Chapter 13. Quantitative Answers

1. (a) Employment in the unionized sector is given by the demand curve. Plugging in \( w = 20 \) yields \( N_u = 200 - 4(20) = 120 \). Similarly, if \( w = 15 \), then \( N_u = 200 - 4(15) = 140 \).

(b) If \( w_u = 15 \), then the union’s utility is \( U = 140(15) + (175 - 140)10 = 2450 \). If \( w_u = 20 \), then the union’s utility is \( U = 120(20) + (175 - 120)10 = 2950 \). So, the union will prefer the higher wage. If the wage in the non-unionized sector falls to \( w_n = 5 \), then \( U = 140(15) + (175 - 140)5 = 2275 \) if \( w_u = 15 \) and \( U = 120(20) + (175 - 120)5 = 2675 \) if \( w_u = 20 \). So, the union still prefers the higher wage.

2. In an economy, there are two sectors: one unionized and the other non-unionized. Aggregate \( L^d = 150 - 5\omega \) in the unionized sector, while \( L^d = 225 - 20\omega \) in the non-unionized sector. \( L' = 75 + 5\omega \) in the non-unionized sector. Under the current union contract, the union wage, \( \omega_u \), is $10/hr and there are 100 workers in the union sector.

(a) What is the equilibrium level of employment and wages in the non-union sector? What is the relative wage advantage for unions, \( R \)?

Answers:

The equilibrium wage in the non-union sector is $6 and the equilibrium level of employment is 105.

Non-union sector:

\[
L' = L^d = 75 + 5\omega = 225 - 20\omega \\
25\omega = 150 \\
\omega = 6 \\
L^d = 225 - 20\omega = 225 - (20)(6) = 105
\]

The relative wage advantage for being in a union is 67%.

\[
R = \frac{\omega_u - \omega_n}{\omega_u} = \frac{(10 - 6)}{6} = 0.67 = 67\%
\]

(b) As the current union contract expires, the union votes to increase its wage demand to \( \omega' = 15 \). How many union workers lose their jobs?

Answers:

The quantity of union labor demanded before the new contract was 100. After the new contract, only 75 union members’ work will be demanded so 25 union workers lose their jobs.

\[
L^d = 150 - 5\omega = 150 - (5)(10) = 100 \\
L'^d = 150 - 5\omega = 150 - (5)(15) = 75
\]
(c) The workers who lose their union jobs move to the non-union sector (as their reservation wages are all well below the wage in the non-union sector). What is the new equilibrium wage in the uncovered sector? What is relative wage advantage for unions, \( R \)?

**Answers:**

The quantity of labor supplied before the worker migration was 105. With the labor migration of 25 former union members, the quantity of labor supplied is 130.

\[
L^\prime = L^d = 130 = 225 - 20\omega
\]

\[
20\omega = 95
\]

\[
\omega = \$4.75
\]

The new equilibrium wage in the uncovered sector is $4.75.

The relative wage advantage for being in a union is 216%.

\[
R = (\omega_u - \omega_n) / \omega_n = (15 - 4.75) / 4.75 = 2.16 = 216\%
\]

3. The length of the strike is found by equating the resistance curve and the concession schedule and solving for \( s \). This implies:

\[
50 + 0.5s = 70 + 0.3s - 0.1s^2
\]

\[
\implies 0 = 0.1s^2 + 0.2s - 20
\]

\[
\implies s^* = \frac{-0.2 \pm \sqrt{8.04}}{0.2}
\]

\[
\implies s^* = 13.2, -19.2
\]

Only \( s^* = 13.2 \) makes sense in this context. Thus, \( SC^* = 50 + 0.5(13.2) = 56.6 \) million.

4. (a)
(b) The length of the strike is found by equating the resistance curve and the concession schedule and solving for \( s \) for each industry. This implies:

\[
50 - sH = 25 + sH \\
25 = 2sH \\
\Rightarrow s^*H = 12.5
\]

in the high-paying industry and

\[
50 - 2sL = 25 + sL \\
25 = 3sL \\
\Rightarrow s^*L = 8.33
\]

in the low-paying industry. Furthermore, the percentage wage increase is \( wH = 25 + 12.5 = 37.5\% \) in the high-paying industry and \( wH = 25 + 8.33 = 33.33\% \) in the low-paying industry.

5. (a) Equate \( L_s = L_d \) in each sector and solve. In the union sector:

\[
50 - 2w = -15 + 8w \\
65 = 10w \\
w^*u = 6.50 \\
L^*u = 50 - 2(6.50) = 37
\]

In the non-union sector:

\[
60 - 4w = -44 + 12w \\
104 = 16w \\
w^*n = 6.50 \\
L^*n = 60 - 4(6.50) = 34
\]

(b) If the union insists on \( w^*u = 10 \), then \( L_{du0} = 50 - 2(10) = 30 \). Thus, 7 workers lose their jobs.

(c) If \( RR = 0 \), then UI does not pay any benefits (0% of one’s former salary is replaced).
As such, the percent that move to the non-union sector is 100%, or all 7 workers. This implies that \( L_{sn0} = -37 + 12w \). Setting this equal to \( L_{dn} \) and solving implies:
\[
60 - 4w = -37 + 12w
\]
\[
97 = 16w
\]
\[
w^*n = 6.06
\]
\[
L^*n = 60 - 4(6.06) = 35.76 \approx 36
\]
The wage in the union sector is obviously 10, with employment being 30. \( R = (wu - wn)/wn = (10 - 6.06)/6.06 = 65\% \).

If \( RR = 3/7 \), then UI replaces about 43% of one’s former salary. As such, the percent that move to the non-union sector is 4/7, or 57%, or 4 of the 7 unemployed union workers. This implies that \( L_{sn0} = -40 + 12w \). Setting this equal to \( L_{dn} \) and solving implies:
\[
60 - 4w = -40 + 12w
\]
\[
100 = 16w
\]
\[
w^*n = 6.25
\]
\[
L^*n = 60 - 4(6.25) = 35
\]
The wage in the union sector remains 10, with employment at 30. \( R = (wu - wn)/wn = (10 - 6.25)/6.25 = 60\% \).