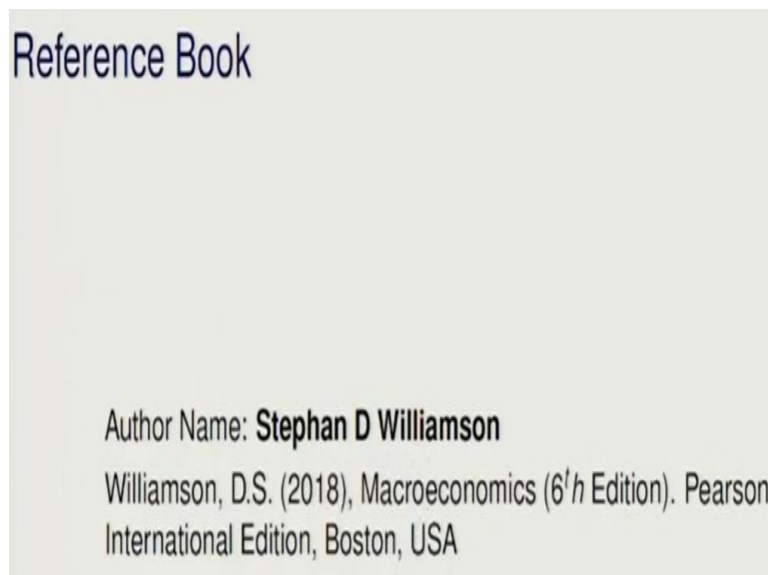**Microfoundations of Macroeconomics**
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Module No # 08
Lecture No # 40
Open Economy Macroeconomics II

Welcome back so we were discussing about the in transfer trade and we have already given you I think all of you have the sufficient idea about. What do you mean by in transfer trade? And how we can bring dimension to the international trade in the macroeconomics? So I think we have already covered that part let us move what we were discussing in the last session.

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Reference Book

Author Name: **Stephan D Williamson**

Williamson, D.S. (2018), Macroeconomics (6^{t}h Edition). Pearson International Edition, Boston, USA

So the reference for this particular session will remain same the Stephen D Williamson, and I am referring chapter 16 of this book.

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Key Learning Objectives

- To understand the micro-fundations of the small open economy (SOE)
- Use the two-period SOE set-up to explain the determinants of the current account balance.
- Understand the dimensions of credit market imperfections, national default on debt, and the possible determinants of default.

So if you want you can also refer and the objective will remain same. Now we understand in the last session we ended up here, when we were trying to set up the 2 period SOE models with a small economy a small open economy model. And then we will be moving to the credit market imperfections and then how it impacts the debt market?

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A Two-Period Small Open Economy Model

- Two periods – current period and future period.
- We consider the case of Small Open Economy (SOE) model for the sake of easy understanding.
- Representative consumer with exogenous current-period and future-period incomes.
- The SOE is a price-taker on world credit markets – the real interest rate is exogenous.
- The current account surplus here is equal to savings in the SOE, as there is no investment.

So here we were talking about the 2 period scenario I as I already mentioned, that here you have a 2 periods here small open economy. The most crucial thing that you have to keep in mind that, we are talking about current account surplus it consists of savings but no investment, so here we talk about that.

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National present-value budget constraint

- From consumer's lifetime budget constraint and the present value budget constraint for the government, we get the following equation:

$$C + G + \frac{C' + G'}{1+r} = Y + \frac{Y'}{1+r}$$

- National present value of consumption plus government spending must equal the present value of national income.

So we were talking about the current accounts surplus so this is how we derived and this is the new thing that we should be talking about. So we drive these 2 from the consumer and the government, and here since we are dealing with the lump sum tax so here the easy transfer. So there you have G = T because of that we have been able to derive here $C + G + \frac{C' + G'}{1+r} = Y + \frac{Y'}{1+r}$.

Here we talk about the national present value of the consumption plus government spending must equal the present value of the national income, so this this is what we try and achieve.

