[SQUEAKING]

[RUSTLING]

[CLICKING]

RICARDO CABALLERO: So today we're going to look at-- we're going to start looking into the labor market. Now, the labor market is very interesting for a wide variety of reasons that we will not discuss in this course, because it's not about labor economics, it's about macroeconomics.

But there are at least two reasons why labor markets are very important in macro. One is because things like unemployment rate is a very important indicator of the macroeconomic health of a country or an economy. And the second one, which is quite relevant these days, is that the inflation rate is-- one of the main drivers of the inflation rate is what is going on in the labor market.

And we will try to understand this mechanism in the next couple of lectures. But you have there is the inflation rate in the US. And I'm showing you this picture several times after going through a long period in which the inflation rate hovered around 2% with cycles. We are experiencing an episode of very high inflation. Things are coming down. But they are still at extremely high levels, 6% or so. And actually, very recently these numbers have picked up again a little.

And so that's very high inflation rate-- way too high for an economy like the US to feel comfortable with. And whenever some member of the FOMC comes out and explains why interest rates are so high at this moment and explains why they are likely to remain high for quite a while, they say, well, look, inflation is uncomfortably at high levels and labor market conditions are very tight.

And that suggests that the inflation problem is not likely to go away in the near future. So that's something we need to understand in macro. Why is it that the labor market being tight says anything about the inflation rate, for example? And that's the kind of things that we're going to discuss in particular on the Monday lecture.

Now today we're going to start with more basics of the labor market and at the same time, we're going to begin a transition in the course in which we have been focusing on things that are in the very short run into things that take more time. Because many of the things that we're going to discuss today are things that you're not likely to see in every single quarter. But there are things that you're likely to see over averages over several quarters, several months. That's what we're going to look at today.

So remember-- let me just recap a little bit what we have been doing up to now. We have been looking at this IS-LM model, which is a great model. It is a very good model to build on. But it's a very nice model, starting point, to understand what happens during a recession and what are the likely impact of the different macroeconomic policies, monetary policy, fiscal policy, and so on.

It is not such a great model once the aggregate supply side of the economy, something we have completely ignored, starts becoming binding. Remember that to now in the IS-LM model we had basically, as a model, we had two assumptions, related assumptions. One, prices were fully sticky. They didn't move at all.

Second, that output was aggregate demand determined. So whatever aggregate demand wanted, producers found a way to produce it at some given price. That combination is unlikely to happen when, for example, when firms are finding trouble finding new workers. Because there may be more demand, more demand for its goods. But the firm may find it hard to expand production.

And it is also highly likely that in a situation like that, firms are going to want to keep prices constant. At some point they will, look, you have lots of meals at my restaurant. I cannot find people to work at my restaurant. I'll hide the prices so at least fewer tables and I can manage one way or the other.

So we're going to start building a model that takes those things into consideration, what is the impact of a tight supply side of the economy on prices? And how that starts affecting, feeds back into equilibrium output eventually. And so the main thing I would say we're going to do, really, relative to the model in the next two, three lectures is endogenize the inflation rate. We have kept prices fixed. But now we're on endogenize.

And the story of that endogenization of inflation starts from the labor market. And that's the reason why we're going to start looking at the labor market today. Now, let me remind you a few things that I think we discussed in the first lecture or so or maybe second, I don't remember. Let me give you a picture of the labor market and some variables, important statistics of the labor market, that matter for understanding inflation and so on.

So this is a picture that's the one that you have in the book of the labor market. It's a picture of the labor market at some point in 2018. I don't know when. This is a picture at one point.

And that says that at that time the US had about 330 million people, that the noninstitutional civilian population. That is, those people that in principle could work, were about 260 million. That excludes people under 16 years old, people that are incarcerated, people that are in the armed forces. Those are excluded from-- that's the difference. That's the reason you have such a big gap between these two numbers.

