

Answers for HW 10 :

1. (a) The employer has four different strategies: (i) offer training to everyone, (ii) offer no training to everyone, (iii) offer training to a worker asking for swivel chair, but no training for a orthopedic chair, (iv) offer training to a worker asking for orthopedic chair, but no training for a swivel chair. The candidate equilibrium (if it is an equilibrium) is a separating equilibrium, and the only possible equilibrium belief is that a worker asking for a swivel chair has a bad back, while a worker asking for an orthopedic chair has a good back. Given the belief, the only possible equilibrium for the employer is to offer no training to a worker asking for swivel chair, and training for orthopedic chair. It is therefore sufficient to show that this only possible equilibrium is in fact not an equilibrium. Given the employer strategy, a worker with a bad back can ask for an orthopedic chair, and get training and his favorite chair. This is better than asking for swivel chair as specified in the candidate equilibrium. Thus the candidate equilibrium cannot be an equilibrium.

(b) The employer has four possible strategies and the only possible equilibrium belief is that a worker asking for swivel chair has a good back, and a worker asking for an orthopedic chair has a bad back. The only possible equilibrium to consider given this belief is to offer training when a worker asks for a swivel chair, and no training for orthopedic chair. We only need to show that this is not an equilibrium. A worker with a bad back can ask for a swivel chair, and get training. Although she does not get her favorite chair, it is better than getting the orthopedic chair and receives no training which results from the candidate equilibrium. Clearly the equilibrium behavior is not optimal for her. This shows that it is not an equilibrium.

(c) The "in-equilibrium-belief" is that when a worker asks for a swivel chair, the employer believes that 10% of them have bad backs. The "out-of-equilibrium-belief" we can use to support the candidate equilibrium is "if a worker asks for orthopedic chair, he must have a bad back". Given the belief, the employer will train worker asking for a swivel chair, and no training for orthopedic chair. It is easy to check that the equilibrium strategy is also an optimal response to the employer strategy. Hence it is a perfect Bayesian equilibrium.

(d) The "in-equilibrium-belief" is that when a worker asks for an orthopedic chair, the employer believes that 10% of them have bad backs. The "out-of-equilibrium-belief" we can use to support the candidate equilibrium is "if a worker asks for a swivel chair, he must have a bad back". Given the belief, the employer will train worker asking for an orthopedic chair, and no training for a swivel chair. It is easy to check that the equilibrium strategy is also an optimal response to the employer strategy. Hence it is a perfect Bayesian equilibrium.

2. (a) In the efficient outcome, a worker will gets his or her favorite training and receives training with payoff \$3 for both types of workers. The employer gets \$1 for training a worker with a good back (prob. 0.9) and -\$1 for training a worker with a bad back (prob. 0.1). Hence the total payoff is  $0.9(3+1)+0.1(3-1)=3.8$ . In the equilibrium, a worker with a bad back receives \$2 instead of \$3.

The equilibrium total payoff is  $0.9(3+1)+0.1(2-1)=3.7$ . The equilibrium payoff is lower, hence is not efficient (not first-best).

(b) If all workers get orthopedic chairs and receive training, then the total payoff is

$$0.9(2.9 + 1) + 0.1(3 - 1) = 3.71$$

which is higher than the equilibrium total payoff. Hence the equilibrium is not second-best.

3. With the modified numbers, the equilibrium total payoffs is still the same as before. When the government mandates orthopedic chairs, the employer will give training to all workers (no separating equilibrium is possible). The total payoff from mandating orthopedic chairs is

$$0.9(2.85 + 1) + 0.1(3 - 1) = 3.665,$$

which is worse than the equilibrium payoff.