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Nation's budget constraint

- The nation's budget constraints for the current and future periods, respectively, as:

$$C + G + CA = Y$$

$$C' + G' = (1+r)CA + Y'$$

- In this set-up, we can think of representative consumer's making choices over consumption bundles
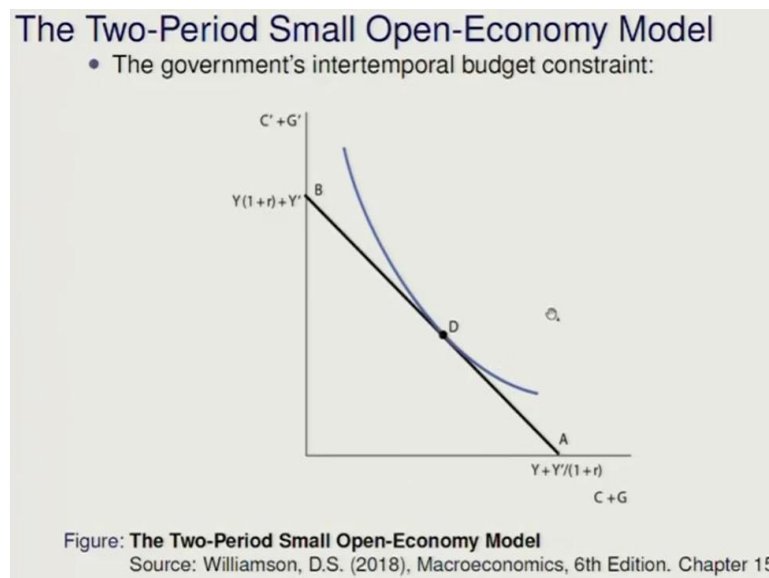
$$(C + G, C' + G')$$

Now if, you think about the nation's budget constraints, so how; it has come with the open economy setup? So as I mentioned that the current account surplus is nothing but the savings. And once you have a saving if you are going to keep in or going to lend to somebody. Then

you will be offered rate of interest which means that this will not be counted in print value term, it this will be counted in the future value term.

So this is what we are adding here C' + G' = 1 + rCA + Y'. In this setup we can think of representative consumers making choices over consumption bundle, so here we have a C + G and C' + G'. So future consumption of the representative consumer, consumption of the government you can think about so government expenditure.

And then, here we talk about C + G implies that here we are talking about the consumption of the representative consumers and the government expenditure. So both if, you want you can also substitute these 2 as in the private consumption and the government consumption since it involves some kind of expenditure. So this is what we are trying to understand here.

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Figure: **The Two-Period Small Open-Economy Model**
Source: Williamson, D.S. (2018), Macroeconomics, 6th Edition. Chapter 15

The two periods small economy model, so if you think about the budget constraint so here it this is how it looks like as I mentioned will have 2 important axis. So here we have C + G + C' + G', here you have a $Y(1 + r) + Y'$, and here you have a $Y + \frac{Y'}{1+r}$, so D seems to be the most obvious choice. B if you are focusing B which means that you are having no C + G but if you are at point A you are missing C' + G'.

So D seems to be the only the suitable point and at this point you have indifference curve tangent. So this is very basic I would say understanding about the 2 period small economy equilibrium. We will be for further working out with competitive statics and then it will be easier to understand.

Implications for the Current Account Surplus

- CA surplus increases with current income.
  - Country saves the money and lends it abroad, CA goes up!
- CA surplus decreases with future income.
  - Country goes for less saving, borrows money, CA comes down!
- Ricardian equivalence – taxes do not matter.
  - Smoothing of savings makes no difference! *CA* does not change!
- $CA < 0$ implies increase in r increases CA surplus.
  - Increased savings and reduction in $C + G$ help CA rise!
- $CA > 0$ implies increase in r has ambiguous effects on CA surplus.
  - Interest rate increase could increase $C + G$ to rise or fall, so CA could rise or fall!

Now there are once I talk about the current accounts surplus then here you have to keep in mind certain things that is current account surplus increases with current income. Which means that if you think that your current income is increasing so this is coming from the consumer behaviour that we; mentioned about the consumption that we discussed. In consumption we had only discussed that if you have the current income increasing; it means that individuals would like to save.

So in the context of the open economy at the country level what does it imply? It implies that the country will be saving. Because the country expect that the income is increasing in the current period so maybe some amount of a good exports, or good production, something has happened. And because of that the country especially expecting that; this particular country will have higher income.

Now higher income will also lead to smoothening of consumption so in the same way if the current income is increasing, so we were seeing the parallel shift in the budget line. In case of consumer here also it will be the same there will be parallel shift of the budget line. Where; if individual is thinking that the current income is increasing you will be saving some part of your income for the future consumption.