Now, out of this people that potentially could work, some of them want to work. And that's what we call the civilian labor force. And then some of them are out of the labor force-- again, at one point in time. It doesn't mean that these people are permanently out of the labor force. They may be temporarily out of the labor force, and so on.

But we started with about 330 million. And by the time that we look at the people that really want to work at that point when the picture was taken, was about half of that, 162 million people. Now, these 162 million people, the great majority of them are typically employed. They have a job.

And then there is a group of people that would want to have a job-- that's the reason they are part of the civilian labor force-- but do not have one. And that's about 6 million in that picture there. So when you hear the unemployment or the unemployment rate, you're really talking about these people here. And when you hear about the unemployment rate is these people not divided over total population, but is these people divided by the civilian labor force. OK, so that's a picture.

The most recent numbers we have about that kind of statistics is here you have them. I mean, the unemployment rate in the US today is about 3.4%. That's very low. I'll show you historical data in a minute and a half shown you historical data in the recent past. But this number is very, very low. The change in the unemployment level-- this is for January-- was a reduction. This is not rate. This is number of people that were-- it's not number of people that were unemployed that are no longer so. You look at the total stock of unemployed in December and then you look at the total stock of unemployed in January 2023, the difference between these two is 28,000 workers.

So 28,000 less workers are in the unemployment pool. Now notice that how this number is made. It's not that you 25,000, 28,000 people just gain a job. That's not what happened. What happens is first employment, 895,000, 894,000 people got a job-- much bigger number.

But also, the civilian labor force went up by 866,000 people. So if you go back to this picture, what you have in January, or the numbers reported in January-- I do not know which month they correspond to exactly-- is that yes, this decline. But that decline was made of a big increase in employment together with a big increase in the civilian labor force. So that must have been mostly movement out of the labor force and probably had something to do-- well, I'm not going to get into that here.

But all these numbers are seasonally adjusted. So they are corrected relative to what happens normally in January and so on. And COVID and weather can derail a lot what happens in January and February. Numbers tend to be very noisy. Since COVID they have been very noisy because the seasonal adjustments are different. And also, weather matters a lot in January and February, and so on. So you can get pretty large fluctuations which are really not that interesting to macroeconomists. But anyways, those are the numbers.

You look at the civilian labor force participation. Then it was about 62%, 62.5%. And the employment population ratio is of the order of 60%. So the employment population ratio is just this divided by total population. And those are the averages.

The number of unemployed in 2022, about 6 million people that's unemployed. So there you have the unemployment rate. And it moves, as you would expect it. It typically goes up in recessions. The last sort of large recession we had big swings. One thing that was interesting, and we couldn't quite understand what was going on, is that we noticed right before COVID the unemployment rate had already declined to very low levels. And so people were wondering whether something was going to talk about later in this lecture, whether the natural rate of unemployment had changed for some reason. We'll come back to that.

Then we got COVID, obviously a very recessionary shock initially, massive unemployment and so on. But then it came back very quickly. And today we have record low levels of unemployment. We haven't seen numbers like this since the '60s really-- very low levels of unemployment.

So one of the things that when you hear the FOMC members talking about the labor markets being very tight, well, one of the things they're looking at is this one. There are other statistics that I'll show you. But this is one of them. Unemployment rate is really, really low.

Sometimes, again, especially post-COVID because of movements in and out of the labor force, the unemployment rate is not such a great statistic, not as reliable because many people left the labor force. So people look a lot at the employment rate. This is not the employment population ratio. Its employment rate-- so employed over the non civilian population.

And that number, you can see, we have discussed this before, was trending up here because of the increase in the labor participation of women, then it came down, had a lot to do with the students and things like that, systematically. But then it was climbing up enormously. It collapsed during COVID. That's mostly unemployment and people out of the labor force.

And then recovery. But the recovery has not picked up to back to the trend. So we are back to more or less the levels we had before COVID, but we're certainly off the trend. And one of the reasons the labor markets are very tight is that we haven't recovered the employment rate that we used to have. This has to do with migration flows, with a variety of things. But that's the issue.

