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The Minimum Wage and the Monopsonist

Consider the case of a firm that acts as a monopsonist in the local labor market. As the sole employer in town, it can push down wages and increase profit by reducing the employment level. The firm's goal is to maximize profit:

$$\Pi(L) = p \cdot Q(L) - w(L) \cdot L$$

with respect to labor, L. For simplicity, assume the production function exhibits diminishing marginal returns and is given by:

$$Q(L) = 100 \cdot \sqrt{L}$$

assume that the quantity of labor supplied is an increasing function of the wage rate and the inverse of that relationship is given by:

$$w(L) = L \cdot \sqrt{L}$$

and assume that the firm sells its output in a perfectly competitive market (so that the market price of output is exogenous to the firm) and that the price is fixed at:

$$p = 5$$

1. Derive the marginal revenue from increasing employment, L.
2. Derive the marginal cost of increasing employment, L.
3. What is the necessary condition for maximizing $\Pi(L)$ with respect to L?
4. What is the sufficient condition for maximizing $\Pi(L)$?
5. What is the value of L that maximizes $\Pi(L)$?
   (a) what is the equilibrium wage at that value of L?
   (b) what is the equilibrium profit at that value of L?

Now, assume that the government imposes a minimum wage:

$$w_{min} = 65$$

6. Derive the marginal revenue from increasing employment, L.
7. Derive the marginal cost of increasing employment, L.
8. What is the necessary condition for maximizing $\Pi(L)$ with respect to L?
9. What is the sufficient condition for maximizing $\Pi(L)$?
10. What is the new value of L that maximizes $\Pi(L)$?
    (a) what is the new equilibrium profit at that value of L?
11. What happened to total employment in the town after the minimum wage was imposed?
12. What happened to the monopsonist's profit after the minimum wage was imposed?