is 0.7, so 70 percent of income consumed in India average suppose the tax the direct tax is 0.2.

So, construct the 2 multipliers say K and K prime, K is 1 over 1 minus C and this is 1 over 1 minus C into 1 minus t. Once, you construct the multiplier, you realize that 100 crores is the government spends under this condition, the increase in the output will be much larger than 100 crores when it the multiplier is less. And let us find out the number this 2 multipliers, find out the 2 multiplier number, one is K, one is K prime the new one.

So, what are the multipliers 1 over 1 minus t is 1 over 0.8, which is 2 point something, 3 point something 3.33, so this is 3.33, and how much is that 20 percent tax direct taxes 2.27, that what you said, can you believe how much it is funk. So, every time 100 crores or any 1 extra rupees spend the additional income will not increase that much, so the effectiveness of the multiplier as gone down. And this is because of the leakage in this system, because government every times there is the income earned, government is the up [FL].

So, every turn every stage [FL], so in India effectively with not paying the tax the expenditure multiply should be large, so have you understood this what I said this the expenditure multiply, so the expenditure multiplied essentially goes down. Now, if I ask you work out the transfer payments multiply or autonomous consumption expenditure multiplier, autonomous investment multiplier, you would be able to do that, you know the method now very simple.

In fact, government expenditure multiplier, autonomous consumption expenditure multiplier, autonomous private investment multiplier all will be the same, because they are under a not is multiplied there is the small c term, so it will be small c at the top, at the head. There will be a small c, now few more things, I have to tell you and I do not want you really rush through it, if you are with it this, up to this point that you with government.

Here, you have a tax and often in a country particularly before budget you would listen here, that the private companies those clubs fickly, and these are tax rate here. So, what happens typically, finance minister gets request from the individuals consumers from the companies, sir please lower the tax rate often that is the case. So, it is a common macroeconomic issue which every year during budget the finance minister as to faced, [FL] fickly or CII consideration of Indian industries [FL], common man on the street requires [FL] the personal income tax, please get rid of education stress is the extra tax we pay.

On the tax revenue some 10 percent of that money, we pay towards education expenses, which government collect and spends on under privilege education systems whatever, they have various programs running. So, there is the education stress please remove that lower the income tax, this kind of statements we often here, so we would like to know that we are macroeconomic understood to, that expenditure multiply that we brought out is there a tax multiplier, we would like to know that.

So, the next thing I would like to do is to work out the tax multiplier, but that one I would not use to work it out, because we do not get exactly the correct expression.

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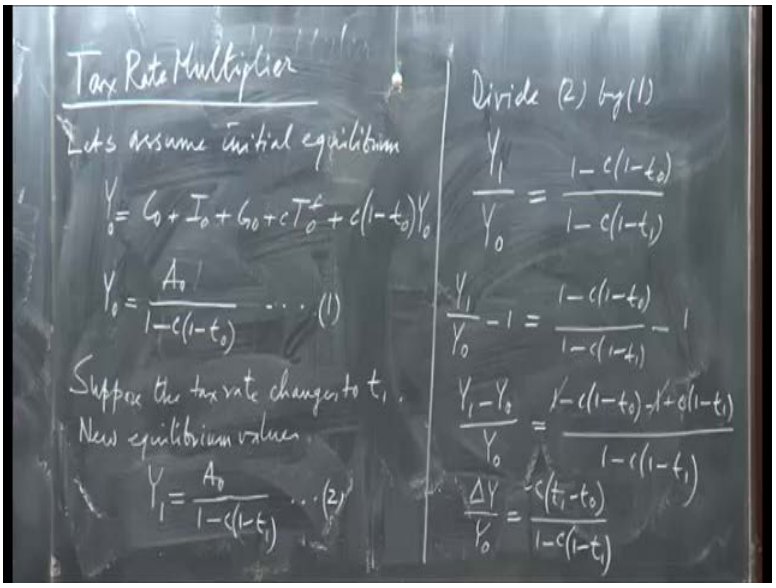

So, let us talk about the tax rate multiplier now the tax rate multiplier the tax rate multiply let us assume initially equilibrium in the economy, why not is equal to C naught plus I naught plus G naught plus c T f naught plus C into 1 minus initial tax rate T naught into Y naught initial equilibrium values alright. So, if you arrange terms here what you will get it is Y naught is equal to some A naught values in the numerator divided by 1 minus C into 1 minus t naught.

Next, suppose the tax rate changes, whatever it may fallen or it may gone up, the tax rate changes to t 1. Then you have the new equilibrium values after the change, new equilibrium values Y 1 is equal to A naught into 1 minus C into 1 minus t 1, now all we require is therefore, the thing that I would require is divide Y 1 call this 1 the expression 1 and call this expression 2. So, divide 2 by 1 what you have is divide 2 by 1 Y 1 over Y naught [FL]. So, Y 1 will be A naught over 1 minus C 1 minus T so [FL]1 minus C into 1 minus t 1 [FL] 1 minus C into 1 minus t naught and A naught A naught cancel [FL].

