Economics 460: Labor Economics

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Problem Set #2 – Answers

1. MRP_L is the additional revenue from hiring one more unit of labor. It is equal to $P * MP_L$ since MP_L gives you the additional output produced by one more unit and multiplying this amount by P translates the output into dollar value. It is the firm's SR labor demand curve since it to maximize profits, the firm must equate w and MRP_L, since MRP_L is the benefit of the firm to hiring another unit and w is the cost. The labor demand curve differs for a monopolist since a monolpolist does not face a fixed price, but rather changes in a monopolist's output change P as well. As a result, when a monopolist hires another unit of labor, it produces more and lowers the price at which it can sell all of its output. Therefore, a monpolist still cares about MRP_L, but now $MRP_L = MR * MP_L$, where MR is the marginal revenue obtained from producing another unit of output which reflects the fact that the additional output produced also changes the price. Since MR is less than the P, the labor demand curve for a monpolist is steeper and to the left of a competitive firm's labor demand.

2. Labor demand ...

   (a) Since K is fixed in the short-run, a change in the price of K will have no effect on the short-run demand for labor. Clearly, this will not be the case in the long-run.

   (b) Lower demand will lower the price of the final good. A lower price lowers MRP_L, and, therefore, shifts the labor demand curve in, resulting in a lower labor demand.

3. This is similar to how we derived an individual's labor supply curve. Use the isoquant-isocost graph and vary the wage and trace out what happens to long-run labor demand. The output effect is the short-run effect on labor demand due to the change in output produced by the firm (the change from $A \rightarrow B$ in your notes) and the substitution effect is the long-run effect due to the substitution of capital for labor (the change from $B \rightarrow D$ in your notes).

4. This just re-iterates the reasoning behind the long run labor demand curve being flatter than the short run demand curve. In the long run, a firm can adjust their capital stock. Thus, in the long run automakers will substitute away from more costly labor towards capital. The degree of substitution depends on the magnitude of the wage increase and the extent to which capital and labor are substitutes.

5. This is the necessary condition for profit maximization, which is cost minimization. It is a necessary, but not sufficient condition. While it is true that this condition must hold for firms to maximize profit, it does not insure it.

6. Since the inputs are perfect substitutes, the firm does not care how much of each is employed, they only care that the 100 units of output are produced at the lowest possible cost. Given that one machine can do the work of three men, the price of three workers will need to less than the price of the machine for the firm to employ workers. At a wage rate of \$300 per week per person, the cost for three workers is \$900 per week, which is greater than the \$750 per week necessary for the machine. Thus at a price of \$300 per week, the firm will choose zero workers. However, at a price of \$225 per week per worker, the cost of three workers is \$675 per week, which is less than the \$750 per week necessary for the machine. Thus the firm will not use any machines. Given that the elasticity of labor demand measures the percentage change in the labor demanded due to a percentage change in the wage rate, that elasticity will be infinity (The number of workers hired went from zero to a positive number, and hence an infinite percentage increase in the numerator and a finite percentage change in the denomnator).

7. Given that the production function is $q = K^{1/2}L^{1/2}$

   (a) $MP_L = \partial q/\partial L = 1/2\left(K^{1/2}L^{-1/2}\right) = 1/2\left(K/L\right)^{1/2}$

   (b) Firms should hire labor until $w = p \cdot MP_L$. We already know, w, p, and K, thus it is simple algebra. $10 = 50 \cdot (1/2)\left(40/L^{1/2}\right) \Rightarrow L = 10,000$.

   (c) $\Pi = TR - TC = pq - (wL + rK) = p\left(L^{1/2}K^{1/2}\right) - (wL + rK) = 50\left(10,000^{1/2}1,600^{1/2}\right) - (10 \cdot 10,000 - 25 \cdot 1,600) = 200,000 - 140,000 = 60,000$.