So this is what it implies here also at the country level that country saves the money, and lends it abroad. So here what it means that if your saving is going up you are lending in the market you is have the CA into $1 + r$ in the future period. So overall your current accounts surplus your saving is further going to go up, and this is coming from here that $1 + r$ CA is going to add up.

So, in future period you are expected to get more so this is how it implies here. CA surplus decreases with future income. So if you have a future income increasing suppose you are in campus doing BTech or BS or suppose you are pursuing some course. In your third semester companies comes and they give you the job offer. If you know that you are being placed in the company and you have the job offer. Then you are very sure that in future you are going to get higher income.

Because once you join the company then company will be paying you the salary what do we do? You normally ask from your friends colleagues and then you have a good party you invite everyone for dinner go out, so if you have that kind of phenomena appearing then that is what it implies here. That if you have a future income increasing, than you go for less saving because in future your income earnings are going to be better.

So you will be taking risk in the current period you will be going for more of a borrowing and if you borrow money then here you have a dissaving happening. So this dissaving will lead to what we have the current account surplus coming down this will be at the country level not at the individual level. So if the country is thinking that they are or if the country is having scenario in which it feels that this better country is going to have better income in future, it will also react in the same way that you have for the for the particular individual.

So the individual or representative consumer behaviour can be replicated here at the country level, and then we can think about in the current account surplus. Then here we have the Ricardian equivalence, so once I have the Ricardian equivalence which means that taxes do not matter which means that even if the government is charging a tax. Individuals are also smart they also learn so they will be saving that amount.

So if the government is going for a tax cut in this period it does not mean that it is going to continue even in the future period also. In future period when it goes for increasing the tax rate people also have the learning. So they will be saving this amount investing in somewhere and this particular amount will be used to compensate for the tax increase in future. So here we have the Ricardian equivalence taxes do not matter.

Smoothing of savings makes no difference and CA does not change, so in this case until and unless the government goes for saving. Which means that even if the government is collecting 100 rupee tax, it is spending only 60 rupees, 40 rupees is saving, that will lead to CA going up.

Because then it can be added to some other factors may be a saving, so it can be also $1 + r$ CA it can be also part of.

But if there is smooth transaction happening that whatever government is collecting it simply invest that in somewhere, then in that case your CA is not going to have any change and your current account surplus is not going to change much. If you have current account surplus less than 0 it imply and implies increase in r. So once you have the increase in r so whatever, happens with the interest rate increase.

So if your interest is increasing so here what it implies that if you have increase in r increases CA surplus. So this is what we have that CA less than 0 means that rate of interest increase it is going to lead to what we have the CA surplus? It means that, the countries if they feel that their saving is going to come down. But rate of interest so this is what is going to be with the help of the representative consumer we can understand.

That whenever we have the rate of it is in interest increase, we have seen that if based on the borrower and lending scenario that whether the consumer is the borrower or the lender. If the rate of interest is going to be higher this particular representative consumer if he is borrower then he is going to face scenario. His substitution effect and income effect may move in the same direction, so based on the magnitude of substitution income effect you can react on this.

But in this case what typically happens that? If you have the increase in r then this will lead to have decrease in your consumption, so current consumption declines. If you have current consumption declining so C + G declines, which means that some amount of money is being left out. And this particular money can be channelled to the CA surplus so this is how it means it mentions here.

CA less than 0 again the same dimension that we can introduce here by lender by lending and borrowing. So if CA if you have a current account saving is greater than 0 so which means that if you have a current accounts are plus greater than 0. It implies that increase in r has ambiguous effect on CA. Because it may go up or down depending upon that whether the interest rate is having a some kind of increasing effect on C + G or not.

If it is not having increasing effect then your CA will also not react. I would say that instead of going by these 2. It is more important to understand these 3 because these threes have lot of implications, in these 2 scenarios where you have the savings lower or higher. In that case it is

also leading to what we have? Here you can say that it will be also some kind of I would say precautionary savings for the government.

Because if the government is borrower, then it will always think about there will be heavy decline in C + G. If the saving is higher then also the government will think about that whether the rate of interest is higher or not? So in that scenario the C + G will matter that whether it is increasing or decreasing.

