

The Consolidated Coal Company (CCC) is located in a small town about 70 miles from Wheeling, W. Va. Except for a few clerical and retail jobs, virtually the only employment available is with CCC. The wage rate is \$10 per hour. The cost of capital is \$20 per unit. CCC's production function is given by.

$$Q = 20 K^4 L^4 \quad \text{where}$$

Q = output of coal in tons per year,

K = quantity of capital used

L = number of man-hours of labor

The current price of coal is \$25 per ton.

- a. Find optimal coal output for CCC, as well as the amount of labor and capital employed, total revenue and total costs (labor and capital) and total profit.
- b. Suppose CCC uses its monopsony power to set the wage. Assume the amount of capital used is fixed at the level found in part a. and the supply of labor curve is given by

$$L = 1,000,000(w-4)^5, \quad w \geq \$4 \text{ per hour, where}$$

L = man-hours supplied

w = the wage rate

Find the optimal levels of Q, L, w and the total profits of CCC if the only costs are for capital and labor.

(Hint: Show that the equation to be solved is $3 \cdot 10^{-12} L^2 - 20000(2^{-8})L^{-6} + 4 = 0$ and use the graph below to find the optimal L)

