EC387 PS4

1. This problem considers an extension of the Ellis and McGuire (EM, 1986) problem. Imagine a doctor trying to decide which of exactly two drugs A and B to prescribe for a single representative patient. The factors that enter into the doctor's utility from prescribing each drug include:

i) The bribes or side payments S_i received from the pharmaceutical companies for each drug prescription, which for this problem should be thought of as persuasion payments, not information payments, S_A and S_B.

ii) The benefit to the patient expected for each drug, calculated in terms of its efficacy E where without loss of generality we assume $E_A > E_B$. Implicitly we assume E is measured in dollars. Doctors attach a weight α to these patient benefits (efficacy).

iii) The out of pocket (OOP) cost to the patient for each drug, $O_A = \theta P_A$ and $O_B = \theta P_B$ where $= \theta$ is the fraction of the drug fee paid by the consumer for either drug, P_A and P_B are the prices chosen for drugs A and B, and the consumer pays the same fraction θ as specified by her health plan.

For simplicity, assume that the marginal cost of both drugs is $0.

The doctor cares about revenue P_i as well as E_i and O_i, although perhaps is an imperfect agent.

Hence the doctor's utility function for drug i is:

$U_i = S_i + \alpha E_i - \beta \theta P_i$ where i = A, B

Where $0 <= \alpha <= 1$ is the EM agency weight assigned to the effectiveness of the drug
$0 < = \beta <= 1$ is the utility weight assigned by doctors to OOP costs to the patient
$0 <= \theta <= 1$ is the consumer cost share paid for each drug
P_i is the price charged by the pharmaceutical company for drug i
S_i is the side payment made by the pharmaceutical company to choose drug i.
E_i is the effectiveness of the drug, measured in dollar terms
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Assume that the only revenue to the doctor from the prescription is S_A or S_B, and that if the doctor is indifferent she chooses A. The doctor does not sell or otherwise benefit from the price charged.

a) Assume B is off patent and competitively supplied so that $P_B = 0$ = Marginal cost. If the price is zero, can it ever make sense for a pharmaceutical company to pay a side payment to get the drug adopted? Assume $S_B=0$ throughout the rest of the problem.

b) Write an expression for the doctor's utility of drug B, U_B given a).

c) Write out an expression characterizing the physician's choice between A and B for the general case without knowing any of the parameters. It should include $\{\alpha, \beta, \theta, S_A, E_A, P_A, S_B, E_B, P_B\}$

d) Use the expression in c) to solve for the optimal price P_A given all of the other parameters.

e) Suppose $\alpha = \beta = \theta = 1$ (perfect agents and no insurance) $P_B=S_B=0$ (perfect competition) and that $E_A - E_B = 10$, i.e., A is much more valuable (effective) than B. If P_A is not allowed, so $S_A = 0$, then what will be the welfare maximizing price for A to choose, P_A?

f) Continue to assume $\alpha = \beta = 1$ and $E_A - E_B = 10$, but allow θ to reflect partial insurance. If still $S_A = 0$, then what will happen to P_A as θ goes to zero? Calculate the profit-maximizing P_A for $\theta = 1/10$.

g) Now assume $\theta = 1$ and consider the effect of allowing β to differ from 1 while $\alpha = 1$. If $S_A = 0$, then what will happen to P_A when $\theta = 1$ but β goes to zero? Calculate the profit-maximizing P_A for $\beta = 1/10$.

h) Now suppose that $S_A = 0$, $\alpha = \beta = 1/10$ and $\theta = 1/10$. Calculate the profit-maximizing P_A.

i) Still assuming $\alpha = 1/10$ and $\theta = 1/10$, what happens to P_A if $S_A = 10$. At the profit max, what is the derivative of P_A with respect to S_A?

j) Ellis and Jelovac (2018) explore the implications of the Hippocratic Oath, whereby doctors are told that costs do not matter, and are instructed to always choose the more effective drug. What is the profit maximizing value for P_A for the drug firm if $\alpha = 1000$, $\beta = 1/10$, $\theta = 1/10$, and $E_A - E_B = 0.1$?