Economics 201   Fall 2013
Introduction to Economic Analysis   Jeffrey Parker
Problem Set #6   Due: Wednesday, November 6

1. Cournot Duopoly. Bartels and Jaymes are two individuals who one day discover a stream that flows wine cooler instead of water. Bartels and Jaymes decide to bottle the wine cooler and sell it but, depending on the circumstances, they may either cooperate (collude as a monopolist) or compete as Cournot duopolists. The marginal cost of bottling wine cooler and the fixed cost to bottled wine cooler are both zero. The market demand for bottled wine cooler is given as: $P = 90 - 0.25Q$, where Q is the total quantity of bottled wine cooler produced and P is the market price of bottled wine cooler. Use graphs to illustrate your answers when appropriate. (Remember that you can calculate the marginal-revenue curve corresponding to a linear demand curve easily: it has the same vertical intercept and twice the slope as the demand curve. In other words, if the demand curve is $P = \alpha - \beta Q$, then the marginal-revenue curve is $MR = \alpha - 2\beta Q$. You will need to apply this formula more than once in this problem.)

a. What is the economically efficient price of bottled wine cooler where price equals marginal cost? What is the economically efficient quantity of bottled wine cooler produced?

b. If Bartels and Jaymes were to collude with one another and produce the profit-maximizing monopoly quantity of bottled wine cooler, how much bottled wine cooler will they collectively produce? At that output level, what price will Bartels and Jaymes charge for bottled wine cooler? At that output level, what is the welfare loss relative to the economically efficient point?

c. Now suppose that Bartels and Jaymes act as Cournot duopolists, what are the reaction functions for Bartels and for Jaymes? (Hint: They are symmetric.) In the long run, what level of output will each produce if the two producers act as Cournot duopolists? In the long run, what will be the price of wine coolers be if they act as Cournot duopolists? What will be the welfare loss compared with economic efficiency and with monopoly?

d. If Bartels and Jaymes were to act as Bertrand duopolists, what price would they charge? Would they be better off or worse off than in Cournot equilibrium? Would consumers be better off or worse off?

2. **Cournot Duopoly and Instability of Collusion.** In class, we examined a Cournot duopoly problem with reactions functions as shown in the diagram below:

Q_2

300

$Q_1 = f_1(Q_2)$

150

100

$Q_2 = f_2(Q_1)$

100   150   300 Q_1
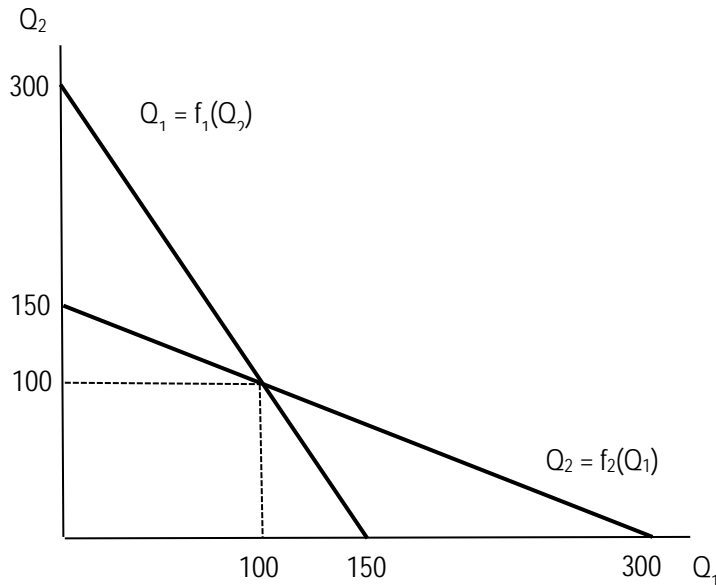
a. What is the Cournot-Nash equilibrium level of output for each firm and for the total market? Explain how you know this.

b. If either firm is the only one in the market, or if the two firms collude to maximize joint profits, how much will be produced in the market? How do you know this?

c. Suppose that the two firms collude and share the market equally, with firm 1 and firm 2 producing the same amount. Show on the diagram what firm 1's optimal output is if firm 2 produces at the collusion level. Now if firm 1 produces at this level, what is firm 2's optimal output? Trace the pattern of changes using the response functions and show that if firms follow their individual interests, collusion collapses into the Cournot-Nash equilibrium.

3. Making an investment decision. The Edgeworth Box Company produces packaging materials. Edgeworth is considering undertaking one or both of two investment projects. The first investment involves a new automated warehouse for the firm's cardboard, foam, and plastic inventory. The warehouse can be expected to have a useful life of ten years, after which it will be obsolete with no scrap value. The warehouse involves $3,000,000 in capital cost that must be paid immediately. The warehouse will lower the firm's cost $400,000 for each of the first five years, and $500,000 per year thereafter. The second project involves the acquisition of a computerized order system that would allow the firm's salespeople to link directly with the computer to place orders. The computerized network will require an initial capital cost of $1,000,000, but will save the firm $300,000 per year in support staff costs. Edgeworth's managers believe that the order system will be obsolete after five years. Cash flows for each project will be at year end. Edgeworth uses a 10% discount (interest) rate in

evaluating the investment projects. Interest rates and future cash flows are in real terms, net of all tax effects.

a. Calculate the net present value of each investment project. Which project(s) should the firm accept?

b. Comment on the impact of a change in the discount rate on the NPV. (Analyze both an increase and a decrease in the discount rate.)

4. Optimal Location. Work GLS's Problem 17 on pages 524–525. Add the following part c:

c. Is the location of the two firms optimal for consumers? If you were a benevolent dictator seeking to maximize consumer benefit, where would you put them? Why? Would the two sellers be better or worse off under your dictatorial location directive?