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Credit Market Imperfections and Default

- The national indebtedness is important to understand as it has enormous implications on the smaller economies and also linked to the sovereign debt crisis in Europe.
- Use ideas on credit market frictions discussed earlier to address sovereign debt issues – model of limited commitment.
- Suppose that at the beginning of the current period, the nation's (private sector and government) debt to the world is B.
- B can be positive or negative whether the country is debtor or creditor.

Now there is one more topic so far we have discussed about the implications on current account surplus which is basically about saving no investment. Now we are going to introduce the credit market imperfections. If you remember we had discussed about the credit market imperfections. And under that we had introduced the concepts of limited commitment. We also introduced the concept of collateral; we will be having the similar kind of scenario here.

The national indebtedness is one of the important topics to be discussed because majority of the countries which are having the higher debt, they end up having a default scenario. The default scenario creates a very bad impression for the global markets, because then that country will have very difficult time to convince the investor to borrow money. So from the lending market side it becomes really tight market for the defaulting countries.

And if you try and understand from the perspective that what are the underlying regions? It is the size or it is the service of the debt? So the indebtedness has lot of meaning in the context of the sovereign debt crisis that we have in Europe. So there also it was very important and

from there the people started exploring the idea that from where; it is coming and how we can understand this particular context in a better way?

So use ideas on credit market frictions discussed earlier to address this subreddit issues limited commitment. Suppose that at the beginning of the current period so let us start so suppose that at the beginning of the current period the nation's private sector and the government debt to the world is **B.** And here this is what the size of the debt that this particular country is having.

B can be positive or negative whether the country is debtor or I would say creditor, if it is creditor then it is negative it is debtor than it is positive if it is having the debtor. So if I am talking about B being negative it means that it is about the creditor, B being positive it means that it is about the debtor.

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Credit Market Imperfections and Default

- In the current period, the nation's budget constraint is:

$$C + G = Y + \frac{B'}{1+r} - B$$

- And the future period national budget constraint is

$$C' + G' = -B' + Y'$$

- Finally, the national present value budget constraint becomes

$$C + G + \frac{C' + G'}{1+r} = Y - B + \frac{Y'}{1+r}$$

So this is how it looks like, that in the current period the budget constraint will be like this. So here ,C + G = Y plus whatever amount that this particular country is going to borrow in future this will be in the present value context minus whatever is the date amount so this is how it mentions? Now future period national date is this so this is the amount that this particular country is having the debt size so debt to the world is B right so this is how we have.

In future what will be the value? So this minus B will be coming here B transpose because this particular value is going to be matured. So this particular value the debt size will be of this plus Y' which is the future income. So apart from the consumption and government expenditure this is the bond that the individual that the country is going to have the debt size and here you have the future income.

If you try and incorporate this into the national current value budget constraint so what we had? Here we had $Y + \frac{Y\prime}{1+r}$ here we are also adding the - B term here so what it becomes. It becomes $C + G + \frac{C\prime + G\prime}{1+r} 1 + r$ here we have $Y - B + \frac{Y\prime}{1+r}$.

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Once I go for the defaulting scenarios, so defaulting scenario it will be easier to understand if you introduce the concept of limited commitment. If you are introducing the concept of limited commitment then it means that the nation can default on its debt either in the future period or in the current periods so limited commitment implies this. In case of the individual, we had introduced the housing or some kind of asset but in case of country it becomes difficult to have the collateral.

So limited commitment implies that is some kind of penalty for the country. If the country is going to default then it is not going to have the access to the world CREDIT market, it will not be able to borrow. So if default occurs in the future period, then the nation suffers a penalty, so this is what is the v amount which captures the cost the country will suffer being denied access to the credit market.

So limited commitment means that whatever is the amount that the country is having the borrowed amount which is less than equal to v which is the default amount. So the idea is that the indebtedness of the nation it should not be so large that the default will occur which is the amount this. So the size of your debt should not be so large that you should be defaulting on the loan, so this is one criteria.

