Econ 537 Take-Home Final

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1. (a)

Employer side:

Given workers’ strategy, “the worker with good back asks for an orthopedic chair, while the worker with a bad back asks for a swivel chair”, then the employer’s belief given workers’ strategy could only be, “worker who choses orthopedic chair has good back, while worker who choses swivel chair has bad back.” Any other beliefs will be updated over time and approach to this belief, since the payoff outcomes will reveal the true types of workers with certainty. With this belief, the employer’s **best response strategy** is “give training to a worker who choses orthopedic chair, while do not give training to a worker who choses swivel chair”. This is because payoff of “training” when “choose orthopedic chair” is 1 and beats payoff of “no training” which is 0; payoff of “no training” when “choose swivel chair” is 0 and beats payoff of “training” which is -1.

Worker side:

Given the employer’s strategy as described above, current strategy of worker with bad back is dominated by the strategy, “choose orthopedic chair”. When both workers choose orthopedic chair, the employer will choose “always give training” since his belief “workers are more likely to have good back” informs him that “training” gives payoff = (1 - *p*) - *p* = 1 – 2*p* > 0 but “no training” gives payoff = 0. Thus, payoff for worker with bad back becomes 3 and dominates the strategy, “chooses swivel chair”. So, worker with bad back should deviate from “choose swivel chair” to “choose orthopedic chair”; thus, there is no perfect Bayesian equilibrium as described in the question.

Since the only constraint on *p* is employer’s belief of “workers are more likely to have good back”, thus *p*’s interval should be *p* < ½.

(b)

Strategy for analysis in question (a) applies in this question. First, on employer side, his belief could only be “the worker with good back asks for a swivel chair, while the worker with a bad back asks for an orthopedic chair”. The reason for this has been explained. With this belief, the employer should choose “training” to worker who chooses swivel chair, and “no training” to worker who chooses orthopedic chair. On worker side, given the employer’s strategy, worker with bad back has the incentive to deviate from “choose orthopedic chair” to “choose swivel chair”, since this could yield payoff of 2.9 instead of 0.9 from the current strategy. The reason is when all workers choose swivel chair, “training” should give payoff of 1 – 2*p* > 0 to the employer, which is better than “no training” payoff = 0. Thus, there is no perfect Bayesian equilibrium as described in the question. Interval for *p* is *p* < ½ as explained in question (a).

(c)

Given strategy, “both workers ask for a swivel chair”, the employer’s belief should be “prob. *p* worker who chooses swivel chair has bad back, prob. 1 – *p* worker who chooses swivel chair has good back, no worker chooses orthopedic chair”. One of his best response to this belief and workers’ strategy could be “always give training to workers who choose swivel chair, no training to workers who chooses orthopedic chair” because this payoff = 1 – 2*p* > 0 which dominates strategy “no training to workers who choose swivel chair” with payoff = 0, and strategy facing “worker choose orthopedic chair” is not related to his payoff. Given employer’s strategy, both workers are best responding: currently worker with good back or bad back has payoff of 3 and 2, respectively; deviation to “choose orthopedic chair” could only give payoff 0.9 to worker with good back and 1 to worker with bad back. So, the equilibrium described above is a Perfect Bayesian equilibrium, and interval for *p* is *p* < ½ as usual.

(d)

Using similar analysis in question (c), employer has belief “prob. *p* worker who chooses orthopedic chair has bad back, prob. 1 – *p* worker who chooses orthopedic chair has good back, no worker chooses swivel chair” given workers’ strategy. And this belief could end up in strategy “always give training to workers who choose orthopedic chair, no training to workers who choose swivel chair” because of same reasoning in question (c). Given employer’s strategy, worker with good back has payoff = 2.9 from “choose orthopedic chair” and payoff = 1from “choose swivel chair”; worker with bad back has payoff = 3 from “orthopedic chair” and payoff = 0 from “swivel chair”. Workers have no incentive to deviate. So, this is a Perfect Bayesian equilibrium, and interval for *p* is *p* < ½.

However, knowing that worker with bad back is going to mimic good back worker’s strategy with certainty, good back worker could indicate that when he chooses “swivel chair”, bad back worker should also choose “swivel chair”. With “swivel chair”, good back worker always has payoff = 3, which better off “orthopedic chair” with payoff = 2.9. As a result, this equilibrium is ruled out.

(e)

In question (c) equilibrium, the efficient total payoff = 3(1 – *p*) + 2*p* + (1 – *p*) – *p* = 4 – 3*p*. When mandating orthopedic chair, equilibrium should be “both worker choose orthopedic chair, the employer always give training”. Reasoning is the same in question (d). Total payoff = 2.9(1 – *p*) + 3*p* + (1 – *p*) – *p* = 3.9 – 1.9*p*. For this to be a less efficient outcome, we need 4 – 3*p* > 3.9 – 1.9*p*, which derives *p* < 1/11. In this case, legal intervention is not favored.

2.

