Unemployment[1]
In-Class Problem[2]

Suppose that, initially, the Idaho economy is in equilibrium with no unemployment: $L_S = 200{,}000 + 200W$ and $L_D = 2{,}000{,}000 - 280W$**, where** W **is the monthly wage and** L **is the number of workers. Sadly, a fungus invades the potato crop resulting in a decrease in labor demand, but only 5% of the state's previously employed workers migrate and those that remain are only willing to suffer a 5% decrease in wages (slightly sticky wages).**

1. What does this market look like before the fungus infestation? This should include a graphic model with all points labeled and relevant values calculated.

First we need to determine the level of wage and number of workers at the initial equilibrium

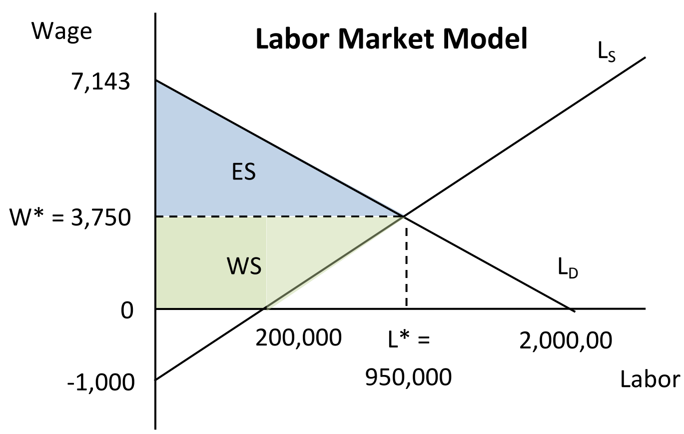
$$L_S = L_D$$
$$200{,}000 + 200\,W = 2{,}000{,}000 - 280W \qquad (1)$$
$$1{,}800{,}000 = 480W$$
$$W^* = \$3{,}750$$
$$L^* = 950{,}000$$

We also need to examine the L_S and L_D equations to identify the X and Y axis intercepts:

<u>For Labor Supply : $L_S = 200{,}000 + 200\,W$</u>
When W $= 0$, $L_S = L_S = 200{,}000$
When $L_S = 0$, $200W = -\,200{,}000$
$W = -1{,}000$

<u>For demand: $L_D = 2{,}000{,}000 - 280W$</u>
When $W = 0$, $L_D = 2{,}000{,}000$
When $L_S = 0$, $280W = 2{,}000{,}000$,
$W = 7{,}143$

So, the model, including representations of Employer Surplus and Worker Surplus looks like this:



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[1] This primer is intended to present an abbreviated discussion of the included economic concepts and is not intended to be a full or complete representation of them or the underlying economic foundations from which they are built.
[2] This problem set was developed by Rick Haskell (rick.haskell@utah.edu), Ph.D. Student, Department of Economics, College of Social and Behavioral Sciences, The University of Utah, Salt Lake City, Utah (2014).

And the relative values of ES and WS are as follows:

$$ES = \frac{(7{,}143 - 3{,}750)(950{,}000)}{2} = 1{,}611{,}675{,}000$$

$$WS = (3{,}750)(200{,}000) + \frac{(3{,}750)(950{,}000 - 200{,}000)}{2} = 750{,}000{,}000 + 1{,}406{,}250{,}000 = 2{,}156{,}250{,}000$$

2. Suppose labor demand changes to $L_D = 1{,}800{,}000 - 280W$, how many workers will become unemployed in Idaho?

If 5% of the workers leave the state that equates to 47,500 workers migrating and 902,500 remaining; so we have a decrease of 47,500 from the labor supply and the new labor supply equation becomes

$$L_S = 200{,}000 + 200W - 47{,}500 = 152{,}500 + 200W \qquad (2)$$

If the remaining workers in the state are only wiling to suffer a 5% decrease in wage, we then see wages falling to $3,562.50 ($3,750 x .95%).

We suppose this market won't be in equilibrium since the state's remaining workers have decided to hold fast to a wage of $3,562.50, so we now simply substitute $3,562.50 for W in the L_D equation to find the number of workers demanded.

$$L'_D = 1{,}800{,}000 - 280\,(3{,}562.50) = 802{,}500 \qquad (3)$$

So... with 902,500 remaining in the state to work, but only 802,500 being able to secure employment at the required wage, at least 100,000 workers will become unemployed in the state of Idaho…. Or maybe not as we'll see in **part 3** below.

3. What does this labor market look like now that we have new labor supply and demand curves and in the presence of slightly sticky wage of $3,562.50? This should include some representation of ES, WS and DWL, and all of the relevant values.

