[SQUEAKING]

[RUSTLING]

[CLICKING]

RICARDO J. CABALLERO: OK, let's start. So what you have there in that picture is the result of a survey to a bunch of economists on-- which are asked to assess the probability that there is a recession within the next 12 months. Recession means, essentially, a decline in aggregate output.

And well, the first thing to notice here is that it's not very good news. There are very high chances that, at least according to these experts, that the US enters a recession within the next 12 months or so-- pretty high probability. You can see that that number typically is very, very low, and it goes very high sort of next to recessions. And now we're not in a recession, but there is a sort of very high perceived probability that we may go into a recession in the near future.

So how is it that these people come up with this forecast? Well, at some level, either explicitly or implicitly, they must have some model of the termination of equilibrium output. And they need to understand-- they need to see certain things that suggest, once you go through a model, that output will decline.

So that's what we're going to start doing today. And in fact, that's what we're going to do throughout this course. We're going to try to find evermore complex, perhaps, or richer models of output determination, aggregate output determination.

So that's essentially what this course is about. And so an understanding. We're going to try to understand what is it that drives equilibrium output, and how is it that we get to one specific level of output. That's what it means to find the equilibrium level of output.

And we're going to do it sort of in three stages. In the first part of the course-- that is, up to quiz 1-- we're going to focus on the very short run, how output is determined in the very short run, say within a year or so-- or a little more even, but that type of frame, time frame. Then we're going to focus on the medium run. That's sort of at the beginning of the second part of the course.

And by the medium run, simply we're going to mean by the time in which prices begin to adjust sufficiently, OK? Before that, it's most of the action happens in quantities. There is little movement in goods prices. There's lots of movements in asset prices, but little movement in goods prices.

And in the last part of the course, we're going to look at how output is determined over the long run, which is quite different from how output is determined in the short run. The determination of output in the short run is what we mostly mean by business cycle analysis. And short or medium run, the way we're going to find it here, is what we mean by business cycle-- the country's in a recession, it's in a boom, is an expansion. Those are all terminologies of the short run or short or medium run.

The termination of equilibrium output in the long run is when we think about growth. When we talk about why China grows faster than the US today, well, that's a question not about the business cycle. It's a question about the long-run determinants of output growth, OK? And they are even different class of models.

In more advanced models, if you were doing a PhD, those things are a lot closer to each other. But in this course. They're going to be very different type of models. It's easier to analyze these things with different type of models than trying to integrate all in one big machine, OK?

But let's start with the simple part. In the short run, the key mechanism, something that will keep showing up in all the models and submodels we analyze in the first eight lectures or so or seven lectures-- the next seven lectures or so is this mechanism. In the very short run, output-- that is, equilibrium output, the thing that these economists are forecasting that will decline in within the next 12 months-- is determined primarily by what we call demand.

So demand will determine output. Thus, if there's a change in demand, that will change production. But when production changes, that will also change income. That you know from national accounts.

Remember, we said that we could measure output from the production side but we also measured the income side. And they're exactly the same. More production, somebody has to receive the proceeds of that-- workers and owners, capital owners, the government, whatever.

So changes in-- so the second step is changes in production that were brought about by the changes in demand will lead to a change in income. But when income changes, that will change demand again and so on and so forth, OK? So that's essentially-- that's quintessential short-run macro, to try to understand this aggregate demand, because that's the main driver, and then how it gets multiplied in the short run, OK?

In this lecture, we're going to talk just about that, primarily about that. But that's one-- so when I mean short-run macro, that's a structure I have in mind. And that's what most people have in mind, something where aggregate demand will determine that.

That's the reason why, in the short run, you worry a lot about whether consumer confidence is high or low. That's demand. If consumers are very depressed, they tend to reduce demand. If consumers are very bullish, that will tend to increase demand.

And since, in the short run, output is determined by demand, the business cycle, whether we have a recession or not, depends a lot on how demand feels. So if somebody's forecasting a recession within the next 12 months, is forecasting really that demand will decline within the next 12 months, OK?

