Information Economics, Fall 2015
Pre-lecture Problems for Lecture 3

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Note. The deadline of submitting the pre-lecture problem is ***9:20am, October 5, 2015***. Please submit a hard copy of your work to the instructor in class. Late submissions will not be accepted. Each student must submit her/his individual work. Submit ONLY the problem that counts for grades.

1. (0 points) Recall the following Bertrand competition (for heterogeneous products): Two firms, 1 and 2, simultaneously set prices p_1 and p_2 for two substitutes. Given these prices, firm 1 sells $q_1 = a - p_1 + bp_2$ and firm 2 sells $q_2 = a - p_2 + bp_1$, where $a > 0$ and $b \in [0, 1]$. There is a unit production cost $c < a$ for both firms. Suppose that each firm wants to maximize its own profit.

   (a) Verify that the unique equilibrium is
   $$p_1^* = p_2^* = \frac{a-c}{2-b}.$$

   (b) Show that when $a = 1$ and $c = 0$, this result is the same as that in the I1 channel structure in McGuire and Staelin (1983).

2. (0 points) Consider the equilibrium wholesale prices w_i^* and retail prices p_i^* derived in pages 18 and 19 as functions of θ (cf. equations (4-29) and (4-30) in McGuire and Staelin (1983)). Determine how they change when θ changes. Make some economic interpretations.

3. (10 points; 2.5 points each) In lecture videos, we solved the static channel structure game

		M2: I	M2: D
M1	I	$\frac{1}{(2-\theta)^2}$, $\frac{1}{(2-\theta)^2}$	$\frac{2+\theta}{4(2-\theta)(2-\theta^2)}$, $\left[\frac{4+\theta-2\theta^2}{2(2-\theta)(2-\theta^2)}\right]^2$
	D	$\left[\frac{4+\theta-2\theta^2}{2(2-\theta)(2-\theta^2)}\right]^2$, $\frac{2+\theta}{4(2-\theta)(2-\theta^2)}$	$\frac{(2+\theta)(2-\theta^2)}{(2-\theta)(4-\theta-2\theta^2)^2}$, $\frac{(2+\theta)(2-\theta^2)}{(2-\theta)(4-\theta-2\theta^2)^2}$

   played by the two manufacturers. We showed that when $0.708 < \theta < 0.931$, this static game is actually a prisoners' dilemma: The two firms may be better off by choosing DD together, but II is the unique Nash equilibrium.

   (a) Set $\theta = 0.8$ show that this game is indeed a prisoners' dilemma.

   (b) Set $\theta = 0.95$ and show that there are two Nash equilibria.

   (c) Continue from Part (b). What if the game is played dynamically, i.e., manufacturer 1 first sets its channel structure and then manufacturer 2 makes its decision by observing manufacturer 1's decision? Does the not-so-good equilibrium go away or become more likely to happen?

   (d) Continue from Part (c). Does your conclusion hold for all $\theta > 0.931$? Why or why not?

References

McGuire, T. W., R. Staelin. 1983. An industry equilibrium analysis of downstream vertical integration. *Marketing Science* **2**(1) 115–130.