OK, so that's sort of-- those are very static pictures of the labor market. What is the stock of unemployment at one point? What is the unemployment rate, and so on and so forth. But the truth is that labor markets are very dynamic, especially in an economy like the US.

The flows are very large. So what I have there-- and I don't know for which state this is in the book-- but the pictures look more or less the same for the point I want to make. This is monthly labor flows. And this has happened in some months-- I don't care, 2018, at some point.

Look at what happened there. You have this. We're talking about the stocks recently. So employment in that month was of the order of 132 million people. Out of the labor force, about 79 million people. Unemployed, about 8.6 million. Those are the stocks. Those were the type of numbers I was showing you before.

But look at these arrows. These are flows. So in every single month, you see in the US about 3 million people that move from one job to another. So employment to employment. You see about 1.8 million that moved from employment to unemployment and about 2 million people that move from unemployment to employment, large flows.

Not only so, not everything goes to unemployment to employment. There are people are also moving out of the labor force and into the labor force into an employment, into employment. Here in this particular case, out the flow, out of the labor force into employment is 3.4 million. Flows from employment, without going through unemployment without the labor force, 3.7 million.

During COVID, this must have been a very thick arrow, lots of people move out from employment to out of the labor force. And one of the problems the economy has had in the recovery on the labor market side is that this arrow hasn't been as strong as we would want it. This arrow or this arrow for that matter of fact-- people coming out of the labor force into unemployment. That's also a big flow.

Sometimes people are not working. And then they decide they run out of unemployment insurance or something like that. And so they decide to start looking. And they move into unemployment here, or they run out of savings and they have to come back. And they may not find a job initially. They have to go through unemployment.

So point is that these flows are very large. And these flows matter a lot for the kind of things we want to talk about in this course. Look at what we have here. The red line is the unemployment rate and it's measured on the left axis.

And what we have here in the blue line is measured in an inverse scale. Look at this-- this goes up as you go down-- is the percentage of unemployed workers becoming employed. So it's the job finding rate from unemployment. So you have unemployed people. And they will be finding jobs. They are looking for jobs. And they will be finding jobs.

This number here, this blue line here, shows you the likelihood that they'll find a job in inverted scale. OK, so what correlation do you notice there? I mean, you know, it's very tight. Yeah.

AUDIENCE: There's a percent of people that get a job each month is smaller, there's more people without a job.

RICARDO CABALLERO: Exactly. That means when the unemployment rate is high, it is harder for unemployed workers to find a job. Or another way of a direct implication of that is the typical unemployed worker will spend more time in unemployment, because they're going to be looking for jobs and it's harder to get a job. So you're going to be looking for a job for a longer period of time.

Why are we talking about these things? Well, because of these type of reasons. Well, this means that when unemployment is high, workers are worse off in at least two ways. And there are two ways that are going to be important for what I'll say next.

One is that the employed workers face a higher probability of losing job. That's what happens when unemployment-- the reason unemployment gets to be high is because firms are firing workers and so on and so forth. And so when unemployment is high, the first thing the workers know is that it's very likely that they'll lose their job, more likely that they'll lose their job.

But the second channel, which is what this picture highlights here, is that if you fall unemployment, it's going to be a lot harder to get out of unemployment. So when unemployment is high, it's scary for workers for two reasons. One, you're more likely to lose a job because you're capturing recessionary conditions and so on in the economy.

But second, if you end up in unemployment, it's going to be hard to get out of it And later on, this unemployment rate is going to show up in wage bargaining. And the main reason is going to show up is of this kind. And also think about the other side. When there's bargaining, there's two in a bargaining. There's going to be firm and workers.