Why they're forecasting that-- that's something we're going to learn in steps as we go through the course. What are the kind of things they may be thinking about? What are the drags on aggregate demand that are likely to depress demand and so on and so forth? But we'll get there, OK?

Anyways, first, let me tell you about the components of aggregate demand. The first and one of-- the largest component of aggregate demand is consumption. And what I mean aggregate demand-- OK, I'll be-- I'll pause for a slide. Let me go over the definition.

Consumption-- we're going to denote by C-- is the goods and service purchased by consumers, households, and so on. Investment, which we're going to denote by I, is the sum of nonresidential and residential investments-- so equipment and factories on one side, and then residential investment is houses, stuff like that, apartment buildings and so on, which is also-- these are goods and services, as well, capital goods and so on. But they're are also goods and services.

Government spending-- that's what we're going to denote by G-- are purchases of goods and services by the federal, state, and local government, excluding-- that's important-- government transfers. What is a government transfer? Many of you may have received that during COVID.

The government sent you a check, for example, OK? Well, that check is not part of government expenditure. That check is like a-- is a negative tax and is going to enter somewhere else. When we mean government expenditure is things the government purchases, services the government acquires and so on, OK?

And then exports, X, which will play no role until seven lectures, eight lectures from now, or actually 10 lectures from now probably, is purchases of US goods and services-- that is, goods produced by US factories-- by foreigners. IM is the other side of the story, inputs. It's the purchase of foreign goods and services by US consumers, US firms, US government. So when you buy something that is produced in Germany, well, that's an import. When the Germans buy something that is produced in the US, that's an export, OK?

And then the last component is something we're not going to pay any attention whatsoever in this course, which is inventory investment. Inventory investment is certainly-- it's almost accidental. There is some planning on it, but there is a lot of-- it's just when there's difference between sales and production. And over the very short run, there's lots of differences. I mean, you're not producing-- unless you're in a bakery, you're not producing and selling immediately. There are certain lags.

That's a small thing. It's volatile, but it's a small thing. So we're going to ignore it for this course. We're going to assume, actually, unless we explicitly say the contrary, and that could show up in a pset. It would never show in a quiz, because it's not that important. We're going to assume that this inventory investment is equal to 0.

Also, for this part of the course, until further notice, we're going to assume that exports and imports are equal to 0 as well. That's not realistic, but it's easier to analyze what we call a closed economy, an economy that is not interacting with the rest of the world. In, again, 10 lectures from now, we're going to open the economy to the rest of the world, and then we're going to have to talk about things like import/exports, exchange rates, things of that kind. But for now, let's keep it simple, OK?

So now, so you get a sense, this is for 2018. But I mean, the totals change, but the composition doesn't change very much, of GDP-- of GDP output, aggregate demand. They're are all the same in equilibrium, but we'll get there. In GDP, you see that consumption accounts for a big chunk, close to 70% of aggregate demand.

That's the reason people worry so much about consumer sentiment and so on. University of Michigan has many claims to fame. But one of them is that they produce its index of consumer sentiment. And everyone is watching that thing. Anybody that worries about macro or finance is watching that thing because it tells you a lot about one of the main drivers of output, equilibrium output.

Then you see investment is substantially smaller, but it's large, in particular, nonresidential investment. Government expenditure is a big component of aggregate demand. And then I'm not going to worry too much about-- for a country like the US, the openness part is relatively small. If you go to a-- a small economy typically will have sort of very large exports relative to GDP and so on. But that's not the case of the US.

And there you see why we're going to set inventory investment to 0. It's a small thing. It moves a lot more than its size, so it can account for fluctuations in sort of the monthly level of GDP. But it's not that important in a slightly longer period of time, OK? So that's more or less the story.

So now this is the model. Please stop me. Is there anything here you don't understand, because everything that we build from here to quiz 1 will build on understanding this, what I'm about to say. Very simple, but if you miss a step here, everything is going to be confusing in the next few lectures. And you're not supposed to understand it in the first run, so it's OK that you ask me. But let's make sure that you understand what is going on here.

OK, so that's aggregate demand. First, definition-- so we're going to denote aggregate demand by this Z, letter Z. And aggregate demand is going to be-- when we say aggregate demand, remember what is the exercise we're trying to do. Ultimately, what we want to determine is the output, the production of the US economy, say.

