Autumn 2004 Robert Gertner

# SHRIMP EXERCISE

Arnold, Beatrice, and Charlotte own the only three shrimp boats on the island of Cournot. Each incurs a cost of $5.00 per pound of shrimp (this includes the opportunity cost of time) and each can catch at most 75 pounds per day.

At the end of each day, they bring their catch to market where price is determined by market demand and the supply of fish. Let $Q_A$, $Q_B$, and $Q_C$ denote Arnold's, Beatrice's and Charlotte's catch, respectively. Once each has decided when to stop fishing and has brought his or her shrimp to market, the price is determined by the following equation:

$$\text{Price} = P = 45 - .2\,(Q_A + Q_B + Q_C).$$

Each shrimper agress that the above equation correctly predicts the market price of shrimp, and each tries to catch enough shrimp so as to maximize his or her dollar profits. **Please note that the goal is to maximize the dollar value of your profits, not to outperform the other shrimpers.** All shrimp goes bad after one day, so a shrimper cannot keep shrimp off the market and sell them the next day. The profits for each shrimper equals the number of pounds caught multiplied by its profit margin, that is

$$\text{Arnold's Profits} = \Pi_A = Q_A\,(P - 5),\ \text{Beatrice's Profits} = \Pi_B = Q_B\,(P - 5),\ \text{Charlotte's Profits} = \Pi_C = Q_C\,(P - 5).$$

You will be on a small team (2-4 students) that will be assigned to be Arnold, Beatrice, or Charlotte in one of several different games that will go on simultaneously in class. Each day you will be asked to set that day's level of production. Note that you are not able to catch more than 75 pounds of shrimp per day. The amount of money you earn at the end of the day will equal the value described above. Remember your goal is to maximize your own profits; you do not care at all about the profits of the other shrimpers.

All shrimp is traded at the Cournot Fish Market. When trade takes place each shrimper reveals its level of production for that day, so this information becomes public knowledge.

The three shrimpers have a history of family feuds and no personal contact. Each will have to set its shrimp production for the day without knowing what levels the other two shrimpers set. However, as described above, at the end of each day the production levels that were set by each shrimper will become public knowledge.

In class, you will be divided into teams and asked to make quantity decisions for one of the shrimpers. There will be a several rounds and several different scenarios that will be explained in class.

**Prior to class, analyze the structure of the game. What level of production maximizes industry profits? What is the impact of changes in your quantity on price and profits?**