Written Exam for the M.Sc. in Economics Summer 2012

Advanced Industrial Organization

Final Exam

1 June, 2012

(3hours 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.

If you are in doubt about which title you registered for, please see the print of your exam registration from the students' self-service system.

ALL QUESTIONS BELOW SHOULD BE ANSWERED

1. We consider a Cournot oligopoly with n firms producing a homogeneous output.

   The firms are symmetric and all have the cost function

   $$C(x_i) = cx_i,$$

   where $c > 0$ is a constant and x_i is the production of firm i.

   The price, p, is determined by the inverse demand function

   $$p = a - bX$$

   where $X = \sum_{i=1}^{n} x_i$ is total production and $a > c \ (> 0)$ and $b > 0$.

   (a) Find the symmetric Cournot equilibrium, and expressions for production per firm, x, price, p, and profit per firm, π.

   (b) Now consider a merger among two firms. Assume that the merger gives rise to synergies, so that the merged firm's cost function is

   $$C_m(x_m) = mx_m$$

   where $0 \le m \le c$ and x_m is the production of the merged firm.
   Find the Cournot equilibrium after the merger. (Remember that the equilibrium is *not* symmetric after the merger). You should find expressions for the production of the merged firm x_m, the production per firm of the non-merged firms, x, the price, p, and the profit to the merged firm, π_m.

   (c) Show that the merger leads to a lower equilibrium price if and only if the merger gives a sufficiently large synergy, namely if and only if

   $$c - m > \frac{a - c}{n + 1} \tag{1}$$

   Discus this result in view of Farrell and Shapiro's general result concerning mergers, which do not lead to synergies.

   (d) A competition policy authority is likely to clear the merger if the involved firms have a sufficiently small joint market share. Does this make sense in view of condition (1)?

(e) Show that the merger is profitable for the merging firms if and only if

$$c - m > \frac{\left(1 + \sqrt{2}\right) n + 1}{n + 1} \frac{a - c}{n + 1} \tag{2}$$

Discuss the dependence on n. Is the condition more easy or more difficult to have fulfilled if the number of firms n increases? Explain the intuition behind the result you find here.

(f) Suppose that the competition policy authority knows all details of the market and the firms except that it does not know the synergy effects of the merger, i.e. the competition policy authority knows the whole model except the value of m. Suppose further that the competition authority is interested in consumer surplus. Should the competition policy authority clear the merger if the firms ask for it?

(g) Without deriving the result, explain in words the central result in Farrell and Shapiro concerning the welfare effects of mergers in Cournot markets. Discuss the problems with an empirical implementation of their criterion for a welfare improving merger.

(h) Farrell and Shapiro consider mergers in a static Cournot model. In competition authority lingo, such effects are called one-sided effects. When a competition authority considers a merger it should investigate one-sided as well as so-called coordinated effects, which are effects pertaining to tacit collusion and cartel behavior. Explain and discuss the so-called Airtour's conditions which competition authorities use to evaluate coordinated effects of mergers. Explain - in words no formulas - how they are related to the theoretical contributions of Stigler and Green and Porter.

2.   Two firms produce a homogenous product and compete in prices. The firm setting the lowest price takes the whole market. If the firms set the same price, they split the market equally. The firms have marginal costs equal to 1. There is an infinite number of periods: $t = 0, 1, ..., \infty$. The per-period discount rate is $\delta < 1$. There is a continuum of consumers of size 1. The consumers have unit demand, and the willingness to pay for the good is v_t in period t. The willingness to pay is deterministic but cyclical: $v_0 = 3, v_1 = 2, v_2 = 3, v_3 = 2, v_4 = 3...$ The firms are aware of this.

   (a)   Derive the equation that determines the critical discount factor $\underline{\delta}$ above which the firms can sustain tacit collusion on the monopoly price in all periods. Show that $\underline{\delta} > \frac{1}{2}$.

   Suppose in the following two questions that $\delta < \underline{\delta}$ such that collusion on the monopoly price every period is not possible.

   (b)   Show that the firms are able to sustain tacit collusion for $\frac{1}{2} \leq \delta < \underline{\delta}$. Derive the optimal collusive prices in odd and even periods.

   (c)   Suppose now instead that the willingness to pay is not deterministic, still either 2 or 3, but that the value in period $t + 1$ is the same as in period t with probability p where $p > \frac{1}{2}$. Discuss – in words, no formulas – how this affects the scope for tacit collusion in the industry considered.