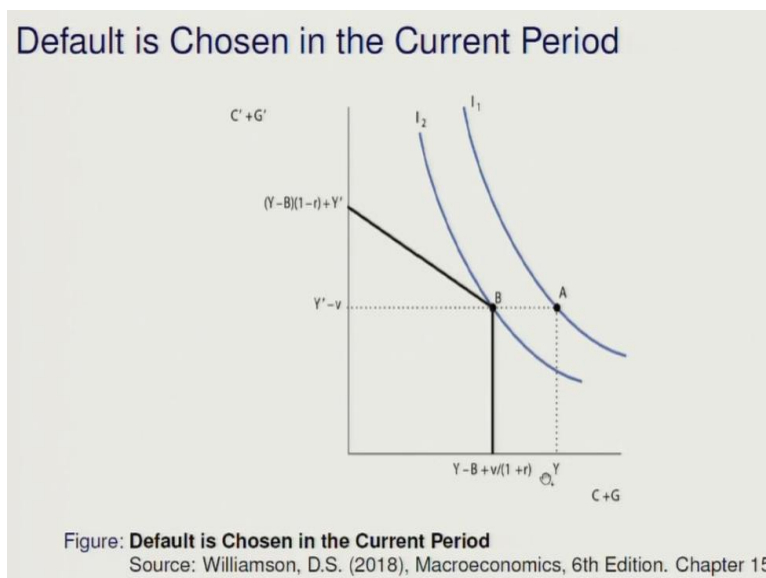## Credit Market Imperfections and Default

Limited commitment involves

$$-B' \leq v$$

- Nation's indebtedness cannot be so large that default will occur.
- The above equation can be written as

$$C + G = Y - B + \frac{v}{1+r}$$

Another criteria is about the debt servicing, so this particular equation as I mentioned this can also be written in this way. But this I will come to later that once I have the in your future period income. Instead of future period income what we have is $Y - B + \frac{v}{1+r}$.

Default is Chosen in the Current Period

Figure: **Default is Chosen in the Current Period**
Source: Williamson, D.S. (2018), Macroeconomics, 6th Edition. Chapter 15
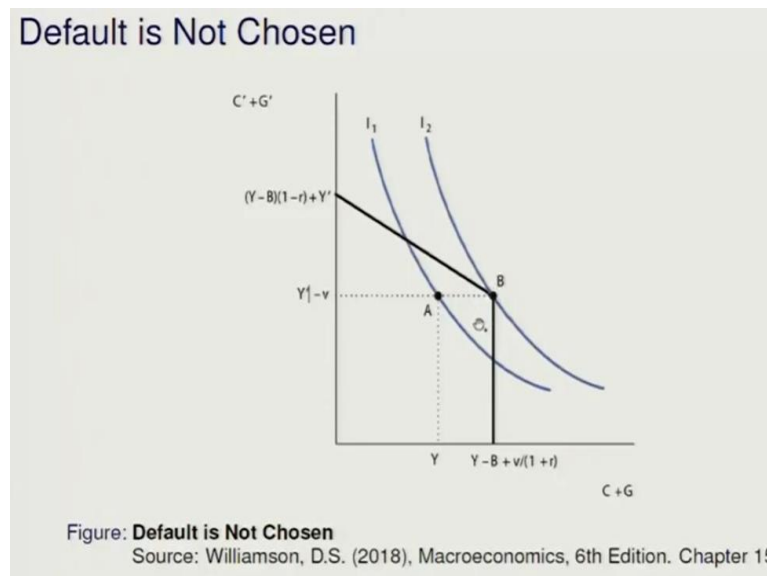
Now if you think about the default in the current period, so default in the current period so B is the most likely scenario here we have you are at I 2. But the country would like to move at A because A is on a higher indifference curve it is giving a better return. But without default scenario is B corresponds to what we have derived here, from here also we can derive.

So this is how we get the value here in the same way when I see here Y - B so here you have my Y - B $(1 - r) + $ Y', and here you have Y - B $+ \frac{v}{1+r}$ so this is coming from here it is not just

the minus it is. So here we have the $Y - B + \frac{v}{1+r}$ and this is the Y amount. The country would like to enjoy B but though it wanted to be at A, but it should it would like to enjoy at point B because this is having no default scenario so this is how it mentions about.

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Figure: **Default is Not Chosen**
Source: Williamson, D.S. (2018), Macroeconomics, 6th Edition. Chapter 15

Now that default is not chosen, in the sense that if the default is not chosen then if this is the scenario. But if default is not chosen then it means that the country is at B without default. If it goes for default then this is the amount that this country will have to bare. Now it is up to the country that whether the country would like to go for default or not if it goes for default no borrowing is allowed.