So when we meet-- when we talk about aggregate demand, we're trying to determine the demand for domestically produced goods, for goods produced in the US. That's what we're trying to pin down. And so that's the reason aggregate demand looks like that, is, well, consumers. Consumers are going to demand goods.

Investment, G, plus exports. If foreign demands US goods, that also increases US production-- minus imports because imports is goods and services that consumers, firms, and governments sort of buy from foreigners, but they're not produced by US companies. So they do not affect the determination of equilibrium output in the US, OK? That's the reason you subtract it.

Now, that distinction is not going to matter until 10 lectures from now, because we're going to set X and IM equal to 0 from the point of view of modeling. So all demand is demand for domestically produced goods in this part of the course, OK? So aggregate demand for US will be this C plus I plus G.

So we need to understand what determines C plus I plus G. And at least initially, we're going to keep it very, very simple. We're not going to think too much about what determines investment. In fact, we're going to assume that it's a constant, is given. So it's determined somewhere else, not in the model I'm about to solve.

Government expenditure, the same-- I'm going to assume it's determined by some other priorities, green agendas and stuff like that. It has very little to do with what we're doing here. And then taxes is something that doesn't show up there, but it will show up very shortly. We're also going to assume that they have been determined somewhere else.

In psets and later on in the course, we're going to endogenize all that, but not now. Let's assume-- I'm trying to come up with the simplest possible model of aggregate demand. And I'm making two of these terms trivial, just constants, OK? And I'm going to focus all my effort here in this component here, which I already told you is the most important component of aggregate demand, which is consumption, OK?

So we're going to assume-- here we're going to have a function. Something has to move for the model to be interesting. So this-- we're going to assume that consumption is an increasing function of disposable income. I'm about to define what disposable income is, but you can imagine what it is. It's something you can use to consume and so on.

So very naturally, if you have a higher disposable income, you're going to consume more. That's what this says, OK? In reality, that consumption function is a lot more complex.

There are lots of things that enter there that we're not modeling for now. But let's start from the basics, OK? So that's going to be the only behavioral assumption we're going to make for a while, that the consumers consume more when they have more disposable income.

And then we're going to get even simpler. I'm going to assume that consumption is a linear function of this disposable income. So there's going to be some constant C0 which captures lots of things that we're not modeling here-- for example, the fact that, for any given level of disposable income, if you-- if you're richer, suppose you have some shares, and now the shares double in value, you probably are going to consume more as well.

There are lots of other things that affect consumption which are different from-- aside from your disposable income. But we're not going to model that. So thus, we're going to call it autonomous, autonomous in the sense that we're not going to determine it here. We're going to take it as a parameter that comes from somewhere else. We may do some experiments moving that variable around, but it's not going to be part of what we model.

C1 is a more interesting parameter for this part of the course. And it's what we call the marginal propensity to consume-- out of disposable income, in this case. That is, C1 tells you the share. If you get an extra dollar of disposable income, how much of that do you spend in consumption?

So say you get an extra dollar of income. If you spend $0.60 in the things you normally consume of that extra dollar, well, then your C1 is 0.6, OK? That's the marginal propensity to consume. And that's what gives us our increasing function. If you get an extra dollar, you're going to do-- you're going to save part, but some of it you're going to spend. That part you're going to spend is the C1 that we have there, OK? Good.

Now let me tell you how we define disposable income. Disposable income is just equal to income, which is equal to production, minus taxes. That's disposable income. It's whatever you earn as a worker or as a capital owner-- well, then the government takes some out of it. That's your disposable income, and that's what you have to decide how much to save and how much to consume.

So that means that our consumption function can be written that way after all these assumptions I've made-- equal to its autonomous component plus C1, the marginal propensity to consume, times income, output, minus taxes. Is it clear? Yes? So all these are assumptions. Now, they're not crazy assumptions in the sense that we know that there is a relationship between these two things.

Again, the consumption function in practice is much richer than that. And there is lots of randomness, random terms around and so on. But that's not what we're about here. But that's-- if you want to start with a consumption function, this is a pretty reasonable one to start with, OK?

