Labor supply curves

There are two different effects that determine the shape of the labor supply curve.

Substitution effect – as the wage paid to workers increases, this increases the opportunity cost of leisure. Recollect, that by consuming leisure (not working), you are forgoing the wage you could have earned by working that hour. As the wage increases, leisure gets more expensive, and you consume less leisure. That is, as the wage increases, you work more hours.

Income effect – leisure is a normal good. As you get wealthier, you'll want to consume more leisure. (If you win the lottery, are you going to quit your job?). As the wage you receive increases, you become wealthier, and thus will want to consume more leisure (and hence work less). Thus, as the real wage increases, you work fewer hours.

These two effects work in opposite directions. Which is bigger? Empirical studies suggest that the substitution effect dominates the income effect for most people at wages we see out in the real world. It is possible that the labor supply curve might be backward bending. It would increase look like a normal supply curve at low wages, but curl back as wages got very high. How many hours would you work if your hourly wage was $1 billion /hr? Not too much I suspect. However, must of us don't receive wages that are high enough to be on the backward bending portion. Might Bill Gates? Thus, we'll assume this is true and draw an upward sloping supply curve for labor, just as we've drawn most every other supply curve you have ever seen. See the picture (two pages ahead).

The Demand for labor

Keep in mind that is firms that demand labor.

Intuitively, we would expect that workers who are more productive would get higher wages. If I you and I are working at a furniture factory, and you can produce 10 tables a day and I can only produce 5 tables a day, I would expect that you would get paid a higher wage. Isn't this the way the world should be?

In fact, it turns out that the marginal product of labor will have a great deal to due with how much labor firms will demand. The marginal product of labor shows us how productive each unit of labor is. How much labor should a firm hire, then?

Suppose a production function is given below. Let's assume that the good that this firm is producing can be sold at a price of $4. (The firm is a price taker). From the production function we can calculate the marginal product of labor. This is the additional output produced from hiring one more unit of labor.

So, take the first unit of labor for instance. If the firm hires one unit of labor, the marginal product of labor is 15 units. That is, hiring that unit of labor increased output by 15 units. What is that worth to the firm?

We figure out what is the "value of the marginal product". Given that this unit of labor produced 15 units of output, and that the price of the good is $4, this means that 15 * $4 = $60 worth of goods have been produced in that hour. We just multiply the marginal product of labor times the price of the good to arrive at this figure. Thus, the first unit of labor produces goods worth $60 to the firm.

Now, suppose that firms could hire workers at a wage of $20. How many units of labor would the firm hire?

Labor	F(K,L)	MP_L	$P * MP_L$
0	0	xx	x
1	15	15	$60
2	26	11	$44
3	34	8	$32
4	40	6	$24
5	45	5	$20
6	49	4	$16
7	52	3	$12
8	54	2	$8
9	55	1	$4

If the firm hires 1 unit of labor, that worker produces goods 15 goods that are worth $60. The firm must pay him only $20. The firm would find it profitable to hire this worker.

What about the second unit of labor? It produces 11 units of output, which can be sold at $4 each, thus $44 worth of output. The firms can hire this unit of labor for $20. It would want to do so.

Similarly, the firm would find it profitable to hire the 3rd, 4th, and 5th unit of labor. On the 5th unit of labor, the wage is just equal to the value of the goods that worker is producing.

The firm wouldn't hire the 6th unit of labor, as the 6th unit of labor would produce only $12 worth of goods, but would cost the firm $20 to hire.

In a nutshell, **a firm will hire labor until the wage is just equal to P* MP_L**, or where the wage is just equal to the value of the marginal product of labor ($P * MP_L$).

If you repeat the same exercise, but assume that the wage is instead $8 now, you'll find that the firm will hire 8 units of labor.

Hmmn… let's see. If the wage is $20, the firm demands 5 units of labor. If the wage is $8, the firm demands 8 units of labor. It as though that $P *MP_L$ curve is the demand curve for labor. It is.