From the firm point of view if there's a lot of unemployment, do you think it's hard or easy to find a worker, to replace a worker that decides to leave for whatever reason? Yes. We have lots of people to choose from. So it becomes easy. So unemployment is high, workers are more scared. If they get out, they're scared of losing the job. If they get out, it's hard to get a job.

And on the other side, the firms, for the firms, it's not that scary to lose a worker because it's fairly easy to replace that worker. Today, firms are very worried about losing their workers in some sectors. In some sectors are getting rid of workers. But if you run a restaurant, you're very scared of losing your workers because it's going to be very difficult to find a replacement for that worker.

Surprise, surprise, wages in that industry are going up a lot. We're going to get there. So that's what comes next-- wage determination. Look at what I'm trying to build here. I'm starting from telling you stories about the labor market, what things are important for workers and so on.

Now I'm going to get into wage determination. And obviously the variables I talked about are going to be important in this way determination. But my ultimate goal is to talk about inflation. So the next step-- so I'm going to talk about wage determination here. And then we want to talk about prices. And there we're going to be one step closer to talking about inflation

OK, so let's go through the intermediate step, wage determination. And so just to give you a little background, sometimes wages are set by collective bargaining, unions, in particular. Now, in the US unions are not a big thing. They were a much bigger thing many years back than they are today. In other economies they are a big thing-- Japan and Europe.

And the unions can happen at different levels of aggregation, at the level of the firm, at the level of the sector, and you name it. In general, regardless of the level of unionization you have in a country or in a sector, the higher the skill needed to do a job, the more likely it is that bargaining takes place between an individual, between an employer, and an individual, rather than a union, because it's sort of much more idiosyncratic and customized and so on.

But either way, regardless of whether wages are set at a collective level or at an individual level, the main macroeconomic drivers of wages are similar across both of them. Of course, the particulars are going to be different. Even the dynamics can be different and so on.

But the big drivers, the big macro drivers, are similar, regardless of the bargaining mode you have at the level which happens, and so on. And those are the things we're going to highlight here. So a fact of life is that workers' wages typically exceed the reservation wage. Now, what does it mean the reservation wage? The reservation wage is a wage that would leave you indifferent between employed or unemployed. It doesn't mean, it's a nice wage or anything. And certainly it doesn't mean that you wouldn't prefer to have a higher wage.

But it tells you that, look, at that wage you'd rather be employed than unemployed. And there is a way, long list of reasons why that ends up being the equilibrium type wage. And I'm not going to discuss them here. But take it as a fact for now. So workers preferred to be employed. They may take the risk of becoming unemployed. But they typically prefer to be employed.

And now wages-- and this is where it becomes important, interesting for us in macro-- is the wages that are finally set depend on labor market conditions. So very clearly, the lowest unemployment rate, the higher the wages will tend to be. And you're seeing it now. The unemployment rate is very low. Wages are rising a lot.

And workers' bargaining power depends, again, there's a huge literature on these things and just compressing it into the bare minimum. And the bargaining power of our workers are things that we already discuss. Well, it depends on how costly for the firm to find the workers. So obviously, if unemployment is very high, it's very easy for firms to find a worker.

That's not good for the bargaining of a worker. If you want to bargain with your employer and there lots of people like you out there, you're not going to have a lot of bargaining power. So it's unlikely that you're going to come up with a very high wage. And it's also, the other side of it is how hard is for workers to find another job if they were to leave the firms. I mean, if you know that there are lots of jobs like the one you currently have out there, which are not occupied-- so there's empty, vacant, jobs-- then you probably are going to have a much stronger hand with your employer because you can say, OK, if you don't pay me what I want, I move to the next door.

And in terms of the macroeconomic variables we care about, a situation like that is very likely to happen when unemployment is very low because that means that other jobs are unlikely to be filled because there are lots of people looking for things, but it's difficult for the firms to find the workers. And therefore, you're going to be a lot more attractive to that labor market.