Now, I subtract one from this, so what you basically have is Y 1 over Y naught minus 1 is equal to 1 minus C into 1 minus t naught 1 minus c into 1 minus t 1 minus 1. So, it will become Y 1 minus Y naught over Y naught is equal to 1 minus c into 1 minus t naught minus 1 plus c into 1 minus t 1 divided by 1 minus c into 1 minus t 1 am I correct or not [FL]. So, what you have essentially is delta Y either may Y 1 minus Y naught over Y

naught are in the numerator you have 1 and 1 cancels out minus c plus c cancels out plus c t naught and either may minus c t 1.

So, you have c minus t 1 minus t naught am I correct 1 minus c 1 minus t 1 am I correct here please find out. So, one more step require I am going to use a color chalk and let us see if I have impressed.

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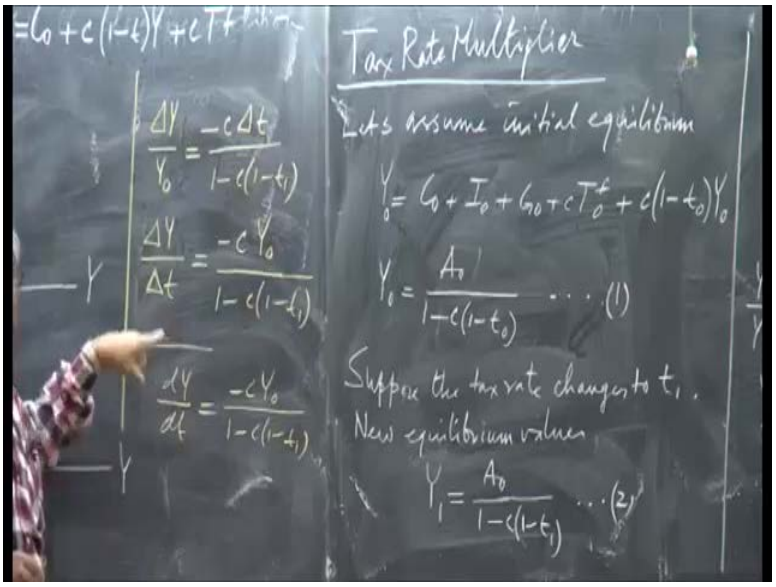

So, delta Y and t 1 minus t naught is delta t, so you have delta over Y is equal to minus c delta t divided by 1 minus c into 1 minus t 1. So, you have delta y over delta t is equal to c this 1 is Y naught c Y naught over 1 minus c into 1 minus t 1, now I did into discrete term the tax paid because, if use calculus you would not get Y naught here t 1 there, you use calculus you would not get this results d y d t if you want to find out, you would not get that Y naught in the numerator and t 1 in the denominator, but in the text book what you will find is this expression.

And then you would wonder saw how did the text book write get this expression, so I took you to this steps, these few steps I taken you to get this multiply, in text book what would they would write in simple what they would write d y d t is equal to minus c Y naught over 1 minus c into 1 t 1 simply they would write that, they would derived that for you, so that is the huge problem.

So, you know how I got this expression, one day I got fed up I asked the student in the class many years back 15 years back may be, I said please go back today and do one job for me, find out how do the text book write us get this expression. Then he went to simple step method, this method student showed to me one of your seniors many years in way, they helped me in many ways earlier in the very early days.

I said just showed that to me, how do they get that because, I really could not think, how do they getting this, because writing calculus rotation I am not getting it I am not get it. So, then I found what they are doing, they doing a discrete calculation like this step by step and then simply replacing delta Y delta t by divided by d t [FL] and I am trying to get this using d y d t, which was not coming you can try that out by yourself today.

So, it has the Y naught term in the numerator, and it has t 1 new tax rate in the denominator, very important this is the very important multiplier it confuses people text books often do not have derivations, so now, we have the derivation here.

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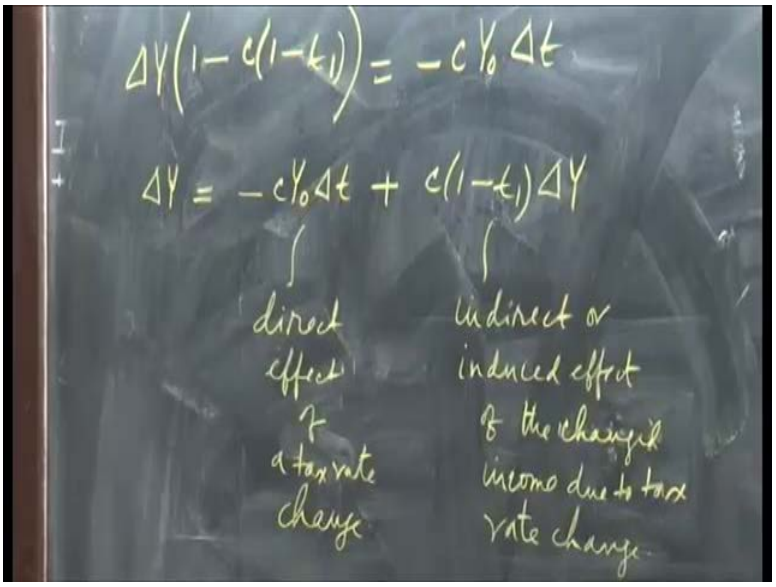