OK, so that's going to look in the space of disposable income, or income-- I could have put income there, not disposable income-- so that it looks like that. OK? So C0 is that autonomous consumption. It's something you're going to consume regardless of your level of disposable income. And there is a minimum consumption you have to have. [CHUCKLES] And then the slope of that is the marginal propensity to consume, which is C1, which is a number between 0 and 1.

OK, so let's determine equilibrium output. So we have aggregate demand, which is C plus I plus G, OK? There we are. That was our definition of aggregate demand.

I'm going to stick in now the functional forms. Well, these guys are very boring. They're constants. And I'm plugging in here the consumption function. So what we have here is that aggregate demand is an increasing function of output, or income, OK? It's also a function of taxes, investment, and so on. But it's an increasing function of output.

And this is important because, remember, the goal of this is to find equilibrium output. So here I have, on the right-hand side of my aggregate demand, output. That's good. I have one equation in which output shows up, [CHUCKLES] OK?

Now, I cannot find equilibrium output just from this equation. Why is that? So remember, we're trying to build a model to find equilibrium output. That's our goal. That's what will tell us whether we're in a recession or not-- output is low, recession, output is high, we're in a boom.

Obviously, I cannot solve it from this. I have two unknowns. What are my two unknowns? Two unknowns, one equation. What is my second unknown there?

AUDIENCE: The aggregate demand.

RICARDO J. CABALLERO: Aggregate demand, of course. We have to determine Z and Y. So how are we going to do that? Well, using a second equation, which is the equilibrium condition.

It's not a function. This is a function. This is not a function. This is an equilibrium condition. It says, in equilibrium-- not outside equilibrium, in equilibrium-- output is equal to aggregate demand. OK? That's what this equilibrium condition tells us.

Off equilibrium, this doesn't hold. That's the reason this is not a function. This holds everywhere. It's a function. This is an equilibrium condition. It says, at equilibrium, aggregate demand is equal to output. So now we're done because we have two equations, two unknowns, OK? Good.

And the reason I post on this is that I see that mistake made often, that this is interpreted as a function. It's not. It's an equilibrium condition. At equilibrium, it holds. And that you can see, actually, I'm going to illustrate the same point in the diagram. So this is the-- let me keep going.

So this is clear, no? So this is just a summary of what we had in the previous slides. And this is the new thing here, which is, in equilibrium, output is equal to aggregate demand.

And again, that's what makes this really a short-term model. You see, I'm saying output, in the short term, is whatever demand wants it to be, which is different from the long run that says, no, no, hold on a second. I mean, but how much output you can produce is a function of the capital you have, of the workers you have. Yeah, yeah, that's true in the long run.

But in the short run, you have lots of flexibility because you have lots of unused capacity and so on, OK? So this is pretty-- is a big assumption. And there are schools of thought within macroeconomics that are split by this assumption, whether you believe that, in the short run, output is aggregate demand-determined or not. Ultimately, we tend to believe that in the short run-- the long run, no. But in the short run, that's what it does.

Now, sometimes the long run gets to you very quickly. And at this point, we're in a situation like that. That's the reason we're seeing inflation and so on. But that's something you'll understand later on, OK?

But for now, so this is important. We're saying here, output-- I don't need another equation. I could have done aggregate demand like this and then output a function of capital, labor, lots of things.

I'm not going to even do that. I'm going to say, no, no, output will be whatever demand wants it to be, OK? And that means, in equilibrium, they have to be equal. [CHUCKLES] Good. You had a question.

AUDIENCE: [INAUDIBLE] can you [INAUDIBLE] output and GDP [INAUDIBLE]?

RICARDO J. CABALLERO: No, they are the same for us.

AUDIENCE: They are [INAUDIBLE]?

RICARDO J. CABALLERO: That's our definition. GDP, for us, is output. So when they say aggregate output, I mean GDP. Remember? Real GDP-- we're talking all about real GDP, OK? And it's also equal to income-- not disposable, but it's equal to income.