Now here you have to also introduce the concept that how much is the size of the debt? If, the size of the debt is larger than the country would say think about the national interest. If the debt service date is higher than the country may, would have to go for the default. So A, and B scenarios are quite important to look from that angle.

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Credit Market Imperfections and Default

- If the nation does not default, and the limited commitment constraint binds
- Then from the above two equations, the private plus government consumption in the current and future periods is, respectively

$$C + G = Y - B + \frac{V}{1+r}$$

$$C' + G' = Y' - V$$

Now this is how it looks like, if the nation does not default the limited commitment constraint binds, if it default then you have the scenario. So private plus government consumption the current future periods will be like this, $C + G = Y - B$ plus the default, so if I am going to simplify this further then what it gets is this particular part.

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Credit Market Imperfections and Default

- But if default occurs in the current period, then

$$C + G = Y$$

$$C' + G' = Y' - V$$

- Therefore, consumption is the same in the future period whether default occurs or not.
- Default will occur if $Y - B + \frac{V}{1+r} < Y$
- That is, $B > \frac{V}{1+r}$

Here we have the if default occurs in the current period then this is how it looks like that this particular amount will be subtracted from your future income. But if you have the $Y - B + \frac{V}{1+r}$ if it is less than Y then you have the defaulting scenario most likely that you have to now bear the burden. Which; means that as long as your bond which is greater than the defaulting cost that you have $1 + r$ then, this will have the chance that you will be defaulting given the credit market imperfections that you have.

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Greece and Sovereign Default

- When Greece joined the Euro area, it could borrow at low interest rates.
- After the financial crisis, perceived chances of a Greek default rose, and so did the interest rate at which Greece could borrow.
- As in our model, high debt and high interest rates increase likelihood of default.
- But why is Japan not at risk of default?

In the most surprising case what we found that? In the case of Greece we had the sovereign debt crisis and Greece became part of the eurozone area in 2000 and since then it has been part of the eurozone countries. But with Greece the major difficulty that the country experienced that it had to go for huge borrowing at the higher cost. So the Greece sovereign debt was traded at much higher than the Germany's bond.

But what it happened that even after joining the eurozone it was still not able to cope up. And the major leakages in the tax efficiency and the macro mismanagement had led to what is called the default. So countries will not go for the default ante unless they see that it is really unbearable on the service part of the date. So the rate of coupon attached with the bond it also matters for the default and apart from the size that we already mentioned about the service of debt also matters a lot, in case of Japan we find a limited risk.

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A Small Open Economy with Production and Investment

- Uses the context of output supply curve and the real interest rate is determined in the world credit markets.
- Aggregate demand and aggregate supply dimensions are critical as they tell about **absorption capacity** of the economy.
- $NX > 0$ generates current account surplus in the economy.

Now what happens if we are having the small open economy with production investment? So now we are going to move toward the comparative statics. So default scenarios are quite I would say intuitive to understand from the perspective of how the countries are going to react, but here in this case we can think about. So here we have the small open economy with production investment. So here we are talking about the absorption capacity.

Here if you are going by the national income accounting so in national income accounting here you have $Y = C + I + NX$. If country is having no trade relation, then it will depend upon aggregate demand aggregate supply. If your aggregate demand is higher than the aggregate supply then you need to import more. If the country is having some kind of trade listen so let us first deal with the trade relation.

That if, the country is having trade relation then how does it look like? If the country is having trade relation then if the demand is less than supply, then whatever is the surplus output it can be exported and the savings can be made in the form of current account. But if the demand is higher than supply then in that case your next export will be negative. So, absorptive capacity matters for the economy when they go about balance of trade.

That how much you are producing and how much you actually absorb by demand. So if you are absorbing more than what you produce it means that you have to import, if you are absorbing less than what you are producing it means that you have excess capacity to export so that is what it generates and this is how we try to understand here also.
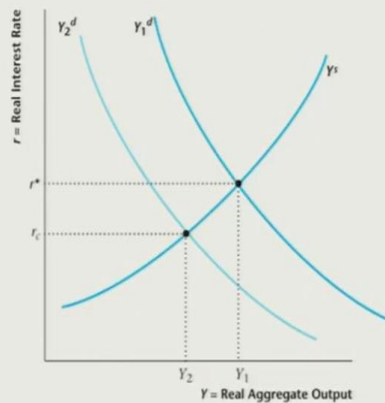
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Figure: **A Small Open-Economy Model with Production and Investment**
Source: Williamson, D.S. (2018), Macroeconomics, 6th Edition. Chapter 16

That this is the world rate of interest and this is high one so here we have at this r_1 at this r here we have Y_1. But if you are going for a target situation no trade with any country then you are going to have a lower output. Because in the market if your r^* is greater than r_c then of course you are not going to get that much I would say income even if you are having whatever you produce. If you have r c greater than r then only you will be able to attract.