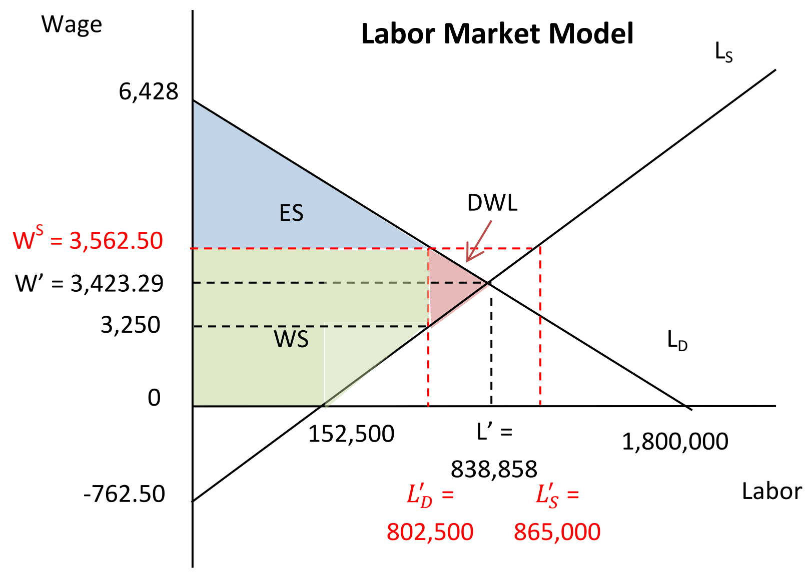
$$L'_D = 1{,}800{,}000 - 280\,W$$
$$L'_S = 152{,}500 + 200\,W$$
$$L'_D = L'_S$$

$$152{,}500 + 200W = 1{,}800{,}000 - 280\,W$$
$$480\,W = 1{,}647{,}500$$
$$W' = 3{,}432.29$$
$$L' = 838{,}958$$

But recall that wages have become sticky at WS = \$3,562.50 and based on the labor demand equation, firms only require 802,500 workers. So this market is clearing experiencing some friction or price distortion as can be seen in the following.

Again, we need to examine the L_S and L_D equations to identify the X and Y axis intercepts:

<u>For Labor Supply : $L_S = 152{,}500 + 200\,W$</u>	<u>For demand: $L_D = 1{,}800{,}000 - 280W$</u>
When W $= 0$, $L_S = L_S = 152{,}500$	When $W = 0$, $L_D = 1{,}800{,}000$
When $L_S = 0$, $200W = -200{,}000$	When $L_S = 0$, $280W = 1{,}800{,}000$,
$W = -762.50$	$W = 6{,}428$



Notice that in this market with a wage (price) distortion brought about by the slightly sticky wage, we have the presence of some dead weight loss. Worker Surplus (WS) appears to have increased and Employer Surplus (ES) appears to have decreased. To calculate these values we need to identify the number of workers corresponding to the new wage (\$3,562.50) with respect to the labor supply and demand equations:

<u>For Labor Supply : $L_S = 152{,}500 + 200\,W$</u>	<u>For demand: $L_D = 1{,}800{,}000 - 280W$</u>
$L'_S = 152{,}500 + 200\,(3562.5) = 865{,}000$	$L'_D = 1{,}800{,}000 - 280(3562.50) = 802{,}500$

And we'll need to know the value of W when L_S = 802,500:

$$L'_S = 802{,}500 = 152{,}500 + 200\,W$$
$$650{,}000 = 200W$$
$$W = 3{,}250$$

With these pieces of information we can also identify the relevant values of ES, WS and DWL.

4. What has been the effect of this fungus infestation and manifestation of sticky wages on the producer and supplier sides of the labor market?

The post-fungus ES, WS and DWL are as follows:

$$ES = \frac{(6428-3562.5)(802500)}{2} = 2{,}299{,}563{,}750$$

$WS = (3562.5 - 3250)(802500) + (3250)(152500) + \frac{(802500-152500)(3250)}{2}$ = 250,781,250 + 495,625,000 + 1,056,250,000 = 1,802,656,250

$$DWL = \frac{(3562.5-3250)(838858-802500)}{2} = 5{,}680{,}938$$

How does this compare to the values of ES, WS and DWL before the infestation and sticky wage manifestation?

	Post-fungus	Pre-fungus	Change
ES	$ 2,299,563,750.00	$ 1,611,675,000.00	$ 687,888,750.00
WS	$ 1,802,656,250.00	$ 2,156,250,000.00	$ (353,593,750.00)
DWL	$ 5,680,938.00	$ -	$ 5,680,938.00
Total	$ 4,107,900,938.00	$ 3,767,925,000.00	$ 339,975,938.00

So, this is interesting. It appears that ES has grown as a result of modest wage concession and changes in labor supply and demand, while WS has declined. The presence of DWL in this market would seem problematic at first, but if we look at the overall change in economic activity we actually see a net increase of $334,295,000.

5. What will be the state's new unemployment rate?

If there are 877,600 willing to work at the $3,652.50 wage and only 802,500 demanded the new unemployment rate is as follows:

$$\frac{877{,}600 - 802{,}500}{877{,}600}(100) = 8.56\% \tag{4}$$