

# Theory of the Firm, Fall 2016

## Problem Set 8

This is a practice problem set for the final exam and you don't have to submit the solutions. Have fun!

### Problem 8.1 \*

Suppose that there is an illness which is cured by a freely available treatment with probability  $\alpha$ . Suppose there are  $n$  firms who each sell the treatment in a different package, so that it is perceived as different product, but the actual effect does not change. So, with each  $n + 1$  treatments, it cures the agent with probability  $\alpha$ . We assume that agent gets payoff 1 if cured and 0 if not, and minus the price of treatment in both cases.

Suppose the agents use sampling-based (or anecdote-based) reasoning: they each hear one random example about the effectiveness of each treatment and mistakenly believe that this is the true value.

- 1) Explain, whether and how can firms charge positive prices for their treatments, when equally good alternative is freely available?
- 2) Compute the average price and profit when  $n = 3$ . What happens with average price and profit, when  $\alpha \rightarrow 0$ ? What if  $\alpha \rightarrow 1$ . Explain the intuition.

### Problem 8.2 \*\*\*

Exercise 6.1 (page 83) from Spiegler's book "Bounded Rationality and Industrial Organization".

### Problem 8.3 (Problem from a previous final exam)

Consider a market with a continuum of consumers and two firms. Both firms 1 and 2 produce at zero costs. Each consumer can purchase at most one product. Consumer who does not buy anything gets utility 0 and a consumer who purchases the product from firm  $i$  gets utility  $1 - t$ , where  $t$  is the total expenditure (purchase price + search costs). Firms choose the prices randomly, with corresponding cumulative distribution functions  $G_1$  and  $G_2$ . Assume that consumers know distributions  $G_1$  and  $G_2$ , but do not know which of the firm is 1 and which is 2. The prices are never negative and never higher than 1.

- (a) Suppose that the consumers can costlessly ask the price quotes from each of the firms and then choose their preferred option. Characterize a symmetric equilibrium.
- (b) Suppose that both firms randomize their prices uniformly in  $[0, 1]$  and the consumers can ask a price quote at costs  $c = \frac{1}{8}$  from one or both firms (sequentially, i.e. they can stop after checking 0, 1, or 2 prices) and then purchase their preferred option. What would be the optimal search behavior?
- (c) Suppose that the consumers search sequentially as described in (b) and firms choose their pricing strategies  $G_i$  simultaneously. Characterize a symmetric equilibrium.

- (d) Suppose now that instead of costly search, consumers get (random) pricing information from their friends. In particular, each consumer gets a random draw  $(\tilde{p}_1, \tilde{p}_2)$  and then regardless of the price  $p_i$  she actually pays, purchases from the firm with lower  $\tilde{p}_i$ . Characterize a symmetric equilibrium.