So that in some way it is linked with what we call it as the Mundel Fleming filling model. But to the extent if you want to understand that how it looks like, this is the output supply curve that we have discussed already that at which labour market clears this is the aggregate demand so these are the lines that we mentioned. But overall, the idea is that if you want to improve upon the current account surplus you need to improve your net exports then only it matters.
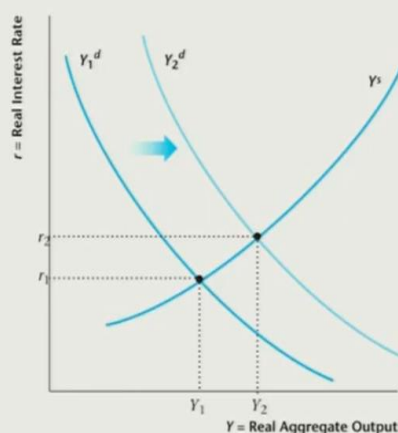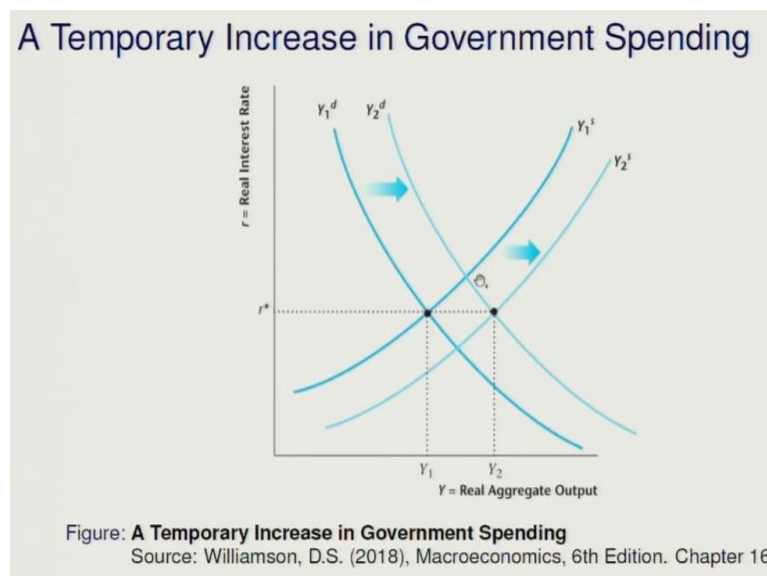
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Figure: **An Increase in the World Real Interest Rate**
Source: Williamson, D.S. (2018), Macroeconomics, 6th Edition. Chapter 16

Now here we have the an increase in the world interest rate, so once we have the increase in world interest rate so here it becomes important. That earlier you were at r 1 here you have the output supply curve, now because of this increase in the world interest rate what typically happens is? That you have more of the earnings coming from abroad and this creates. So if you have the world interest rate moving up the now once you have the world interested moving up you earns more.

But since you have the only one market credit market and in that you have to participate, so if the interest rate has gone up on your savings you may be earning higher rate of interest. But here with regard to your domestic investment it will be lower, and for some other variables also it will be lower. So overall what it feels like? That if you have the r_2 then this r_2 will create in increase interest rate will create a favourable scenario and your earnings are going to better.

But from domestic side your investment may be lower so this is also a favourable scenario for the current account surplus. Some of the arguments can be linked here that here you were at r 1 but because of the rate of interest increase now you are becoming more competitive in the transfer market. And whatever is your savings with regard to the CA you can extra you can lend and make money. And that lending will create an extra output and then the aggregate demand will also shoot up.

