Title

The context for this unit

Markets differ in a number of ways and we should craft our analysis appropriately— we should not treat the labor market like the goods market. In the labor market that we are now considering, incomplete contracts and asymmetric information are problems which prevent the market from clearing. Involuntary unemployment in equilibrium is an inherent feature of the model.

The approach we are taking differs from the presentation in many principles of economics courses. The more common, yet unworldly presentation of the labor market is one in which the market does clear— a model in which there is no unemployment in equilibrium. The traditional approach is to treat the labor market like any other goods market in which contracts are complete and power dynamics absent. Does the absence of unemployment match the empirical reality? Clearly not, unemployment is a problem, and it does not emerge from a minimum wage or other ad-hoc assumptions.

This unit

We will return to labor discipline model form unit 6 to derive the supply side of the labor market represented with an economy wide wage-setting curve. Changing the unemployment rate affects the best response function and hence the efficiency wage.

We will also return to the price-setting model from unit 7 to derive the demand side represented with price-setting real wage curve.

The intersection of the two curves gives us the Nash equilibrium of the labor market. Equilibrium unemployment results from incomplete contracts and is positively related to the power of the firms to set the price.

The labor market and the unemployed

Imagine you are exhausted after spending a long day studying economics. You plop down on the couch, crack a cold one, and tur on the tele. The news comes on and they are talking about the high unemployment the US economy is experiencing. What exactly is the unemployment rate the news reports? It's the U3 measure which is quite narrowly defined.

Start with the entire civilian population- military and the institutionalized are excluded. The civilian population is then reduced by excluding those who are under 15 and over 64. Next we remove anyone who is not actively seeking work or already employed to determine the labor force. The labor force is then broken into two groups the employed and the unemployed. The U3 measure is the unemployed divided by the labor force.

A useful measure for sure, but like all measures it has limits. Imagine you just graduated college with your MBA and the only job you can is working 5 hours a week at McDonald's- you are underemployed, but not unemployed. Imagine that you have children who cannot attend school because of covid-19 and

so you quit your job at McDonald's so that you can care for your children- since you are not willing and able to work you are not unemployed because you are out of the labor force.

Labor market statistics

Here you can see three common measure for labor market outcomes.

Familiarity with what information the measure conveys is crucial. We could have two countries with very similar unemployment rates, but very different labor market experiences for the citizens. If one country has a very low participation rate, the unemployment rate will be artificially lower. The lower participation rate is similar to the example in the previous slide about quitting the job at Mickey D's to care for family; when someone is no longer willing or able to work they are not unemployed because they are no longer in the labor force.

Price setting and wage setting

A quick refreshed from unit 6 and unit 7. In unit 6, we modeled the interaction between labor and capital. Firms set the wage high enough to generate a rent which served to motivate workers to exert effort. The cost of job loss was sufficient to work hard even though contracts are incomplete.

In unit 7 we modeled the interaction between firms and customer. Firms start with the cost of production and determine how far above that cost they can set the price. The size of the markup depends on the market power of the firm; elasticity of demand serves as the proxy for that power.

The real wage

The real wage is calculated by dividing the nominal wage W by the price p. You should think of the real wage as representing the share of the product that goes to labor.

The Bureau of Labor Statistics (BLS) estimates the real wage and makes it publicly available. In their calculation, the nominal wage is the median and the price is calculated from a basket of consumer goods.

And let me just add that the real wage has been stagnant for decades now.

W and p, we have a model which solves for the value of these two variables. The wage W is determined in the capital-labor interaction and the price p is determined through the interaction between the firm and its customers.

The chain of the firm's decision

The firm must set the wage first because it determines the cost structure. The cost structure must be know prior to determining the price because the price is set as a markup over cost. For simplicity we have assumed that labor is the only input and so the nominal wage is the only cost to production. How far the price is set above the cost depends on the demand curve confronting the firm. The markup is inversely related to the elasticity of demand.

Once the price is set, the demand curve provides the quantity the firm can expect to sell.

With the quantity determined, go to the production function to figure out the employment level of the firm.

The wage setting curve

The wage-setting curve (WSC) represents the real wage necessary to motivate workers for every level of employment. It is an if-the statement: looking at the figure here, if unemployment is 5%, then the real wage necessary to motivate workers is W_h.

