ECON 433
Quizzes on Dynamic Oligopoly, Patents, and Mergers

Dr. Kevin Hasker

$\chi_1 = \chi_2$	t
10	4
2	8
4	12
4	8

1. *(18 points total)* Consider a linear city where the customers are distributed uniformly over the interval $[0,1]$. Firm a is located at 0 and firm b is located at 1. Their cost functions are $c_1(q) = \chi_1 q_a$ and $c_2(q) = \chi_2 q_b$. These firms choose prices, p_a and p_b. A consumer at location $x \in [0,1]$ has the preferences:

$$u(p_a, p_b, x) = \begin{cases} V - p_a - tx^2 & \text{if they buy from firm } a \\ V - p_b - t(1-x)^2 & \text{if they buy from firm } b \\ 0 & \text{if they do not buy.} \end{cases}$$

You may assume that V is high enough that they always buy from either firm a or firm b.

(a) *(2 points)* Confirm that:

$$\begin{aligned} D_a &= \frac{1}{2t}(t + p_b - p_a) \\ D_b &= \frac{1}{2t}(t + p_a - p_b) \end{aligned}$$

you may use this from now on even if you can not derive it.

(b) *(2 points)* Set up the objective functions of firm a and b.

(c) *(4 points)* Find the best responses of both firms.

(d) *(3 points)* Find the equilibrium prices of both firms and their profits. **NOTE:** You may not assume the equilibrium prices are the same.

Now consider a model where firm a chooses their price and then firm b chooses their price.

(e) *(1 point)* Why do you not need to derive the best response of firm b again?

(f) *(2 points)* Set up the objective function of firm a in this new environment.

(g) *(4 points)* Find the optimal value for p_a, p_b, and both of their profits. How do their profits compare to those found when they chose price simultaneously?

2. *(5 points)* What is Shumpeter's Hypothesis? What does the empirical evidence suggest about the importance of market structure on research and development (in terms of R&D expenses relative to revenue)?

3. *(14 points total)* About Entry and exit.

   (a) *(6 points)* What are the stylized facts about entry and exit? For example, is it cyclical? How much is there? What size are these firms relative to others in the industry? How long do these firms last? I am not looking for precise numbers.

   (b) *(4 points)* What is take or pay? How can incumbents use this to make entrants smaller?

   (c) *(4 points)* Do the stylized facts fit a classic analysis of entry and exit? Do they match Shumpeter's hypothesis? Explain.

4. *(6 points)* Explain intuitively why a merger between firms who's strategy variables are strategic compliments will result in higher profits than before the merger. You may assume their strategic variable is price.

χ	a	b
4	28	4
8	28	2
16	28	1
8	24	1

5. *(12 points total)* Consider a Stackleberg leader model. Firm 1 chooses their quantity first and has total cost $c_1(q) = \chi q_1$, firm 2 chooses their output second and has total cost $c_2(q) = \chi q_2 + \phi^2 \frac{(a-\chi)^2}{b}$. The inverse demand curve is $P = a - bQ$.

   (a) *(2 points)* Assuming firm 2 produces a positive output, what will be their best response (as a function of the quantity firm one produces)?

   (b) *(4 points)* As a function of ϕ, what output for firm one will make firm 2 shut down? (I.e. they would make a negative profit if they produced any output.

   (c) *(4 points)* Assuming firm 2 produces a positive output, what quantity will firm 1 choose? What will their profits be?

   (d) (*2 points)* As a function of ϕ, when will making firm 2 shut down result in higher profits than letting firm 2 produce a strictly positive output? You do not need to explicitly solve for the range of ϕ, you can find them as the solution to an equation.