Université d'Orléans

Master International Economics

Competition policy and game theory

Exercise Set 4 : Competition policy 's basic elements

Fall 2019

You should know the definition of the competitive equilibrium market, understand the behavior of a monopoly, it's strategy that can be formulated in terms of price or in terms of quantity, and the basic Cournot and Bertrand first basic and historical oligopoly models.

Price competition usually designs an oligopoly where each firms posts simultaneouly prices. Then, there is a demand addressed to each firm, that depends on the price posted by each firm ; let denote it $q_1^d(p_1, p_2-$ and $q_2^d(p_1, p_2$. The basic model have been developed by Bertrand, in the case of an homogeneous good, and similar firms without capacity constraints, and marginal constant cost equal to c. The unique Nash equilibrium is such that $p_1^* = p_2^* = c$.	Quantity competition usually designs an oligopoly where each firms posts simultaneouly quantity. Then, we suppose that the price will be the one that equilibrates demand and the produced goods, q_1^* and q_2^* ; we deenote it p^*. The basic model have been developed by Cournot, in the case of an homogeneous good, and similar firms without capacity constraints, and marginal constant cost equal to c. The equilibrium is such that the corresponding price $p^* > c$, and the price cost margin is decreasing with the number of competing firms. In the case $n = 1$, the unique firm behave as a monopoly and p^* is the monopoly price.

1 Back to the monopoly, regular and discriminant

Let consider an homogeneous non divisible good, 28 consumers and one producer. Let suppose that in that market the consumers are interested in consuming 1 or 0, depending on the comparison of the selling price with their reservation price. The firm capacity is equal to maximum 28 goods produced, with a marginal cost increasing. The characteristics of the consumers and of the producers are the following :

$r^1 = 979$ $r^2 = 934$ $r^3 = 868$ $r^4 = 836$ $r^5 = 806$ $r^6 = 799$ $r^7 = 792$ $r^8 = 775$ $r^9 = 685$ $r^{10} = 654$ $r^{11} = 604$ $r^{12} = 591$ $r^{13} = 532$ $r^{14} = 512$
$r^{15} = 512$ $r^{16} = 490$ $r^{17} = 469$ $r^{18} = 460$ $r^{19} = 436$ $r^{20} = 330$ $r^{21} = 311$ $r^{22} = 240$ $r^{23} = 238$ $r^{24} = 219$ $r^{25} = 190$ $r^{26} = 92$ $r^{27} = 91$ $r^{28} = 22$
$c^1 = 5$ $c^2 = 12$ $c^3 = 29$ $c^4 = 94$ $c^5 = 94$ $c^6 = 134$ $c^7 = 134$ $c^8 = 139$ $c^9 = 156$ $c^{10} = 325$ $c^{11} = 370$ $c^{12} = 395$ $c^{13} = 435$ $c^{14} = 470$
$c^{15} = 501$ $c^{16} = 511$ $c^{17} = 521$ $c^{18} = 549$ $c^{19} = 581$ $c^{20} = 652$ $c^{21} = 729$ $c^{22} = 738$ $c^{23} = 748$ $c^{24} = 778$ $c^{25} = 808$ $c^{26} = 850$ $c^{27} = 886$ $c^{28} = 903$

1) Describe the efficient allocation of this market et denote by q^* the corresponding quantity produced. Compute the global surplus.

2) Prove that the optimal strategy (p^{**}, q^{**}) of the monopolist is such that $q^{**} \leq q^*$

3) Describe the optimal strategy of the monopoly [Hint : use a tableur to make computations]

4) Analyze the behavior of the monopoly if he is able to price discriminate, and if he knows (still) the characteristics of the consumers. Compute in particular, π^d the profit of the discriminant monopoly. [Hint, back to the Spreadsheet].

5) Would you say that the discriminant monopoly is efficient.

2 A Cournot Game with asymmetric costs

Let consider an oligopolistic market such that the inverse demande is $p = p(q)$. Two and only two firms, firm 1 and firm 2 produce the good, respectively at the unit cost c_1 and c_2 and sell the produced units of good to the consumers. They choose individually a quantity to produce (denoted q_1, q_2), thereafter the selling price is set to $p(q_1 + q_2)$ (all produced goods are sold).

1) Compute the firm's payoff and explain why the two firms are in strategic interaction

2) Consider that $p(q) = 1 - q$ and write the profit functions

3) Compute reaction functions for each firm and the Nash equilibrium

4) Check that $q_1^* > q_2^*$ and interpret.

5) Check the conditions under which $q_2^* = 0$.

6) Explain why in your solution the condition $c_2 < 1 + \frac{1}{2}c_1$ is needed in the computation of question 3. Find the formal reason, and then make the interpretation.

7) Explain how work the market under the condition $c_2 \geq 1 + \frac{1}{2}c_1$. Find and interpret the behavior of firm 1.

Let consider the introduction of a VAT. When any firms receive p, the consumers pay $p(1+t)$.

8) Explain how theVAT will affect the equilibrium. What are the variables that change significantly ?

3 Bertrand and Cournot Models

1) In two three lines, describe a basic model of duopoly, the differences between the Cournot and the Bertrand mechanisms,

2) In two three lines, describe a basic model of duopoly, the differences between the Cournot and the Bertrand equilibria.

4 Bertrand under capacity constraint

Consider two firms that have the same marginal cost c, but they differ, holding a different capacity $k_i < D(p_i = c)$: when charging at marginal cost, a firm would have to supply a larger number of units than its capacity would allow it to do. We suppose that those two firms compete in prices.

1) Show that $(p_i^*, p_j^*) = (c, c)$ is not an equilibrium of the competition game.

We suppose that the market demand is $q = 1 - p$ and that the cost is $c = 0$.

2) Prove that if firm 2 produces at capacity $q_2 = k_2$, then, firm 1 best response (without considering its capacity) is : $R_1(k_2) = (1 - k_2)/2$. Compute in the same spirit firm 2 's best response (without considering its capacity) whenever firm 1 produces at capacity $q_1 = k_1$.

We say that capacities are small whenever $k_1 \leq R(k_2)$ and when $k_2 \leq R(k_1)$

3) Interpret that condition, and already think about what will happen in that market.

4) When both firms compete with prices, show that $p_1^* = p_2^* = 1 - k_1 - k_2$ is an equilibrium.

5) When both firms compete with prices, show that $p_1^* = p_2^* = 1 - k_1 - k_2$ is the unique equilibrium.

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