So in summary, at the aggregate level, we can write a wage setting equation of this form. So the wage-- and this is a nominal wage-- can be written as an increasing function of the expected price, meaning wages are not set, in most professions, they are not set second by second. You bargain for a wage and so on. And that thing sticks for a year or so at least.

Well, obviously if you expect, if inflation is zero, you're going to demand a wage that is more or less what you need today. If inflation is 10%, you say, well, I'm going to have to demand a higher wage because I have to live with this wage for a year and prices are going to be rising when I have this wage.

So if they expect lots of inflation, if I expect prices to be high in the future, then I'm going to ask for a higher nominal wage today because I'm going to have to live with that wage on average for the next year or so. So that's the first thing, and it's going to play an important role, is that wages are an increasing function on the price level workers expect. They expect a higher price level in the future or during the life of the wage contract, then they obviously are going to demand a higher wage, other things equal.

What are other things? Well, the arguments of this function here-- unemployment. For any given expected price, if the unemployment rate is high, workers are going to demand a lower wage. Why is that?

AUDIENCE: Because it's going to be harder for them to find a job so they have less bargaining power.

RICARDO CABALLERO: And they have less bargaining power, exactly. And so they're going to demand a lower wage. This variable, z, here is a catch all variable for strength, workers' strength in the bargaining position situation, something like that. So for example, this is things like employment protection laws, firing costs. If it's difficult to fire someone, the z will tend to be high. So this only tells you that given the level of unemployment, if it is very hard to fire someone, workers are going to be very likely to demand a higher wage. It's hard for you to fire me. I'm going to bargain hard for my wage.

And these type of institutional factors play a huge role in Europe, much more than in the US. Good. But as a matter of definition, we're going to say an increase in z, z is something that increases the bargaining power of workers. And therefore, for any given level of unemployment and expected prices, they're going to lead to a higher wage demand. This is the workers' demand in a wage.

We have to figure out what happens in equilibrium. But this is what the workers are demanding. Is it clear what we have here? So let's now move to the other side.

So that's one side of the scissor. We have the workers. And they given certain macroeconomic conditions summarized by the unemployment rate and expected prices. They demand certain wages. Now, we can find the equilibrium wage until we don't see the other side, what firms are willing to pay and so on. So we need to explore this other side.

And the starting point of that other side is the production function, meaning firms are going to end up setting prices for goods. But producing those goods will take factors of production. They're going to have to use something to produce that. And the cost of that something will determine, importantly, what is the price they end up charging. I'm going to simplify things a lot here. I'm going to assume the production function is first linear and linear only on labels, so no other factors of production.

Meaning this says that to produce one unit of the aggregate good, you need-- well, this says that if you add an extra worker to the big production function of the economy, then you're going to get A more units of output. That's what this says.

So Y is output, the output we've been talking about, measuring the way we have been talking about, and so on. N is employment. And A is labor productivity. That is the output per worker. I want to make things very simple. We're going to talk a lot about in the next part of the course and the part of growth about this A, what moves this A over time, what it does, and so on.

But I'm going to simplify things a lot here for now. And I'm going to set A equal to 1. So it doesn't get any simpler than this as a production function. This production function says you want to produce one more good, you need one more worker. This is what this says. If you have 10 workers, you produce 10 units of good. If you have 11 workers, you produce 11 units of goods. To produce one more unit of good, you need one worker more.

Now, why do you think I'm simplifying it so much and I'm even repeating this idea that one more worker one more unit of good? That tells you that how much does it cost to the firm, to the firm that has this production function, to produce one extra unit of workers, of one extra unit of goods. Well, you have to ask the question, well, what will the firm have to do?

Well, the first-- so suppose a firm wants to produce one more unit of goods. What is it that it needs to do?

AUDIENCE: Hire another worker.

RICARDO CABALLERO: It needs to hire another worker. How much will that cost?

AUDIENCE: The wage.

