Chapter 5. Quantitative

1. A monopsonist faces a labor supply curve given by \( L' = -300 + 0.01\omega \), where \( \omega \) is the annual salary.

   (a) What is the lowest salary the firm can pay yet still induce one worker to want to work for the firm? What is the lowest salary the firm must pay to induce two workers to work for the firm?

   (b) What is the marginal cost to the firm of adding a second worker given that it must pay all employees the same wage? Is this greater than, less than, or equal to the wage paid to each of the two workers?

   (c) In general, the marginal cost of hiring additional labor for this firm is given by \( ME_L = 29,900 + 200L \). If the firm’s labor demand curve is given by \( L^d = 398 - 0.01\omega \), what is the profit-maximizing number of workers the monopsonist should hire? What is the salary the workers will be paid?

2. Referring to the previous question, suppose the workers employed (and potentially employed) by the monopsonist become unionized and successfully get the monopsonist to agree to a fixed salary of $36,000 per worker.

   (a) Graph the aggregate labor supply and demand curves, as well as the original and new Marginal Expense of Labor (\( MEL \)) lines under the union agreement.

   (b) How does the firm’s profit-maximizing wage and employment level change under the new union agreement?

3. Assuming diminishing marginal product of additional workers and diminishing marginal product of additional hours-per-worker, how would a profit-maximizing firm adjust its mix of workers and hours-per-worker in response to:

   (a) A new user-friendly computer system that reduces training time required by one-half?

   (b) New legislation requiring workers be paid 50% extra per hour worked (i.e., time and one-half) on weekends and after 5 p.m. during the week?

   (c) A wave of new (skilled) political refugees to the town where the firm is located, thereby raising the marginal productivity of new workers?

   [Note: In each case, everything else remains constant].

4. A worker is offered a job at two different firms. At the first firm, the wage paid increases each year. At the second firm, the wage is constant over time. The worker anticipates working three years at whichever job she accepts and then retiring. The first firm offers a three-year contract paying an annual salary of $50,000 in year 1, $60,000 in year 2, and $70,000 in year 3.
(a) If the worker’s discount rate is $r = 0.1$, what must the annual salary be at the second firm for the worker to accept its job offer?

(b) How does the lowest annual salary that must be paid by the second firm in order to attract the worker compare to the average annual salary paid under the three-year contract offered by the first firm?

5. Suppose a firm hires a worker under a legally binding two-period contract. The contract specifies that worker will be paid $1000 in period 0 and $3000 in period 1. The worker has a MPL (in either period) of $1000 if the firm does not offer any training program for the worker. If the firm makes a training program available in period 0, the MPL of the worker will be $4000 in period 1. What is the highest cost of the training program, $Z$, such that a profit-maximizing firm will choose to train the worker in period 0? What is the highest cost of the training program, $Z$, such that a profit-maximizing firm will earn positive profits from this contract? Assume the firm uses a discount rate of 10%.