So we do a few tricks, adjust wages for prices, and we have a demand curve for labor.

What's important for us?

The demand curve for labor is downward sloping (just as the marginal product of labor curve is downward sloping).

As the marginal product of labor shifts, the demand for labor will shift. If the marginal product of labor increases, the demand curve for labor will increase. If the marginal product of labor decreases, the demand curve for labor will decrease.

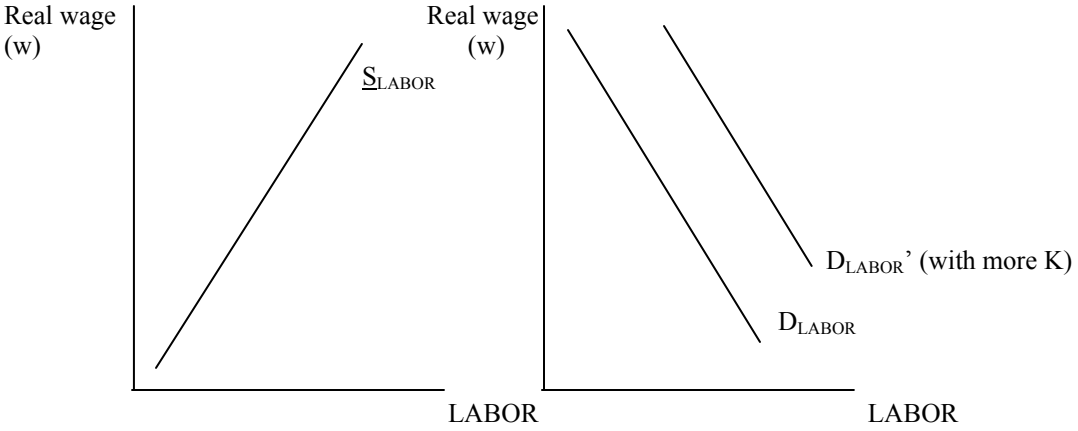
Since adding capital (or improving technology) makes labor more productive, adding capital (or improving technology) will increase the demand for labor.

Staded yet another way, any time you move the production function, you will also change the demand curve for labor in the same direction.

Obviously, then, reducing capital (or degrading technology) will make labor less productive, and thus decrease the demand for labor.

The pictures of the supply and demand curves for labor

When we draw the demand and supply for labor, we'll use real wages (nominal wages adjusted for price changes).



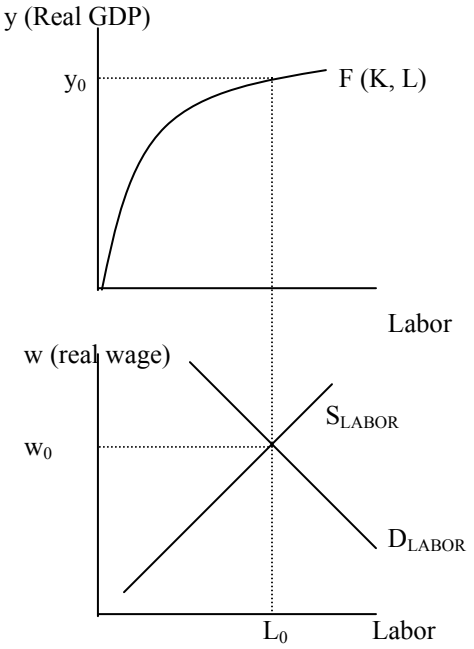
So we have the supply of labor on the left. On the right we have the demand for labor, and a second demand curve for labor (with either more capital or improved technology).

Finally – a simple model that determines the level of real GDP in the economy – "The Classical Model"

Now, we are ready to come up with a simple equilibrium model of real GDP. Equilibrium is graphed on the next page.

We determine real GDP in a two-step process.

