Problem Set 4

1. Inappropriate technology transfer from developed to underdeveloped countries is a major issue in development economics. Although the cost of labor relative to capital is far lower in India than in the United States, a U.S. multinational construction firm often builds a dam in India with the same mix of capital and labor that it uses in the United States.

   a. Suppose labor costs $1 and capital costs $2 in India while, in the United States, the costs are reversed (i.e. labor costs $2 and capital costs $1). Draw the 2 isocost lines for the respective countries. What kind of technology (more or less capital intensive) would be appropriate for India?

   b. What might dam isoquants look like if using the same production technique in both countries is appropriate?

2. Some firms make donations of money and/or capital equipment to universities. Does this mean that these firms are not profit maximizers? Explain.

3. One possible mathematical form for a fixed proportions production is

   \[ Q = F_n(K,L) = \min(aK,bL) \]

   where the term "\( \min \)" means that \( Q \) takes on the lower value of the two terms inside the parentheses. If, for example, \( aK \) is less than \( bL \) then \( Q = aK \) and \( K \) is the binding constraint in production.

   a. When \( Q = \min(aK,bL) \), what is the optimal capital-labor ratio?

   b. What are the returns to scale for the above fixed proportions production function?

   c. Does the fixed proportions production function \( Q = (\min(aK,bL))^{1/2} \) exhibit constant returns, increasing returns or decreasing returns to scale? Are the isoquants L-shaped?

4. Suppose you have a short run production function estimated to be:

   \[ Q = 100L + 50L^2 - 3L^3 \]

   where \( L \) = number of workers. At what number of workers will you first experience diminishing returns? At what level of employment will total output be maximized with this plant size?
5. A contractor for the U.S. Defense Department produces airplanes from capital (K) and labor (L) by the production function:

\[ A = K \times L^2 \]

The marginal product of labor (\( MP_L \)) = 2KL.
The marginal product of capital (\( MP_K \)) = \( L^2 \).
The Defense Department is ordering 125 airplanes.

a. How much labor and capital will the firm employ if labor costs twice that of capital?
(Hint: Let \( w = $2 \) and \( r = $1 \). Use \( MP_L/MP_K = w/r \) to find L in terms of K. Then substitute this into the production function for \( A = 125 \).

b. How much capital and labor will the firm use if capital costs twice that of labor?

6. A few years ago, the *Boston Globe* reported that the city of Boston planned to spend $14 million to convert the FleetCenter sports arena and entertainment center into an appropriate venue for the Democratic Nominating Convention (DNC). The city engaged Shawmut Design and Construction in a contractual relationship to complete the work, which was supposed to start 48 days prior to the commencement of the DNC on July 26. However, when negotiations between Boston’s mayor and the police union broke down, the Boston Police Patrolmen’s Association took to the picket lines surrounding the FleetCenter and prevented construction crews from beginning work. The *Globe* reported that “a truck attempting to deliver steel turned around after a crowd of union members stood at a chain-link gate in front of the arena, shouting ‘back it up,’ and ‘respect the line, buddy.’” Moreover, the *Globe* reported that “On-duty police officers, who had been instructed to prevent pickets from restricting access, did not intervene.” Given the tight construction schedule, construction delays reportedly cost about $100,000 per day. Identify the principle-agent problem in this situation. Did the mayor and the city of Boston face the classical “hold-up problem” or another problem? Explain.

7. According to *BusinessWeek Online*, worldwide spending on IT services and outsourcing are expected to modestly grow through the end of this decade. Growth in business-process outsourcing (BPO) – the practice of hiring a third party to administer and manage functions ranging from human resources and management training to sales, marketing, finance, and accounting – is projected to be particularly strong, reaching $200 million by the end of the decade. Competition among firms in the BPO market is already strong. Companies based in the United States include Electronic Data Services (EDS), Affiliated Computer Services, and Automated Data Processing (ADP). A number of Indian companies, however, also provide worldwide BPO services, such as InfoSys, Wipro, and Satyam Computer Services. The *BusinessWeek* article suggests that BPO can save end-users anywhere from 15 to 85 percent. This contrasts to traditional IT services, which alone offer a savings range of 10 to 15 percent. International BPO service providers are particularly attractive since offshore labor
offers an additional 25 to 30 percent cost savings. Furthermore, approximately 25 percent of the cost savings results from BPO firms’ proprietary products. The remaining 10 to 30 percent in cost reduction accrues from consolidated operations. Suppose you are the manager of a U.S.-based company and must decide whether to outsource your human resources department. Outline arguments supporting and opposing a decision to outsource this function of your business. From a purely business standpoint, do any issues arise from contracting with an international-based versus U.S.-based BPO service firm? Explain.

8. You are a management consultant for a 30-year old partner in a large law firm. In a meeting, your client says: “According to an article in the New York Times, 57 percent of large law firms have a mandatory retirement age for partners in the firm. Before they retire, partners are paid directly for the work that they do, and, as an owner, they are entitled to a share of the profits of the firm. Once they retire, partners do not receive either form of compensation. In light of this, I think we should eliminate mandatory retirement in order to gain a ‘competitive advantage’ in attracting high-quality lawyers to work for our firm. Of course, you are the expert.” What do you recommend? Explain.