RICARDO CABALLERO: The wage. Exactly. So now we're beginning to [INAUDIBLE]. So this is the wage, in this case is the cost per unit of production for this guy. So the marginal cost of production for this firm is the wage. All the rest, intermediate inputs, is all summarized. This value added is built on something else.

So this production function, as simple as it is, says exactly that. The marginal cost of production is equal to the wage. So now I'm going to come up with a pricing model, a price setting rules. Firms that understand how much more it costs to produce an extra unit of good now have to decide the price they want to charge for that extra unit of the good.

There is a lot that comes into that decision. But we're going to summarize it with a markup, very simple. I'm going to say, look, the firm will do the following. We'll say, it costs me one worker to produce one unit of extra of good. A worker costs me W. So the price I want to charge is 1 plus is M. M is a positive number times W.

So M is a number like 0.2. So you pay 100 in the wage. Then you're going to charge-- and suppose the wage is 100. If the markup is 20%, you're going to set a price of $120. That's the price setting rule that we're going to adopt. And again, it's not that crazy. Simple, but not that crazy.

So thus, we call this the price setting equation. The firm takes the wage because that's the marginal cost of production and then adds a markup. And that's the final price. Now, we can rewrite this price setting equation as a wage equation in the following sense. It's still a price setting equation.

But all that I've done here is I divided by P, by P and 1 plus M. And I get that the wage, the real wage the firm is willing to pay, is equal to 1 over 1 plus the market. That's another way of saying it. It's the same. I took this price setting equation. And I just rewrote it. I rewrote it this way because then when I look at the wage setting equation, I also wrote it that way, W over something.

I want to write the price setting equation in the same sort of units as my wage setting equation so then I can use one diagram, put them together easily, and find an equilibrium of something. So what you see here is, for example is that the higher is the markup, the lower is the real wage the firm is willing to offer. You see that?

And this is an equilibrium at the level of the economists, not you individually. But on average, that's what ends up happening. Firms, on average, end up charging a higher markup. It has to be the case that in equilibrium the real wage offer by the firms is lower. That's what this is.

So if we're in a situation where the markup was 0 and now all of a sudden because of imperfect competition or perhaps some price of a key input went up and it's not well measured in value added or whatever, if the market goes to 1, then the real wage in equilibrium will fall to half what it used to be. That's what the firms will offer.

Well, that's an equilibrium or not, we shall see. Or how do we get that to be an equilibrium? We shall see. But that's what the firms will offer. That's what the price setting equation says.

In fact, you already know from this equation that that's what the real wage will be because there is no variable here that can adjust to that. What happens is something else will have to give in the economy. So this ends up being the equilibrium wage. But you'll understand that a little later, or you'll understand it better a little later.

So now, we're almost ready to come up with-- to discuss a very important concept in macroeconomics. And that's the concept of the natural rate of unemployment. Now, the first warning is that there is nothing natural about the natural rate of unemployment. It's not something that God gave us or anything like that.

I'll say for us, and what typically means the natural rate of unemployment, simply means what I wrote there, which is the unemployment that takes place when the expected price is equal to actual prices. That's what we'll define for this class, for this course, we'll define the natural rate of unemployment. The natural rate of unemployment is when the expected price is equal to P. That's what we mean.

If we ask you any question about the natural rate employment, we don't mean that that's what is good, that that's what is bad, that that's what God decided or someone else decided. This is all that it means, is that in any equation where you have P, you can stick in P and then solve for equilibrium. And the unemployment rate that comes from that is what we call the natural rate of unemployment.

Because of this, you can also think of that unemployment rate as a good proxy for what is likely to be the average rate of unemployment of an economy over a longer period of time. Because people are unlikely to be fooled all the time in the same direction. So sometimes they're going to expect a higher price [INAUDIBLE], sometimes it's lower, and so on.

