Note 10 with HW10

Models of non-verifiable information

When certain information about an agent is not verifiable, we may look for other verifiable information signals which are related to it, and make use of those information to make decisions. For example, a famous education model fits this description. An employer may use education levels of a prospective employee as the basis of making decisions. Education serves as a screening device in this issue. The employer gives higher wage to a worker with higher education levels, and lower one to worker with lower education levels. The contract is contingent on verifiable information which is related to the levels of education. There are costs of education, and difficulty of finishing the education requirement which are related to worker's ability or productivity.

A firm wants to hire a worker. There are two types of workers: those with back pain problems those who don't. There is no way to find out directly whether a worker has good or bad back.

The workers request the kinds of chairs they want: swivel or orthopedic chairs. The cost to the employer of providing either chair is 0. Workers with good back value the swivel or orthopedic chairs by \$1, \$0.90 respectively. Workers with bad back value them as \$0, \$1.

The employer decides whether to give training to workers. The worth of training to a worker is \$2 for either type.

The employer net benefits from training a worker with good back (\$1), but suffers from training a worker with bad back (\$-1, due to absence from work in the future). It is common knowledge that workers are more likely to have good back (prob. 0.9) than bad ones (prob. 0.1). This is the initial belief, and employer belief may be changed (or updated) when informed of the chair requested by the worker.

The employer uses the choice of chairs to decide whether to give training. The employer strategy maps the chair choice to training or no training. The worker decides which chair to request as a function of their types, anticipating the consequence of their choice, and different benefits from chairs as well as training. In a candidate equilibrium, you need to specify the strategies of each player, and the beliefs (in or out-of-equilibrium) of the employer after a worker request a particular chair. There are two kinds of perfect Bayesian

equilibrium: A perfect Bayesian equilibrium is called a separating equilibrium if different types of workers make different choices. It is called a pooling equilibrium if they make the same choice and cannot be distinguished from each other by the employer. A socially optimal (or efficient) outcome is one in which all workers receive training (benefit always outweigh costs), and all workers get the favored chair. The unique perfect Bayesian equilibrium is not efficient. Therefore it is not first-best. It is not second-best either. There is another outcome which is more efficient: all workers get orthopedic chairs and receive training. A legal requirement that orthopedic chairs be given to every worker would yield a more efficient one than the equilibrium without the legal intervention.

No Discrimination

Another kind of legal intervention is to forbid discrimination by law. In other words, training, when given, should be provided to all.

Such legal rule improves the worker with a bad back without hurting the employer. This is because the employer provides training anyway without the rule, but the worker with a bad back benefits from being able to request an orthopedic chair without fearing the loss of training.

Factors that may have implications for the merits (or demerits) of legal intervention:

(1) The amounts of benefits from having the correct chairs to use

(2) The distribution of population with back pain problems.

For instance, if we change the benefit of a worker with good back having a orthopedic chair to \$0.85 instead of 0.90, other assumptions are kept the same, then mandating orthopedic chairs leads to a worse outcome.

Sizes of benefits also affect the kinds of equilibrium that can arise.

If we change the benefit of a worker with bad back having an orthopedic chair to \$3 instead of \$1, then the payoffs are given in Fig 4.3.

There are two perfect Bayesian equilibrium in this game.

One is a separating equilibrium in which worker with a good, bad back asks for swivel, orthopedic chairs respectively, and the employer only gives training to the worker asking for a swivel chair.

The other is a pooling equilibrium in which both workers ask for orthopedic chairs and receive training, and employer has the out-of-equilibrium belief that anyone asking for a swivel chair has a bad back.

This pooling equilibrium is ruled out by the refinement of equilibrium dominance.

The separating equilibrium is not efficient, as all should receive training at an efficient outcome. The equilibrium has a total payoff less than that of the pooling equilibrium.

Requiring orthopedic chairs for everyone would improve the efficiency of the outcome. But it is still inefficient.

There is one way to get a separating equilibrium that is also efficient by a legal intervention. It calls for a damage compensation rule.

Damage Compensation Rule

The rule provides damages so that employer internalize the cost of training provision.

For example, if a worker requests orthopedic chairs, and the employer does not provide training as a result, then the employer is required to pay damage compensation to the worker equal to the value of training ($2).