Remember when we did those little tables where we look [INAUDIBLE], the three different ways of doing it? Well, the first two were output. And the last one was income. And they had to be the same, OK?

So why is it real GDP for us? That's real GDP. What happens, in the table I showed you, I already used the fact that real GDP is equal to aggregate demand. And that's the reason I showed you the different components of Z I showed you that, that, and that, [CHUCKLES] OK? But in equilibrium, they are equal.

There's really a figure that will clarify, I think, a lot of that. But let me keep solving this. So we have that-- so what I'm going to do next is just solve it. So we have this equilibrium condition. I'm going to plug in my aggregate demand function here.

And so I can solve out for equilibrium output. And here we have, for the first time in this course, an equation for equilibrium output. There you are. That's your equilibrium output in this economy. OK?

Now, this guy here is very famous and is very macro It doesn't happen in micro. It happens in macro only, this guy here. Another guy there is called the multiplier. And it's a very important macro concept. It's a huge concept in macro.

Now, why do you think it's called a multiplier? Well, obviously, it multiplies something. But a multiplier sounds like it multiplies-- that makes something bigger. [CHUCKLES]

So what happens if C1 is greater than 0? What happens if C1 is greater than 0. Remember, it's between 0 and 1. But what happens if it's greater than 0? What happens with that number there, 1 over 1 minus C1?

AUDIENCE: Bigger than 1.

RICARDO J. CABALLERO: It's greater than 1. It multiplies. So the reason we call it a multiplier is not nothing deep there. So this thing here is sort of autonomous stuff. It's what the government spends, what firms are spending, capital. This is autonomous consumption.

And this actually is a typo there. There should be a C1 in front of that-- typo. It comes from there, C1 times T. So fix that typo, please. I'm going to upload the slides again with the typo fixed, OK? I'm just-- it comes from here, C1 times T.

OK, so that's what this does. It multiplies. So whatever it is that is happening here, whatever it is that the government is spending or whatever, this term is multiplied. And that's a huge thing.

There was a big debate-- almost always, when you're trying to get out of a recession, and the government starts spending, a big question is, well, how big is the multiplier? If the multiplier is small, you're going to have to spend a lot to get the economy out of the recession. If the multiplier is large, then you're going to have to spend very little, and then the multiplier will take you away from that recession.

So what is it that makes a multiplier large or small? Well, mechanically, when is it that multiplier large?

AUDIENCE: When C1 is closer to 1, so when people are spending more of their income.

RICARDO J. CABALLERO: Exactly, when C1 is large. And that gives you the logic. And that's very important in macro, is why is it a big multiplier? Well, because think what happens in macro. The government spends-- not increases output.

But now output increases income. And if consumers spend a big share of their extra income, an output, and consumption again, then that increases output again, which increases the income again, and you keep going, OK? So that's the sequence.

On the contrary, if consumers are very scared, they don't want to spend any extra dollar they receive, anything of the extra dollar they receive, then you don't get any multiplier, because this initial increase in output that comes from the government expansion, that does lead to increase in income. But if consumers don't spend it, it doesn't recirculate into the economy, and then you don't get a multiplier. So that's the reason we call it the multiplier.

So that diagram is an important diagram. I'm just doing this, actually. In that diagram, I'm plotting the aggregate demand function and then this equilibrium condition, output equal to aggregate demand, in the space of aggregate demand and output, production, and income here. But remember, income is equal to production, OK?

So there's your aggregate demand and, thus, your 45-degree line because this output equal to-- so whatever is in this axis equal to that axis, that's the 45-degree line, OK? So that's your equilibrium conditions. It's, at equilibrium, these guys here, aggregate demand, Z, will have to be equal to Y. Those are-- that's traced there.

This is aggregate demand. Why is this line flatter than that? Why is aggregate demand flatter than--

AUDIENCE: Because people don't spend their entire dollar.

RICARDO J. CABALLERO: Exactly, because C1 is less than 1. So the slope of the aggregate demand in this space is C1, is the marginal propensity to consume. How much more they demand if they get an extra dollar? Well, they don't get-- they don't demand one extra unit. They demand C1 unit, and C1 is less than 1. So that's the reason this.