(1) Equilibrium in the labor market determines the amount of labor (L_0).
(2) Then, the short run production function, which relates total real GDP in the economy to total labor hours worked, determines real GDP (y).



For now, we should note a few factors that determine the level of real GDP.

1. The amount of capital and the level of technology - determines where F (K,L), and also where the demand curve for labor is (by affecting the marginal product of labor).
2. People's tradeoffs between leisure and goods -determines where the supply curve of labor is.

If people become more willing or less willing to work at prevailing wages, this will affect real GDP in the economy. See below. The demand curve for labor is affected by the amount of capital and technology.

What are the comparative statics we can conduct?

1. Add capital or improve technology – increase the demand for labor
   The computer is invented
   A nuclear power plant floats down from heaven

2. Decrease capital or degrade technology – decrease the demand for labor
   A tornado wipes out a Ford factory, but doesn't kill any workers

3. More workers, or workers more willing to work at given wages - increase the supply for labor
   A bunch of immigrants show up in the US
   Women enter the labor force in the 1950s

4. Fewer workers - decrease the supply for labor
   A bomb explodes in Time Square on New Year's Eve killing a bunch of workers (but does not destroy any capital)
   You win the lottery and quit working

For fun, you can compare what would happen across countries as a result of WWII. Let's assume the only affect of WWII in the US would be to kill a bunch of workers. But in France, workers were killed and capital was destroyed (by big bombs and tanks). How would the changes be different?

Results of comparative statics listed above

1. $y \uparrow, w \uparrow, L \uparrow$

   The production function shifts up when we add capital or improve technology. Adding capital or improving technology makes workers more productive, meaning the MP_L increases. When the MP_L increases, firms respond by hiring more labor, thus the D_{LABOR} increases. As a result, we get a higher real wage, more labor, and higher real GDP. Draw the picture.

2. $y \downarrow, w \downarrow, L \downarrow$
   Same story as #1, in reverse.

3. $y \uparrow, w \downarrow, L \uparrow$
   The immigrant workers will cause an increase in the supply of labor. As a result, there will be a lower real wage and a higher quantity of labor hired. While the production function has not shifted, we will hire more labor, and hence will get higher real GDP. Draw the picture.

4. $y \downarrow, w \uparrow, L \downarrow$
   Same story as #3, in reverse.

Bigger picture – where does this model fit?

This model we just described is what other books calls a "**Classical Economics**" model, but what it really is a model that describes the economy in the long run. The amount of real GDP the model generates is the steady state level of real GDP.

This is a long run economy. It assumes that prices and wages quickly and freely adjust to changes in demand or supply conditions. It allows there to be booms and recessions, but they will be temporary. There would be strong forces bringing this model back to equilibrium.

In the future, we will look at some models that suggest that prices and particularly wages don't adjust quickly – they are sticky. These will be "**Keynesian Economics**" models.

There are some people who use this type of classical economic model to try and explain the business cycle (the ups and downs of the economy). They are called **real business cycle models**. For instance, they would say a boom would be caused by an improvement in technology. A recession in Venezuela (a major coffee exporter) would be caused by a drought in the coffee market.

How does real business cycle model do? What do we have available to explain downturns in the economy in this model? Decreases in technology, decreases in populations, natural disasters, increases in labor taxes? Doesn't sound very good, eh? You mean you can't remember the big drought that caused this recession. Or the giant hurricane that cased the early 80's recession? Or the plague that caused the supply of labor to decrease a few years ago? Me neither. Oil prices may be a more legitimate one.

One more shortcoming is that this model doesn't allow for cyclical unemployment (at least not for long). It would imply that we would always see unemployment at the natural rate (no cyclical unemployment). At the very least it would suggest that cyclical unemployment couldn't last long. Historically it has.

The point is that these real business cycle models do not do very well at explaining the ups and downs of the economy. However, we'll hold on to this classical economic model because it does OK at describing the long run or steady state level of real GDP.

What should I be reading?

Just the notes here.