On average, unless there is something very weird going on, they're going to get right, because you know more or less what the level of inflation of the economy is. Sometimes you miss up. Sometimes you miss down. But on average, you're going to be right if you take an average over a long period of time. So for that reason, you can also interpret this natural rate of unemployment as the unemployment rate of the medium run, if you will-- so when you have collected enough data and positive errors are balanced with negative errors, and so on.

But that's all that we mean by the natural rate of unemployment. Now, notice that with this assumption, that Pe is equal to P. I can go back to my wage setting equation, which was W over Pe equal to F that. I don't remember what I had divided by P. But I had P there.

And when I divide by P both sides, and then I'm going to set Pe equal to P. And now I have that my wage setting equation can be written this way. And notice that the unemployment rate I put here is N. It's a natural rate of unemployment. Because once I have a model in which I assume that Pe is equal to P, the unemployment rate that comes out of that is a natural rate of unemployment.

That's all that it just means. It says OK, you allow me to replace Pe by P, well, then I can call my unemployment rate here the natural rate of unemployment. And it has lots of names-- natural rate, structural rate of unemployment, and so on.

Now what this tells you-- I mean, you can see the slope of this function. If the natural rate of unemployment is higher in this economy, what is the real wage that comes from the wage setting equation? Lower. It's a downward sloping curve in the space of wages to real wages to unemployment. So the natural rate of unemployment is a downward sloping curve for the reasons we discussed before-- bargaining power and so on.

OK, so I can put together-- remember, the price setting equation led me to also an equation the real wage, which was not a function of anything. It was only a function of parameters. So that's a horizontal curve in the space of real wages and unemployment, natural rate of unemployment. Here we have a downward sloping curve. And the intersection of these two curves is the natural rate of unemployment.

So this was the price setting relation. Remember, it's 1 over 1 plus M. This is the wage setting equation with the assumption that Pe is equal to P. And thus, the natural rate of unemployment. And here you can understand what I said before is that you see, in this economy, the real wage, because this price setting equation is flat in this simple economy, the real wage is pinned down by the firm, by the firms collectively-- and not collectively in an oligopsonistic way. It's what happens in equilibrium.

But the equilibrium unemployment, natural rate of unemployment, is intersection of the real wage set by the firms and the wage setting relationship. So what happens to a point, say to the right? What happens in this point here? What is the situation we have?

Well, at that high level of unemployment, workers are willing to work for much lower real wages than the firms are offering. This is what workers, at this level of unemployment, very high level of unemployment, workers would be fine with this. Firms are paying that. So unemployment is very likely to be falling because workers are not demanding a lot and firms are going to hire all these workers.

The opposite here. If here, workers are demanding a wage that is much higher than firms are willing to pay, that's likely to lead to more unemployment because firms are going to be very reluctant to hire these very expensive workers. So that's going to be unemployment in this direction. Good.

So that's the natural rate of unemployment. Again, nothing natural about it is the equilibrium when you assume the expected price is equal to price. So there are some important parameters in this diagram here. One is this M, the market. That's a parameter, very important markup here. See, if the markup changes, the natural rate of unemployment will change.

There's another set of parameter here, which is z. We took as given the institutions that protect the bargaining power of workers institutions, supporting institutions, the z. That's a parameter here. If that changes, the natural rate of unemployment will change, which is, again, something that confirms that there is nothing natural about the natural rate of unemployment.

So let me just do it in equations very quickly and then I'll do a couple of important shifts. So in terms of equation, all that I did is says, look, the wage setting equation, the price setting equation gives us that. The wage setting equation gives us that. Therefore, that equal to that, that's a point we found. That's the natural rate of unemployment

So from here, that's when the two are equal. This was the flat curve. This was the downward sloping curve. Well, these two are equal when these two things are equal. And that's what you get there. So from there you solve the natural rate of unemployment. What do you think happens to the natural rate of unemployment is z goes up.

Let's just be very mechanic at this point, just math. If z goes up, watch what happens to F? Goes up if z was positive. Well, the right hand side hasn't gone up. So this went up. Something has to give, so F comes back down.