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Figure: **A Temporary Increase in Government Spending**
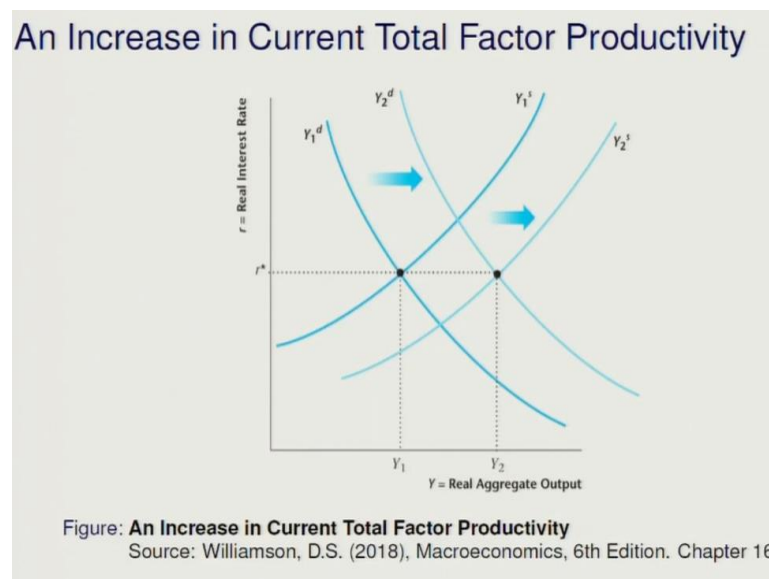Source: Williamson, D.S. (2018), Macroeconomics, 6th Edition. Chapter 16

Now here we are having the government spending, so once we have the government spending then it matters a lot that because of the government spending expenditure. So if your government expenditure it is bound to happen that your output is going to be higher, so this is

what your production capacity is going to be increasing. So once it increases then here you have the demand also.

Because people will have extra amount of income to purchase so that will also compensate this. So if you are having both increases you will be moving from lower output to higher output and this will create a favourable scenario. But here again the interest or inflation scenario may be a challenge.

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Figure: **An Increase in Current Total Factor Productivity**
Source: Williamson, D.S. (2018), Macroeconomics, 6th Edition. Chapter 16

Then here we have an increase in current total productivity, this is also favourable scenario as we have seen already in one period model. That if increase in productivity this creates a favourable scenario so this is also leading to what we had here in government spending? The only thing you have to know that here it is the output is less elastic whereas the demand is more elastic.

In this case we are seeing both the same so not much change so this is also having the same kind of scenario. If you are having current productivity increasing it creates better scenario and your exports and everything will go up and current account surplus will also go up and this will create a favourable scenario for the economy.
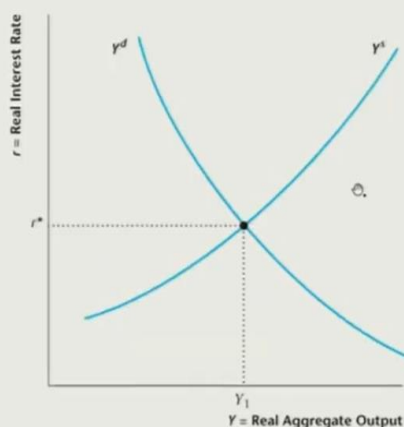
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Figure: **An Increase in Current Total Factor Productivity**
Source: Williamson, D.S. (2018), Macroeconomics, 6th Edition. Chapter 16

In case of future total productivity, if you are going to have a forward-looking scenario. Then in forward-looking scenario people may not be giving that much preference about the future. So in that case your current account surplus may not rise, but in most of the cases we have covered. Here also current account surplus will rise, here also will rise and here also it is highly likely in this case the current accounts are surplus may rise or fall, but highly likely that it is going to rise.

Here in this case future total productivity is not going to increase because in most of the cases we have found that with certain expectations about future productivity it may not be good. Because then you have the sudden in the current period itself, we have the demand for investment goods a lot and this will create. When people expect that margin product of capital is going to be higher then of course there will be more of demand of that and that may not be able to meet in future.

So that was the reason for the dot-com bubble that we had in the US around 2000, so those are the issues that we the dot com bubble that we had in the US so that mentions about. So with this I will be concluding the session. So we have covered the most of the section that we wanted, and this particular session I hope it has been useful to understand the micro dimensions.

And I request all of you to please pay attention to what we discussed here especially the microeconomic dimensions. So microeconomic dimensions may have helped you understand that how to draw the 2 periods our scenario. So with this I am going to stop here thank you so much for your attention.