3.   The market for handheld game consoles first took off with the appearance of Nintendo's *Game Boy* in 1989, the first device to sell to the mass market. Handheld game consoles are part of a system comprising both hard- and software. Hardware manufacturers supply consoles and often also software titles, while software providers concentrate on the development and distribution of games. Hardware suppliers actively manage the quality of the market's software side: developers need to sign detailed licensing contracts which are then enforced by legal and technological means such as security chips. This also prevents any hardware manufacturer from developing consoles that are compatible with games for other platforms.

Industry observers typically separate consoles into generations. In industry terminology, generations IV to VII are considered here. Table 1 provides an overview of the consoles in the different generations in terms of specifications, launch date, etc. "Backward Compatibility" refers to whether games developed for the previous generation console from the same company can be played on a given console. Figure 1 illustrates the market shares of the different consoles.

(a) Explain why consumers might care about the number of other consumers that have bought the same type of console.
(b) Drawing on the theories covered in class, try to explain the evolution of the market shares observed in the market for handheld game consoles. In particular, think about the role that backward compatibility plays in this market.

Table 1: Mobile handheld consoles sold between 1995 and 2007

| Console	Platform	Backward Compatibility	U.S. launch	Manufacturer	Hardware CPU [MHz]	Weight [g]
Generation IV						
Game Boy	Game	No	8/1989	Nintendo	4.2	300
Game Boy Pocket	Boy		9/1996			148
Game Gear	Game Gear	No	1/1991	Sega	3.6	500
Generation V						
Game Boy Color	GB Color	Yes	11/1998	Nintendo	8.4	188
Virtual Boy	Virtual Boy	No	8/1995	Nintendo	20	760
game.com	game.com	No	9/1997	Tiger	10	380
game.com Pocket Pro			12/1999			n/a
Generation VI						
Game Boy Advance	Game Boy	Yes	6/2001	Nintendo	16.7	180
Game Boy Advance SP	Advance		3/2003			142
Neo Geo Pocket Color	NGP Color	No	8/1999	SNK	6.14	145
N-Gage	N-Gage	No	10/2003	Nokia	104	137
N-Gage QD			8/2004			143
Generation VII						
DS	DS	Yes	11/2004	Nintendo	67	275
DS Lite			6/2006			218
Playstation Portable	Playstation	No	3/2005	Sony	333	280
Playstation Portable Slim	Portable		9/2007			189
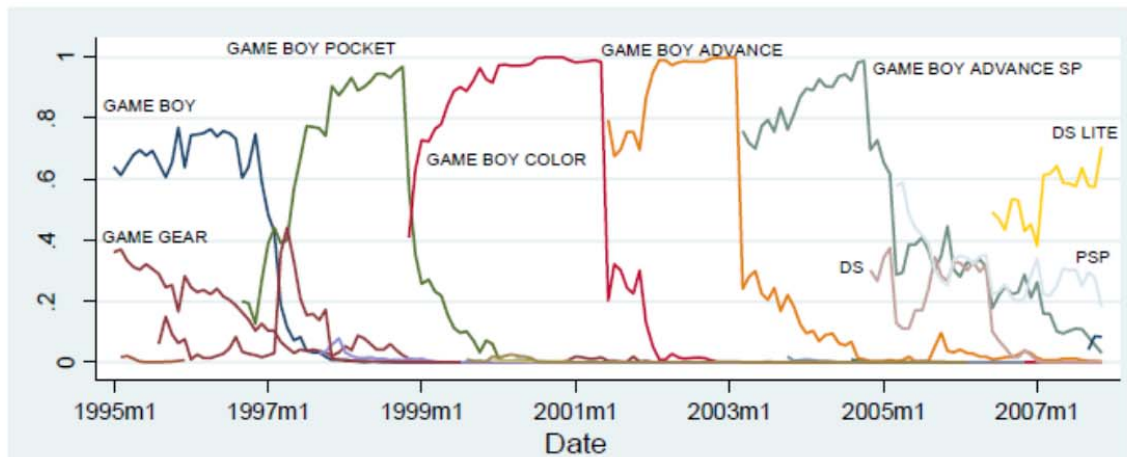
Figure 1: Monthly market shares from 1995 to 2007