So, you take the delta version of whatever, so it will be delta y into 1 minus c into 1 minus t 1 minus c Y naught delta t. So, I can write it has delta y is equal to minus c Y naught delta t then plus c into 1 minus t 1 delta y, delta y is equal to minus c Y naught delta t, delta y is equal to minus c Y naught delta t plus c into 1 minus t 1 delta y. So, what it happens suppose government gets tax deduction from 20 percent to 15 percent

immediately peoples when we did people have to pay the lower taxes, they are more disposal income.

So, they will spend how does the original income whatever they had, they will spends c times y into the delta t as an extra that they can spend the tax reduction as really some money into the pocket. Earlier they were paying in to the government, but the delta t the tax reduction has now given them an extra money, which they are not paying to the government. So, out of the old income that what they would spend, so that would create a total demand and income again for the economy to extend of delta Y.

But, delta Y when tax is occurred also has another part, this is the direct impact what is the next impact. The next impact it is saying c into 1 minus t 1 into delta y when the income changes with the lower tax rate, they can for every tax income through the multiplier process, they will be spending a larger amount of it. And therefore, pressing a larger amount of demand on the for the goods in the economy.

Because, every stage income changes there is nothing lower tax, so they have more income in the pocket that is like 1'st stage and the 2'nd, 3'rd, 4'th stage and all the stages were they will have to spend, they can spend a larger amount. Because, 1 minus c 1 is larger now because, t 1 is smaller than earlier tax, so 1 minus t 1 is larger, so c into 1 minus t 1 times whatever increase in income that will take place to the multiplier process in the economy.

You know every time one you spend it they are earn some income and you spend again people will go increase income that you spend out against some demands, demands for goods placed in the economy just generate other round of income out of which you spend again. So, this is what you will have, so there are direct and indirect effect whether tax cut, as soon as the tax is cut whatever income I am getting from IT I go home with the larger amount of money.

Because, I am paying lower so I spend extra as soon as extra is spend and extra demands the goods are created company is would produce an extra amount of goods economy wide imagine how big that is, just not one person millions of people, crores of people generally extra income how does again people would spend and generate extra demand again people would spend multiplier process will go on. So, those are the induced

effects, so these are the direct effect over the tax cut weight change and these are the indirect effect or induced effects of the increased income.

How are the changed income I should say due to tax rate change are you clear [FL] direct and indirect effect when tax is a cut. So, the total effect on income both the way the tax is a cut look there is the minus sign so if taxes are cut what will be the delta t value from 20 percent to 15 percent if we a minus value. So, minus into minus into minus plus [FL], so that minus cancels out becomes the whatever you say.

So, delta y is the step of positive because, the c Y naught is positive term 1 minus c into 1 minus is the positive term. So, there is the tax multiplier, but if taxes are increase delta t is positive, the ratio should be negative because, it has the minus term here and plus term here ratio's negative. So, delta t is positive from 15 percent to 20 percent taxes are gone up delta t is positive 20 percent minus 15 percent, which is 5 percent divided by 100 whatever it comes to be 0.5 probably.

And delta y will be up negative term then income would fall the tax would go up, why because, more taxes go up this intention model if tax rate goes up people spends less. So, lesser amount to demand or demand strings, so lesser amount of extra output or income that could be produced in the economy. In fact, it can fall, so how to fall, so the whole thing accession philosophy it just not the government's role, it essentially it depends on the margin you can assume etcetera, which people have spend which was not there in the classical model no consumption function.

So, one can say the most crucial assumption that Keynesian method compared to the classical macroeconomics is the introduction of the consumption function. Because, we consumption function, you have marginal provision it should working, which means the multiply which will work, you saw that delta y over delta g is 1 over 1 minus c. And now today we have 1 over 1 minus c, if c is not there no multiplier, it is very critical, so the introduction same more contribution in the of the consumption function, which create the multiplier.

And now problem with the multiplier what would you realize, it can have both directional effects you can have the positive impact and negative motive working also, if tax increase the multiply works in the reverse direction, keeps one reducing output for the long time. So, the shock and the aftershocks must go on in the economy also in the

reverse direction, because you increase taxes you reduce people income permanently in some sense, what I can do in the short run.

And therefore, they will have multiple effects, the triple effects on the economy reduction, reduction, reduction of income an output. Similarly, if taxes are cut it will have multiple effect on the economy and increase, increase, increase income and output, I can go home and tell my wife and kids that, I have no extra income taxes are gone down, I can spend more let us go to rave. Then, the rave people earn that money, the more people what they are, that money they spend again, it goes on and on and on, you see my point.

So, I have more or less done except little bit, I may talk about budget multiplier, etcetera, balance budget multiplier, a little bit of Keynesian cross model, but the Keynesian cross model is more or less done today.