Every point along this curve is a Nash equilibrium, representing the best any player can do given the actions of the other players.

The wsc is derived from the labor discipline model. Assume that you start with 5% unemployment and increase unemployment to 12%. What happens to the wage? Can you demonstrate this result graphically using the labor discipline model?

Deriving the wage setting curve

The wage setting curve represents all of the equilibrium wages derived in the labor discipline model when varying the unemployment rate. A change in the unemployment rate affects the best response curve and thus the wage.

As the unemployment rate goes down, the expected duration of unemployment goes down which reduces the employment rent. When the employment rent goes down, the firm needs to raise the wage in order to reestablish a rent sufficient to motivate labor. Because of incomplete contracts, the rent is what compels labor to exert effort. The result of varying the unemployment rate and solving for the wage yields an upward sloping wage-setting curve.

An estimated wage curve

Go way back to unit 2 and recall the modelling process. There were four questions:

- Is it clear- does the model help understand something important?

- Is it accurate- is the model consistent with evidence?

- Improve communication- does the model clarify what we agree/disagree about?

- Useful- does the model help us find ways to improve economic outcomes?

This model does indeed match reality. Here is an estimated wage-setting curve which shows the same positive relationship between real wages and the unemployment rate.

Profit maximizing price

The interaction between the firm and its customer is presented here. The equilibrium price occurs at the tangency between the demand curve and the Isoprofit curve. Using the demand curve, for the chosen price the firm can determine the quantity of output it expects to sell.

How does the firm use the quantity of output to determine employment? To answer this question, we will introduce a very simple production function where output q is equal to the product of hours of labor

(n) and the productivity of labor (lambda). Use the production to solve for n and assume that lambda equals one so that q=n.

Given the cost structure and the market power of the firm, is the price too high or too low at point A and point C? What about the price at point B?

When the firm sets the price, it is also simultaneously determining the distribution between labor and capital.

Distribution of output

Given our assumption that labor is the only input, we arrive at a historically significant result in the history of economics. Labor is the source of value and prices are proportional to labor values. For more on this you will have to take my history of economics course.

Back to principles…

The price can be decomposed into the share going to capital and the share going to labor, profit and wages respectively.

Another way to think about this is that the product of labor (output per worker) is divided between the two groups involved in this social interaction- capital and labor.

We will return to this in a moment…

Deriving the price setting curve

The price decision determines the optimal markup and the level of output. With both the wage and price set, the real wage is also determined.

Recall that the real wage represents the share of the product going to labor. This result is exactly what can be seen in this image.

The product (outout per worker) is given to us by lambda, the share of that product going to capital is denoted as real profits and the share going to labor is the real wage. The real wage is equal to the product of labor (output per worker) minus the share captured by capital (real profit).

If the price goes up, ceteris paribus, the real wage goes down. Graphically, this would be a downward shift of the price-setting curve. This downward shift is analogous to the share of the product going to capital increasing and the share to labor decreasing.

The price setting curve

The price setting curve (psc) is the real wage paid when firms choose the profit maximizing price. On the next slide we will fulfill the quantitative reasoning requirement as I show you algebraically the psc depends on the power of the firm and labor productivity.

If a firm, in making the price decision, was confronted with greater competition what would the result be? Increased competition is modeled as a flatter demand curve and a smaller markup so that prices are lower. Lower prices drive the real wage up and is represented graphically as an upward shift of the PSC.

Now some math and an answer to the question that I am sure you are dying to know. How does the psc change with a change in the productivity of labor?

The labor market equilibrium

The wage-setting curve represents the supply side of the labor market and the price-setting curve represents the demand side.

The intersection of these two curves gives us the equilibrium unemployment.

The wage setting curve represents the real wage necessary to motivate workers for different levels of unemployment. The price-setting curve represents the real wage that maximizes profit. The level of employment where the profit maximizing real wage is sufficient to motivate workers is where the two curves intersect.

Spend some time considering how the equilibrium unemployment changes when the degree of competition faced by firms increases. What happens to the shares going to capital and labor?

The labor market equilibrium II

The labor market equilibrium is a Nash equilibrium. The firm choses a wage which minimizes their cost. Given the real wage which maximizes profits, this equilibrium represents the highest employment level. There is involuntary unemployment in equilibrium. Those who are unemployed cannot persuade the firms to hire them at a lower wage, because the firm is already paying the wage which minimizes cost. If they were to pay less, there would be labor discipline concerns.