So if C1 is very small, this line is going to be very flat. If C1 is very large, very high propensity to consume, this is going to be very steep, the red line. The other one doesn't change, the 45-degree line.

And what I said is that, at-- so you see, if I take an off-equilibrium level of output-- say, this-- aggregate demand is different from output. It's only at equilibrium that these two things will hold. This function, I can plot it everywhere. But this one will hold only at equilibrium, OK? That's when these two things are equal.

So what I solve here-- here, I just found this point. So parameters here are C0, C1 times T, and G. They all shifters of this aggregate demand, up and down. And that point here is exactly that. And all those things are parameters in my aggregate demand.

I really want you to internalize this diagram. Any questions about it? Just stare at it a little because it's going to show up repeatedly. And later, it's not going to show up. But whenever you get confused, the way to get yourself out of that confusion is going to be to go back to the diagram. You'll see. I'll remind you when that's likely to happen.

So you better understand this diagram. Play with it. Move-- here, the only thing you can move around is the ZZ, the aggregate demand curve, OK? The other thing is an equilibrium condition. [CHUCKLES] You can't move that 45-degree line. But ZZ, you can move it around.

So let's do a few exercises. One, the most obvious, suppose that C0 increases by $1 billion. So autonomous consumption-- that is, that level of consumption which is independent of income-- goes up by $1 billion.

And that could be we're only in a better mood. Disposable income is whatever it is today. But there is great expectation that the economy will enter a boom next year. And so then you feel richer and so on. And you may decide to consume-- not wait until next year. You may decide to consume more today.

That kind of thought experiment can be captured by a C0 type shift, go up. And that's when I talk about consumer sentiment. Well, consumer sentiment is a lot about C0-- for any given level of income, whether consumers are likely to consume more than they would otherwise or less. And that's what C0 captures.

So let's go-- everything in this model-- there's no dynamics in this simple model. So we immediately-- what we know is, if you just were to solve the equation, and I tell you what happens to-- if output-- what happens to output if C0 goes up by $1 billion, you know that output will rise by how much?

Let's keep it simple. Just staring at that equation, if I tell you autonomous consumption goes up by $1 billion, what happens to equilibrium output? Goes up by more or less than $1 billion? Or exactly $1 billion?

AUDIENCE: [INAUDIBLE]

RICARDO J. CABALLERO: Exactly. And the multiplier is greater than 1. So we know that the output will increase by more than $1 billion, will increase by 1 billion times the multiplier. If C1 is 0.5, then it will increase by $2 billion equilibrium output. Now, I'm going to get you from the $1 billion to the $2 billion in steps using the diagram. That's what I intend to do next. OK?

So this shift here-- so we're starting from this equilibrium output here. This shift here, boom, is increasing C0. That's at $1 billion. So distance A to B is $1 billion. That's because what I did is, for any given level of output. I shift this aggregate demand up by $1 billion. Thus, autonomous consumption, up, OK?

Well, because output is whatever demand wants, that immediately increases output by $1 billion. So the distance between B and C is also $1 billion. Demand increased by $1 billion, boom, output immediately catches up. So output increases by $1 billion.

But if output increases by $1 billion, what has happened to income? It also increased by $1 billion. Income is the same as output. So income has increased by $1 billion.

Well, if income has increased by $1 billion, and C1 is different from 0, that means part of that extra billion is going to be spent in consumption, second round. So say C1 is 0.5, then now you get $500 million more of expenditure. But if it's-- of consumption. And it's $500, that's the CD. That's $500 million.

Obviously, this C1 here is less than 0.5 because otherwise this would be half of that, but it's not. But anyway, you get $500 million more.

But if now there's $500 million more of demand, since output does whatever-- production does whatever demand wants, then you get $500 more of production. And if you have $500 more, million dollars of more production, then you have $500 million more of income. And if you have $500 more of income, and you have C1 is greater than 0-- say, 0.5-- you're going to spend $250 million more.

But $250 million more will generate $250 million of production, which also will generate $250 million more of income, which will generate $125 million more of consumption, and blah, blah, blah, blah, blah. You [INAUDIBLE] OK? So that's-- and that's what is happening here. [WHISTLING] Boom. Yeah?