With the damages, there are two perfect Bayesian:

One is a separating equilibrium in which a worker with good back asks for a swivel chair, a worker with bad back asks for an orthopedic chair, and both receive training.

The other is a pooling equilibrium in which both ask for orthopedic chairs and receive training. This equilibrium is ruled out by the refinement of equilibrium dominance.

The separating equilibrium is efficient (socially optimal).

Parental Leave

There are two types of workers: one who with low probability of becoming parents, and those with high probability of becoming parents. There is only one type of employer.

Those with high probability of becoming a parent would negotiate a contract allowing for parent leave in exchange for lower pay.

Those with low probability of becoming a parent would negotiate a contract without parental leave in exchange for higher pay.

Legal requirement of parental leave may prevent information revelation and leads to inefficiency.

If an employer does not want to hire any worker who plans to become parents for fear that they would not be willing to work overtime, we may get a pooling equilibrium in which no one asks for a parent leave.

A legal rule mandating parental leave yields a pooling equilibrium in which everyone gets a parental leave. Similarly considerations earlier will tell us whether mandatory parental leave will be more efficient.

Plant Closing Laws

The law mandates an employer to give employers advanced notice of plant closing.

To model the issues involved in such laws. We assume there are two types of firms: those with a low risk of failing and those with a high risk of closing. The firm has private information about its risk, such information is not verifiable.

A firm who gives advanced notice of closing suffers loss of productivity. A higher risk firm suffers higher cost from advanced notice. A worker prefers to work for a firm with lower risk of closing. A worker may monitor a firm to detect possible closing and reduce the cost of job loss. Monitoring also reduces productivity of the workers.

Workers can negotiate with the firm to provide advanced notice, so that monitoring cost can be reduced. A low risk will be willing to provide such a contract.

A high risk firm may find it less attractive to provide advanced notice. Thus the willingness to provide such a contract is a signaling device for the type of firms.

Mandating advanced notice of closing may prevent such information revelation, and make it less efficient outcome (depending on the parameter values). Similar analysis allows us to evaluate the merit or demerit of such legal rule.

Homework 10
Due April 10

1. There are two types of workers: those with back pain problems those who don't. There is no way to find out directly whether a worker has good or bad back. The workers request the kinds of chairs they want: swivel or orthopedic chairs. The cost to the employer of providing either chair is 0. Workers with good back value the swivel or orthopedic chairs by \$1, \$0.90 respectively. Workers with bad back value them as \$0, \$1.

The employer decides whether to give training to workers. The worth of training to a worker is \$2 for either type. The employer net benefits from training a worker with good back (\$1), but suffers from training a worker with bad back (\$-1) It is common knowledge that workers are more likely to have good back (prob. 0.9) than bad ones (prob. 0.1).

(a) Show that there is no perfect Bayesian equilibrium in which the worker with good back asks for a orthopedic chair, while the worker with a bad back asks for a swivel chair. (Note that beliefs and strategies of the employer are not specified here, and you need to consider all possible cases in your proof).

(b) Show that there exists no equilibrium in which a worker with good back asks for a swivel chair, while a worker with bad back asks for a orthopedic chair. (Note that beliefs and strategies of the employer are not specified here, and you need to consider all possible cases in your proof).

(c) Show that there is one pooling equilibrium in which both workers ask for a swivel chair. The employer offers training when the worker asks for a swivel chair, and no training when a worker asks for a orthopedic chair. (Again, you need to specify in and out-of-equilibrium belief here).

(d) There is another pooling equilibrium in which both workers ask for an orthopedic chair, and the employer offers training to those who ask for orthopedic chairs, and no training to those asking for a swivel chair. (Again, you need to specify in and out-of-equilibrium belief here).

2. (a) Under the same assumptions in problem 1, what is the total payoff of all players in the efficient outcome? (Compute the sum total of the expected payoffs of the worker and the employer), and compare with that of the unique equilibrium (in 1(c)). Which is higher?

(b) Show that the unique equilibrium is not second-best. It is less efficient than the one in which all workers get orthopedic chairs and receive training. Compute and compare the total payoffs.

3. (a) Now we change the benefits of a worker with good back having a orthopedic chair to \$0.85 instead of 0.90, other assumptions in problem 1 are kept the same. Show that the equilibrium in (1(c)) is still an equilibrium.

(b) Show that mandating orthopedic chairs leads to a worse outcome than the equilbrium.