

TOPIC 24: GAME THEORY II

I. Duopoly Game

- a. Imagine a world where there are only two fast food options: Arby's and Burger King.
 - i. Arby's can either set a high price or a low price.
 - ii. Burger King can also either set a high price or a low price.
- b. If Arby's sets a high price when Burger King sets a low price, Arby's won't get much business (and vice versa). If the prices are the same, the profits are the same between the two firms, though the profits are higher if each sets a high price.
 - i. The profit values (in millions) are given as:

| | | Burger King | |
|---------------|-------------------|--------------------|------------------|
| | | <i>High Price</i> | <i>Low Price</i> |
| Arby's | <i>High Price</i> | \$30, \$30 | \$5, \$40 |
| | <i>Low Price</i> | \$40, \$5 | \$10, \$10 |

- ii. The Nash Equilibrium here is Low Price/Low Price. Note this is an inferior result for *both* players. Each player would like to be in the High Price/High Price cell.
- iii. But the temptation to cheat is too high. If the other player goes with the agreement to set high prices, you have a lot to gain by cheating. If the other player cheats on the agreement and sets a low price, also cheating avoids being cheated on.
- c. The general form of this game is called the *Prisoner's Dilemma*, a reference to why police officers put criminals in different rooms when they interrogate them. Police structure the incentives so each suspect has the incentive to rat out her partner.

II. Cooperation

- a. When people see an industry with a small number of firms have similar prices, they typically assume they're colluding. But we know from both pure competition and this game, similar prices might be the result of competition.
- b. Achieving cooperation in a prisoner's dilemma is very hard. Collusion is thus marked by enforcement, not similar prices. (This is why those

engaged in illegal activity have such a strong cultural norm against ratting someone out.)

- i. What we need is *repeated play*—playing the same game with the same players multiple times.
- c. If the value of future cooperation is large, then each player will fear defection (or cheating) since neither player wants to be locked into that equilibrium for many periods.
 - i. *Grim strategy*—once there is a single non-cooperative play, the other player never cooperates again.
 - ii. *Tit-for-tat*—a non-cooperative play immediately follows another non-cooperative play but no longer than one game. (Though if there is non-cooperation in the following game, tit-for-tat would trigger again.) In international politics, it is sometimes called a proportional response.
- d. How many times the game repeats matters.
 - i. If it is repeated *finitely*—or both players know how many games they will play—then cooperation can and will break down as you approach the last game.
 - ii. But if the game is repeated *infinitely*—both players will either never stop playing the game or both don't know when they will stop—then cooperation can persist. There is always the threat of the trigger strategy.