AUDIENCE: [INAUDIBLE] the movement from C to D [INAUDIBLE]?

RICARDO J. CABALLERO: From C to D. OK, so this is the initial shift in aggregate demand up, $1 billion. That leads to a $1 billion more of production as well, which means $1 billion more of income, OK? But now these consumers not only have this C0-- $1 billion higher in C0, but they also have $1 billion more of income.

And since they have $1 billion more income, and they're going to spend part of it-- C1 times that, and I assume C1 was 0.5-- that's what gives me CD. That's the extra $500 million. And then that thing there is also $500 million. And there was $250 million, $250 million, $125, $125 $62.5. That's the way you get there.

There is an alternative way of finding equilibrium output, which is entirely equivalent. And it's the way it was initially done, by the way. And you'll see later on a very important curve in this course will be the IS curve, which is a curve that describes all the equilibrium in goods markets. We'll get there.

But the reason it's called IS because of this alternative way of deriving the same I have derived, which is through-- you can arrive to the same equilibrium by saying, look, equilibrium output is that output at which investment is equal to savings. That's the reason that curve is going to be called IS, investment equal to savings, S.

So let me very quickly do it for you and then make a point and connect the two things. So private saving is what consumers do and so on, and firms. It's just disposable income minus consumption. That's your saving, OK? So it's equal to Y minus T. That's disposable income minus C.

Government saving is taxes minus government expenditure. So if the government has a deficit, that thing is negative. Governments often have negative saving, OK? If it has a surplus, then taxes are greater than G, then you have a fiscal surplus. Again, rarely happens in the US or in the Americas in general. It happens a lot in Asia, but it doesn't happen very much in this part of the world.

But there we are. So in equilibrium, investment, I, has to be equal to saving. So that's what you are going to use the saving for, to invest, OK? So investment is equal to the sum of savings. I can replace all that in here, and you see that I get exactly the same equilibrium condition I had before-- output equal to aggregate demand.

So this is an entirely equivalent way of deriving this. And I just want to show you this because it's the way it was originally done. And you'll understand better the terminology we use later on if you see that this is an equivalent way.

This is also a nice way of illustrating something, why macro can be counterintuitive sometimes. Microeconomics is very intuitive. I mean, things make sense. It's like physics. It makes sense. Macro can be confusing.

For example, there is a well-known paradox of savings, in the short run, not in the long run. In the short run, you have the paradox of saving. So we all think that you save more is a good thing. Our parents teach us that is a good thing to save more and so on. And in general, that is true. You'll do better in life if you save a little more and so on.

But it's not true for the macro in the short run. It's not good for macroeconomics in the short run, unless you are in an overheated economy. Now it could help. But otherwise, it's not very good for equilibrium output. And let me show you that very quickly with the expression I just showed you.

Remember I said, equilibrium output is pinned down by investment equal to saving. And saving-- the private saving here is an increasing function of output, OK? It's equal to, actually, 1 minus-- the function has a slope of 1 minus C1. C1 is the share of income that you spend in consumption. Therefore, 1 minus C1 is the share of your income that you spend in saving, OK? So this function is increasing with a slope of 1 minus C1.

So suppose I tell you now that all we decided to learn the lessons of our parents and say, OK, we should all save more. So that means, for any given level of income, now we all decide to save more. That means the S function shifts up. For any given level of income, we save more.

But we have a problem there because now we have more savings than investment. So how do we restore equilibrium? That's not in equilibrium. How do we restore equilibrium?

So now we all decided to be more prudent and save a little more. At the level of the economy as a whole, now we have more saving than investment. That can't happen. It's not an equilibrium. What restores equilibrium?

Well, in this very simple model, our investment is fixed. So nothing can adjust on the investment side because it's fixed. Later on, it's going to move, but now it's fixed. Nothing can adjust in the public savings part because it can't move. We assume that it's exogenous.