(a)

With the belief, “if the seller acquires information, but does not disclose it, the furnace must be bad”, buyer will pay $180 whenever seller does not disclose information. The reason is that seller with a good furnace house is always willing to disclose information for a higher payoff = 200 – 8 = $192 even he is a high cost seller. Since “pay $180 when no disclosure” is buyer’s dominating strategy, it is reasonable for all seller to acquire information and disclose it. For low cost seller, this strategy has expected payoff = 0.5 \* 200 + 0.5 \* 180 – 4 = $186; for high cost seller, this strategy has expected payoff = 0.5 \* 200 + 0.5 \* 180 – 8 = $182. Both payoffs are higher than the payoff of “not disclose information after finding a bad furnace” or “not acquire information”. After finding a bad furnace, it is indifferent for seller to disclose or not disclose the information. The value of *p* is not related here since it is always better for both low-cost or high-cost seller to acquire and disclose. Thus, this is a perfect Bayesian equilibrium.

(b)

With the new belief, “if seller acquires information but does not disclose it, the furnace is good or bad with equal probability”, buyer should pay 0.5 \* 200 + 0.5 \* 180 = $190 when no information disclosed according to the probability in the belief. With buyer’s strategy, “acquire information” gives low cost seller expected payoff = 0.5 \* 200 + 0.5 \* 180 – 4 = $186, which is lower than the payoff of “not acquire information”. Thus, low-cost seller has the incentive to not acquire information. Same situation applies for high-cost seller since he is also better off when he chooses “not acquire information”. Values of *p* is not related since it is always better for both types to deviate from equilibrium. As a result, this is not a perfect Bayesian equilibrium.

(c)

(i) Given sellers’ strategies, when no information disclosed, buyer has the belief that “the house is bad with prob. = 0.5”, so he should be willing to pay $190. Following the described strategy, low cost seller has expected payoff = 0.5 \* 200 + 0.5 \* 180 – 4 = 186 < 190, low cost seller has the incentive to deviate to “not acquire information. Thus, this is not a perfect Bayesian equilibrium for all *p*.

(ii) Given sellers’ strategies, when no information disclosed, buyer has the belief that “the house is bad with prob. = ”, so he should be willing to pay:

Following the described strategy, low cost seller has expected payoff =

This payoff is always bigger than the payoff from no information disclosed case.

For high cost seller, “acquire information but not disclose if it is bad” gives him expected payoff:

, then high cost seller is better off when he chooses “acquire information and not disclose if it is bad”. There is another smaller interval of *p* for high cost seller to deviate to “acquire information and disclose anyway”, but it is dominated by “acquire and not disclose if it is bad”, so I do not solve for this *q*. So, this is a perfect Bayesian equilibrium only when *p* ≤ ¾.

(iii) Given sellers’ strategies, when no information disclosed, buyer has the belief that “the house is bad with prob. = ”, so he should be willing to pay:

Low cost seller has expected payoff:

For low cost seller not deviate, we need , which gives us the condition: . This condition is always true so low cost seller never has the incentive to deviate.

High cost seller has expected payoff from “acquire information and not disclose if it is bad”:

For high cost seller not deviate, we need, which gives us the condition: . This is condition is always true, so high cost seller never deviates.

In conclusion, this is a perfect Bayesian equilibrium for all possible *p*.

3.

(a)

(b)

We know the Bayesian equilibrium bidding strategy is:

(c)

Plug in the FOD condition, we have

The FOD condition satisfies.

(d)

Revenue is

(e)

Given the reservation price *r*, the biding strategy is

The revenue is

Taking first derivate

With the optimal reservation price *r* = ,revenue =

(f)

All buyers should bid their true value, as *b(v) = v,* we know virtual value is

4.

(a)

Assume buyer and seller share the trade surplus. So, their expected price *P* =

Expected buyer’s payoff =

Expected seller’s payoff =

Calculating first order condition regarding to *i\** and *j\**, we will get:

Assume that quantity level *q* = 1, then we will have *i\* =* 1, *j\**

(b)

Expected buyer’s payoff =

First order condition gives us:

A higher results in higher marginal return from *j* thus optimal level of *j* should increase. This will not affect the level of *i.*

(c)

They can make the contract: there is default price and quantity, (. When investment is realized, the buyer makes an offer to the seller. The seller can accept it or reject it and pay the default option.

Since in this mechanism, buyer can offer to trade ex-post efficient quantitywhile leaving the seller indifferent between the trade and the default-option, so seller will choose *i* to maximize:

Taking first order condition will give us the optimal default quantity

5.

(a) According to Myerson (1981), equilibrium bidding strategy:

(b) Expected revenue:

(c) Prob. =1 since it should be always sold.

(d) Since seller’s expected revenue = 1, that means the item is sold only to buyer who bids his true value = 1, which gives him 0 payoff. Other buyers also have 0 payoff. So the equilibrium payoff = 0.

(e) It benefits for the seller. Recall when N=2, expected revenue = 1/3, when N increases, buyer has more competition in bidding price so they tend to bid more closely to their true value. Meanwhile, more buyer gives more realization of high value, so the final payment should increase as N increases.

6.

For each individual *i,* he only pays tax only when . Such individual is called pivotal individual, and he pays tax

(c)

When *i* is pivotal,

When *i* is not pivotal,

So, is always true.

(d)

Yes. Collected tax

So total collected tax revenue is always less than or equal to the cost.

7.

(a)

(b)

it is better to pay the penalty.

(c)