Involuntary unemployment

On previous slides I have talked about involuntary unemployment. This is a situation where there are members of the labor force who are willing and able to work at the given wage but remain unable to find work.

In our model there will always be involuntary unemployment. Because of incomplete contracts, the threat of the sack – that is the threat of being fired and losing the employment rent – is what motivates labor to exert effort. With no involuntary unemployment, there is no cost to job loss.

Unemployment is the stick which capital uses to discipline labor.

Unemployment and aggregate demand

The unemployment that we solve here should be understood as a center of gravitation: in the long run the economy would end up at this level of employment. However, in the short run there can be fluctuations around this equilibrium level of employment due to fluctuations in aggregate demand.

Division of output

The level of employment is very important. Work is how society has decided to solve the economic problem. The employment relation is how society produces the material means of well-being and how it distributes this product to ensure that production can continue.

Employment is also a key determinant for determining distributional outcomes, inequality will increase with an increase in unemployment, a decrease in wages, or a rise in prices.

Labor unions

Labor unions empower workers. However, in the US, union density has been in decline for decades. This decline in union density correlates with the stagnant wages I mentioned earlier in this lecture.

Declining union density has not afflicted all nations equally as can be seen in this image.

Wage bargaining

Without unions, only capital has the power to make the threat of the sack; however, by bargaining collectively, labor is empowered to make a threat to "fire" the firm- to strike.

The ability to fire the firm leads to higher wages and/or other improvements to work like having a say in shaping the work environment and nature of jobs, better insurance, etc.

Bargaining curve

Collective bargaining allows labor greater power in negotiating the wage with capital. One possible outcome can be higher wages.

Introducing a union that seeks higher wages will shift the wage setting curve, lowering the equilibrium level of employment.

Remember that we need to evaluate our model by considering how well it matches reality.

Labor unions and unemployment

This figure shows average unemployment rates plotted against union density for quite a few countries. There does not seem to be a clearly discernible correlation between union density and unemployment as our model suggests.

This failure suggests that there is something important that we have omitted.

The union voice effect

One important feature that we omitted was that union do not only seek higher wages, they also benefit workers by giving them a voice in decisions. The voice effect is modeled by introducing additional inputs to the best response function; it is not only the wage that workers care about. The voice effect would cause higher effort for a given wage offer, shifting the wage setting curve down.

The effect of unions will depend on how strong the voice effect is and how militant unions are in exercising their power to demand a higher wage.

Labor market policies

With the assumption that labor is the only input, then he only things that will shift the psc are those that affect the productivity of labor and/or the markup.

Anything that affects employment rent, excluding a change in the unemployment rate, will shift the wsc.

That's all I have to say. Peace out.

Quantitative reasoning video

1. We start with the definition of elasticity. Remember it's a measure of proportional change which tells us how responsive demand is to a change in price. Some simple algebraic manipulation yields an equivalent expression for elasticity.
2. Decompose the fraction
3. Recognizing that slope of the demand curve is the inverse of the second fraction we can make a substitution here
4. In equilibrium we know that the slope of the demand curve is equal to the slope of the isoporift curve. So, lets isolate the slope on the left-hand side of the equation so that we can set it equal to the slope of the Isoprofit which was given to you in last week's lecture.
5. The slope of the Isoprofit curve is stated here.
6. Set the two slopes equal to each other and simplify.
7. Let mu be the markup so that mu=1/epsilon.
8. We are assuming labor is the only input. This assumption means that the unit labor cost = w/lambda = marginal cost. The wage paid for an hour divided by how much stuff labor produces in an hour gives us the marginal cost. Set mu equal to the markup and replace the marginal cost with its previously stated value. And then a bit of simplification yields the following.
9. Isolate the real wage on the left. And what we have arrived at here is the equation for the price setting real wage curve.
10. Here we see that the real wage which is the price setting curve is equal to the output per worker - real profit per worker. The product of labor is divided between the two groups: labor and capital.

From here its apparent that, when labor is the only input, only changes to the markup or to productivity will shift the psc.

If the wage rises, the price rises proportionally so the psc does not shift.