

EconS 503 - Microeconomic Theory II
Homework #8 - Due date: April 15th, in class.

1. **Exercise from MWG:**

(a) Chapter 13: Exercise 13.C.2.

2. **Exercise from Fudenberg and Tirole:**

(a) Chapter 8: Exercise 8.6.

3. **Labor signaling with two and three types.** Consider the Spence's labor market signaling game we discussed in class. A worker with privately known productivity θ chooses an education level e . Upon observing e , each firm responds with a wage offer that corresponds to the worker's expected productivity. The payoff of a worker with type θ from wage w and education level e is $w - \frac{e^3}{\theta}$.

(a) Assuming that there are two equally likely types $\theta_L = 1$ and $\theta_H = 2$, characterize the set of all separating equilibria.

(b) Assuming that there are three equally likely types $\theta_L = 1$, $\theta_M = 2$ and $\theta_H = 3$, characterize the set of all separating equilibria.

(c) Which of these equilibria survive the Intuitive Criterion?

(d) Which of these equilibria survive the Divinity Criterion?

4. **Too-Cool-for-School, or Countersignaling, based on Feltovich et al. (2002).**¹

Consider the following labor signaling game with three types. Bob privately observes his productivity, θ_L , θ_M , or θ_H (denoting low, medium, or high productivity), where $0 < \theta_L < \theta_M < \theta_H$. The prior probability that Bob's type is being θ_L is λ_L , the prior probability that his type is θ_M is λ_M , and the probability that his type is θ_H is $1 - \lambda_L - \lambda_M$. Bob acquires an education level $e \geq 0$, with cost function $c(e, \theta) = \frac{e}{\theta}$. A manager (Alice) observes Bob's education, e , but doesn't observe his type, and responds offering a salary $w \geq 0$ to Bob. Alice's utility function is $(\theta - w)^2$, which depends on Bob's true type, θ , and the salary she pays, w . Bob's utility function is $w - c(e, \theta)$. Each agent is an expected utility maximizer.

We modify the above three-type labor market signaling game as follows. Carol, Bob's former employer, has learned something about his type. In particular, if Bob's type is θ_L , Carol believes that Bob is "sloppy." If Bob's type is θ_H , however, Carol believes that Bob is a "pro." If Bob's type is θ_M , Carol believes that he is sloppy with probability $p \in (0, 1)$ and a pro with probability $1 - p$. Here is the time structure of the game:

¹Feltovich, N., R. Harbaugh, and T. To (2002) "Too Cool for School? Signaling and Countersignaling", RAND Journal of Economics, 33(4), pp. 630-49. Downloadable in Rick Harbaugh's webpage: <https://kelley.iu.edu/riharbau/>.

- 1) At time $t = 0$, Alice can privately meet Carol and learn whether, in Carol's opinion, Bob is sloppy or a pro.
- 2) At time $t = 1$, Bob acquires an education level $e \geq 0$ at the cost $c(e, \theta)$.
- 3) At time $t = 2$, Alice meets Bob and observes his education e , and pays him a salary $w \geq 0$.
- 4) At time $t = 3$, Alice's and Bob's utilities are realized.

Answer the following questions:

- (a) Assuming that Alice does not meet Carol at time $t = 0$ and that Bob knows that Alice does not meet Carol, solve for the least-costly separating equilibrium. Interpret.
- (b) Assume that Alice meets Carol at time $t = 0$ and learns whether Bob is sloppy or a pro, and that Bob knows that Alice meets Carol but does not know what Alice learns. Identify the parameter conditions for which there exists a so-called countersignaling (or too-cool-for school) equilibrium, in which Bob's chooses education levels $e_L = 0$, $e_M > 0$, and $e_H = 0$. Why do you think that this equilibrium is called "countersignaling"?
- (c) Does the equilibrium found in part (b) survive the Cho and Kreps' Intuitive Criterion?
- (d) Would Alice be better off if she could publicly commit not to discuss Bob's past job performance with Carol? Would Bob be better off?
- (e) In 1970s, Gola Meir, then the Israeli prime minister, reproached a U.S. diplomat, who had just given a speech in Jerusalem: "You shouldn't be so humble; you are not so great." Discuss Golda Meir's remark in the context of the countersignaling model.