So something has to happen endogenously here that the reverses the increase in savings, the only thing that can happen. And the only thing can happen endogenously here is a decline in output-- output declines, saving declines. So here you end up in a situation in which we all decided to be better people, save a little more. And we ended up sinking the economy in a recession-- output decline.

That's the reason it's called the paradox of saving. That's not going to happen to you individually, but to an economy as a whole, that's the reason I said it's counterintuitive. It can happen.

So look, if you don't like this way of-- and it's not the main way we're going to use. If you don't like this way of finding equilibrium output, just ignore it. I just wanted you to know it. Go back to-- the thing you really need to understand is not this. It's this, that, that. That you need to understand.

So let me illustrate the paradox of saving in the model we're using, in the one I want you to really remember. Well, the paradox of saving I can capture by a decline in C0. For any given level of income, now we decide to consume less. If we consume less for any given level of income, that means we're saving more.

So I can capture in this diagram the fact that we have all become sort of more prudent by a decline in aggregate demand. But if aggregate demand declines-- so suppose we start at this equilibrium level of output, and then, all of a sudden, we say, OK, enough is enough. We need to start saving more.

Then what happens? Well, aggregate demand declines. I mean, for any given level of income, if you're going to save more, that means you're going to consume less. So aggregate demand declines. But what happens when aggregate demand declines?

AUDIENCE: Output declines.

RICARDO J. CABALLERO: Output declines. What happens when output declines?

AUDIENCE: [INAUDIBLE]

RICARDO J. CABALLERO: Income declines. What happens when income declines? Well, part of that income you consume. So you're going to consume less. C1 times that. So then-- and then you get the multiplier working against you. So not only-- if now we all decide to save more, not only output falls by the same amount that we increase savings, but actually declines by more than that because you get the multiplier working against you, OK?

That's the reason a big role of policymakers, really, in recession is to try to maintain the calm because you can get into these kinds of things. It's everybody gets scared, and we all get scared. So the economy can implode just out of bad sentiment and so on.

Now we're on the opposite side of the cycle. We would want output to decline a little because we are having other problems, inflation and so on-- again, something we'll discuss later. So now you may want to scare consumers a little.

And in fact, the governance of the Federal Reserve-- and the same is happening in other places in the world-- are doing just that. I mean, when they go out there, says the economy is too hot, we're going to have to mess up this economy a little. [CHUCKLES] They're telling us that.

And the first one is listen to these things is the financial markets. So every time they come out and make a speech of that kind, equity markets decline. Well, equity markets capture before the mood that consumers will have in the future, captures it early. But that's the message, OK? So they're trying-- at this moment, really, policymakers-- at least the central banks-- are trying to do just that, depress a little bit consumers so we can cool off the economy a bit. OK.

Any questions? Again, very important lecture because we're going to build on this and, later on, this is going to be always in the background. And of this-- until we actually go to the third part of the course, the key model will be this. This will be in the background.

More things will be happening on top. But whenever I ask you a question-- for example, later-- ah, one example-- what else would produce a situation like this? What else-- what could happen? What kind of policy would generate that movement?

Well, at this point, we haven't introduced monetary policy. So you cannot talk about monetary policy. But we do have other kinds of policy we could talk about. Remember? Here, fiscal policy. OK? Fiscal policy. G and T, those are fiscal parameters.

When G goes down or T goes up, we call that contractionary fiscal policy. Why contractionary? Because it contracts aggregate demand. If G goes down, clearly aggregate demand goes down immediately. If T goes up, well, disposable income for any given level of income goes down, and therefore, consumption goes down.

So we call an increase-- a decline in G or an increase in T a contractionary fiscal policy. The opposite-- if G goes up, and T goes down, we call that an expansionary fiscal policy. So I take you back to this diagram here. And I ask you the question again, what kind of fiscal policy will generate this type of-- this picture? Contractionary or expansionary?

AUDIENCE: Contractionary

RICARDO J. CABALLERO: Contractionary. I mean, a good mnemonic, the output decline. So contractionary-- so that is a decline-- a reduction in G, in going expenditure. Or an increase in taxes will shift that curve down. And then the multiplier will make it even more contractionary than the initial fiscal impulse. OK? Very good, see you on Wednesday.