Chapter 4. Quantitative Answers

1. When \( w = 600 \), \( L_d = 2000 - 1.5(600) = 1100 \). A 1% increase in the wage implies \( w0 = 606 \Rightarrow Ld0 = 1091 \). The own-wage elasticity is given by \( \frac{\Delta L_d}{\Delta w} \times \frac{w}{L_d} = \frac{-9}{6} \times \frac{600}{1100} = -0.82 \). Thus, the labor demand curve is inelastic at this point. If \( w = 1000 \), then \( L_d = 500 \). A 1% increase in the wage implies \( w0 = 1010 \Rightarrow Ld0 = 485 \). The own-wage elasticity is given by \( \frac{-15}{10} \times \frac{1000}{500} = -3 \). Thus, the labor demand curve is elastic at this point.

2. The own-wage elasticity of demand is \( \% \Delta L_d / \% \Delta w_m \). When \( w_m = 20 \) and \( w_f = 10 \), \( L_d = 400 - 40(20) + 50(10) = 100 \). A 1% increase in \( w_m \) implies \( w0_m = $20.20 \Rightarrow Ld0_m = 92 \). A decline in employment by 8 represents a decline of 8%. Thus, the own-wage elasticity is -8, which implies the labor demand curve is elastic at this point. A 1% increase in \( w_f \) implies \( w0_f = $10.10 \Rightarrow Ld0_m = 105 \). The cross-wage elasticity is 5. Since this is positive, male and female labor are gross substitutes.

3. In an economy, \( L^d = 125 - 5 \omega \), while \( L^s = 20 + 10 \omega \), where \( \omega \) is the hourly wage rate.

(a) What is the equilibrium level of employment and wage?

**Answers:**

\[
L^s = L^d = 20 + 10 \omega = 125 - 5 \omega
\]

\( 15 \omega = 105 \)

\( \omega = $7 \)

\( L^d = 125 - 5 \omega = 125 - 5(7) = 90 \)

(b) If the present minimum wage is $5.85/hr and the government raises it to $6.50/hr, how many workers will lose their jobs? What is the unemployment rate?

**Answers:**

Equilibrium wage \( (\omega = $7) \) is higher than the minimum wage of $5.85/hr. It is also higher than the new minimum wage of $6.50/hr. When the minimum wage is below the market equilibrium wage, the minimum wage is a non-binding price floor. The market will pay \( \omega = $7 \) and there will be no unemployment.

(c) If instead the government voted to raise the minimum wage to $8/hr, how many workers will lose their jobs? What is the unemployment rate?

**Answers:**

If the minimum wage is raised to $8/hr (above the equilibrium wage \( (\omega = $7) \)), the minimum wage is a binding price floor.

With a minimum wage of $8/hr, the quantity of labor supplied is 100.
\[ L' = 20 + 10\omega = 20 + 10(8) = 100 \]

In problem (a), 90 workers were working in the labor market. Because of the minimum wage of $8/hr, the quantity of labor demanded is 85 so 5 workers lose their jobs.

\[ L^d = 125 - 5\omega = 125 - 5(8) = 85 \]

The difference between the quantity of labor supplied and the quantity of labor demanded with the new minimum wage is 15. This means that 15 workers who are willing and able to work cannot find jobs or are unemployed. There are 100 total workers at a wage of $8/hr who are willing and able to work or are in the labor force.

\[ L' - L^d = 100 - 85 = 15 \]

Unemployment rate = total unemployed / labor force = 15 / 100 = 15%

(d) The workers who lose their jobs in (c) are able to move to another sector that is not covered by the minimum wage (and are willing to work for any positive wage). Before the unemployed workers arrive, aggregate labor demand and labor supply are given by

\[ \omega = 201 - 20\omega \]

and

\[ \omega = 5 + 5\omega \]

respectively. What is the equilibrium wage in the uncovered sector before and after the minimum wage is increased to $8/hr?

Answers:

Before worker migration, the equilibrium wage rate in the uncovered sector is $7/hr.

\[ L' = L^d = 15 + 5\omega = 190 - 20\omega \]

\[ 25\omega = 175 \]

\[ \omega = 7 \]

\[ L' = 15 + 5\omega = 15 + (5)(7) = 50 \]

After worker migration, the equilibrium wage rate in the uncovered sector is $6.25.

The labor supply migrating from the covered market \((L^m = 15)\) is added to the labor supply in the uncovered sector \((L' = 50)\) for a total labor supply of 60.

\[ L' + L^m = 50 + 15 = 65 \]

\[ L' = L^d = 65 = 190 - 20\omega \]

\[ 20\omega = 125 \]

\[ \omega = 6.25 \]

4. The own-wage elasticity of demand is \(\%\Delta Ld/\%\Delta w\). When \(w = 3\) and \(pa = 200\), \(Ld = 2500 - 75(3) - 5(200) = 1275\). A 1% increase in \(w\) implies \(w0m = 3.03 \Rightarrow Ld0 = 1272.75\). A decline in employment by 2.25 represents a decline of roughly 0.18%. Thus, the own-wage elasticity is -0.18, which implies the labor demand curve is inelastic at this point. A 1%
increase in \( p_a \) implies \( p_0 a = 202 \implies L_d 0 = 1265 \). The cross-wage elasticity is -0.78. Since this is negative, labor and land are gross compliments.

5. In a particular industry, labor demand is perfectly inelastic and is given by \( L^d = 250 \), while \( L' = 150 + 10\omega \), where \( \omega \) is the hourly wage rate.

(a) What is the level of employment, wage, and unemployment rate if the minimum wage is set at $8/hr?

Answers:

The equilibrium wage rate is $10/hr. A minimum wage set at $8/hr is a non-binding price floor. In this industry, the wage rate will stay at $10/hr, the number employed is 250, and the unemployment rate is 0%.

(b) If the minimum wage is raised to $12/hr, how many workers will lose their jobs? What is the unemployment rate?

Answers:

With a minimum wage set at $12/hr, 20 workers will lose their jobs.

\[
L' = 150 + 10\omega = 150 + 10(12) = 270 \\
L' - L^d = 270 - 250 = 20
\]

Unemployment rate = total unemployed / labor force = 20 / 270 = 7.4%

6. Use the following data for two industries (A and B) to answer the questions.

<table>
<thead>
<tr>
<th>Industry A</th>
<th>Industry B</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \omega )</td>
<td>( L^d )</td>
</tr>
<tr>
<td>$6.00/hr</td>
<td>15,000</td>
</tr>
<tr>
<td>$7.00/hr</td>
<td>10,000</td>
</tr>
</tbody>
</table>

(a) In which industry would a union be more likely to organize workers? Why?

Answers:

For Industry A:

\[
\eta_{AA} = \frac{\% \Delta \omega_A}{\% \Delta \omega_{\eta}} = \frac{\frac{(15,000 - 10,000)}{12,500}}{\frac{(6 - 7)}{6.50}} = \frac{0.4}{0.15} = 2.67
\]

For Industry B:
The labor demand curve for Industry A is more inelastic than the labor demand curve in Industry B. This means that a union is more likely to organize workers in Industry A because the potential gains to unionization are higher than in Industry B.

(b) In which industry would a union be more successful in winning larger wage gains for union members?

**Answers:**

The labor demand curve for Industry A is more inelastic than the labor demand curve in Industry B. This means that, all else equal, a union will be more successful in winning larger wage gains for union members in Industry A than in Industry B.