Written Exam for the B.Sc. or M.Sc. in Economics summer 2014

Microeconomics C

Final Exam

August 13, 2014

(2-hour closed book exam)

Please note that the language used in your exam paper must correspond to the language of the title for which you registered during exam registration. I.e. if you registered for the English title of the course, you must write your exam paper in English. Likewise, if you registered for the Danish title of the course or if you registered for the English title which was followed by "eksamen på dansk" in brackets, you must write your exam paper in Danish.

This exam question consists of 3 pages in total (including this page).

1. Consider the following game G:

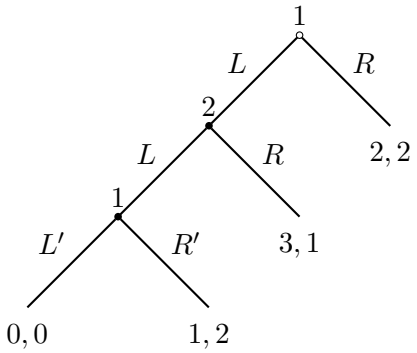
		Player 2		
		D	E	F
Player 1	A	$7,7$	$1,8$	$1,6$
	B	$2,0$	$3,3$	$2,2$
	C	$6,3$	$2,1$	$5,4$

   (a) Find all pure strategy Nash Equilibria in G. Find a mixed strategy Nash Equilibrium where Player 1 randomizes between B and C and Player 2 randomizes between E and F.

   (b) Now consider the game $G(2)$, where G is repeated twice. Find a Subgame Perfect Nash Equilibrium of $G(2)$ where Player 1 earns a total payoff of 12.

   (c) Would the Subgame Perfect Nash equilibrium from part (b) still exist if the payoffs $(3,3)$ from strategy profile (B,E) were replaced by $(1,3)$? Explain your answer briefly (2-3 sentences).

2. Now consider this game written in extensive form:



   (a) Is this a game of complete or incomplete information?

   (b) Write down the strategy sets for Player 1 and for Player 2, and find all pure strategy Subgame Perfect Nash Equilibria.

   (c) Find all pure strategy Nash Equilibria of this game.

   (d) Check that every Subgame Perfect Nash Equilibrium in this game is also a Nash Equilibrium. Briefly explain why this must be the case (2-3 sentences). Take one Nash Equilibrium and describe intuitively why it is not subgame perfect (2-3 sentences).

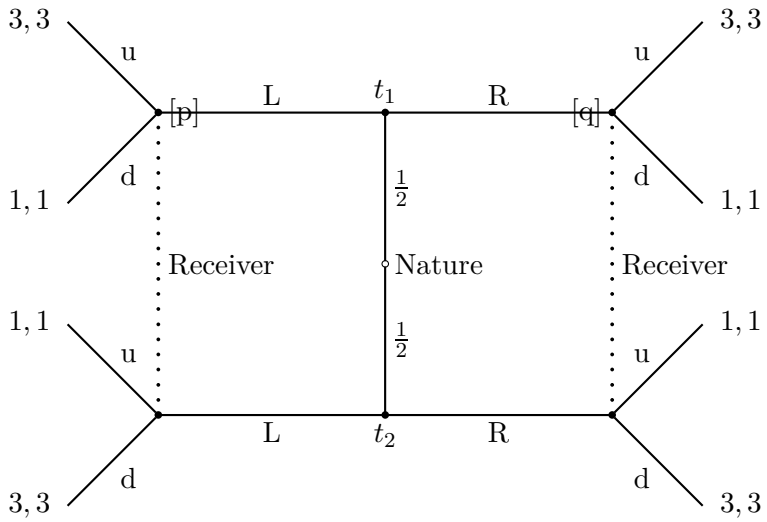
3. Two firms compete in the market for frozen desserts, where Firm 1 produces chocolate ice cream and Firm 2 produces vanilla. These products are imperfect substitutes: demand for chocolate ice cream is $q_1 = 1 - p_1 + p_2$, and demand for vanilla is $q_2 = 1 - p_2 + p_1$, where p_1 and p_2 are the prices of Firm 1 and 2. Firm 1 has access to advanced ice cream production technology that allows it to produce at zero marginal cost. Firm 2 is still using old-fashioned production techniques, so it has marginal costs of $c > 0$. This means profits for Firm 1 are $\pi_1 = q_1 p_1$, and profits for Firm 2 are $\pi_2 = q_2(p_2 - c)$. Firms set prices simultaneously and independently.

   (a) Show that in the Nash Equilibrium of this game, firms set prices $p_1 = 1 + c/3$ and $p_2 = 1 + 2c/3$. Explain intuitively why both equilibrium prices are increasing in c (2-3 sentences).

(b) Suppose Firm 2 develops an innovation that it hopes will lower production costs. If the innovation works, then Firm 2's marginal costs become zero. If the innovation does not work, then its marginal costs remain at c. Firm 2 knows whether or not the innovation works (so it knows its own marginal cost), but Firm 1 does not. Firm 1 believes there is a probability 1/2 that the innovation works, so that Firm 2 has marginal cost of zero, and a probability 1/2 that it does not work, so that Firm 2 has marginal cost of c. Write down the three best-response functions that, taken together, implicitly define the prices in the Bayes-Nash equilibrium of this game. *(It is sufficient to write down the best-response functions of the players. You do not need to explicitly solve for the equilibrium prices).*

(c) *(You should attempt to answer this question even if you were unable to solve parts (a) and (b)).* Imagine that before setting prices, Firm 2 announces to Firm 1: "Unfortunately, the innovation does not work, so I have high costs!" Why might Firm 2 make such an announcement? How do you expect this announcement to affect the price set by Firm 1? Explain your answers briefly (2-3 sentences each).

4. Consider the following game G':



(a) Is G' a static or a dynamic game?

(b) Find one separating Perfect Bayesian Equilibrium and one pooling Perfect Bayesian Equilibrium.

(c) Do these equilibria from part (b) satisfy Signaling Requirement 6?

(d) What real-world strategic situation might correspond to G'? Explain briefly who are the players, what are the messages, what are the actions, and whether you think people are more likely to play a separating equilibrium or a pooling equilibrium (3-5 sentences).