And the only thing that can give, the only thing that's endogenous in that picture there is a natural rate of unemployment. So if z goes up, F goes up. Well, I need to bring F back down because the right hand side hasn't given an inch. So what do I have to do to a natural rate of unemployment for F to come back down? Rise-- because that's what will weaken bargaining power.

Workers' bargaining power got stronger because increasing z. Well, I have to weaken it some-- I don't have to. Equilibrium will weaken it somehow so that we end up in the same situation, with the same real wage that we had before, which was equal to 1 over 1 plus m.

What happens if m goes up? Well, if m goes up, markups go up, that means firms real wage-- the real way to firms offers drops. So if this right hand side drops, then I need the left hand side to drop, as well. And the only thing that is endogenous here is the natural rate of unemployment.

So I know that I need to drop F, what do I need to do to? So I need to bring F down. And the only tool you have is not a tool, but in equilibrium anything that will can change here is uN. It will increase uN because that will reduce bargaining power of workers and that will reduce the real wage demand. And therefore, you restore equilibrium that way.

So this environment is a very nasty environment for workers in a sense because it's always the escape value is the natural rate of unemployment. So here you have what I just said in pictures. So that's example of z going up, bargaining power of workers going up. So suppose you start at an equilibrium like this.

And now z goes up. Well, that means that workers, for any given level of unemployment, natural rate of unemployment, want a higher wage because they have more bargaining power. Well, that higher wage is inconsistent with the wage that firms want to pay. What restores equilibrium is unemployment, the natural rate of unemployment goes up enough so that the wage demand sort comes down to the same original level because this price setting equation is completely flat.

So there you have a situation where bargaining power of workers went up and all that end up happening is that, in the medium run, at least, that the natural rate of unemployment went up. That's very much the story of Europe, by the way, in the '80s-- France in particular. France had major labor reforms, z boosting, if you will, in the 1980. Initially it was a great deal for workers. Real wages went up and so on. It was wonderful.

But eventually with the passage of time, they ended up just with a much higher real-- not a much higher real wage, but a much higher real unemployment rate. That went from single digit, low single digits, to 15% unemployment rates and things like that. And since then, they have been sort of reforming the labor market to fix some of that.

But that was very much what happened in continental Europe in the '80s. This is the case of a markup increase, the other one I described. So if markups go up, then that means firms in equilibrium are not willing to pay real wages. They want to pay a lower real wage. Well, at this level of unemployment, workers are not going to take it. The only thing that will restore equilibrium is that the natural rate of unemployment goes up that weakens the hand of workers. And you end up with this.

And again, there is nothing natural about this. I'm not saying this is good or bad. I have no idea why the markets went up. It is just imperfect competition, going up, that's clearly not a good thing. But it may have been something else-- the price of oil went up a lot, I don't know. It was a war somewhere and then productivity came down, something of that kind. So I don't know what it did. But the only thing I'm describing here is the mechanics.

Good. So the quiz is up to here. So the quiz ends here. In the next lecture, we're going to start the Phillips curve, which is now using this model, but looking at deviations situations where the price is not equal to expected price, or the expected price is not equal to the actual price. And that's going to lead to interesting situations.

And then we're going to be talking about inflation. Here, this is not a model to talk about inflation. I'm talking about what happens in the medium run. I haven't told you whether the adjustment happens through the nominal wage, through the prices, or what. I mean, there are many ways of reaching the same real wage. You could have it-- you could lower real wages by increasing wages by 50% and prices by 60, say. Or you could do it by lowering nominal wages by 10 and not moving prices.

So there are many ways of doing it. The Phillips curve is going to allow us to get into that part. But it's not going to be part of your quiz. The quiz, that's going to be part of the second quiz. So in the next lecture, I'm going to talk about the Phillips curve and then on Wednesday a review. And then you have your quiz.