

## Discussion 4

Cournot oligopoly) Say there are 3 firms with demand  $P = 26 - 2Q$  and quadratic costs  $c_i = 2q_i$ .  
Find Nash.

$$\begin{aligned}\pi_1 &= Pq_1 - C_1 \\ &= (26 - 2(q_1 + q_2 + q_3))q_1 - 2q_1 \\ \frac{\partial \pi_1}{\partial q_1} &= 26 - 4q_1 - 2q_2 - 2q_3 - 2 = 0 \\ 24 - 2q_2 - 2q_3 &= 4q_1 \\ \frac{12 - q_2 - q_3}{2} &= q_1 \quad \text{Best response.}\end{aligned}$$

By symmetry,  $\frac{12 - q_1 - q_2}{2} = q_3$  and  $\frac{12 - q_1 - q_3}{2} = q_2$ .

Trick: look for symmetric equilibrium  $q_1 = q_2 = q_3 = q$ .

$$\frac{12 - q - q}{2} = q$$

$$12 - 2q = 2q$$

$$12 = 4q$$

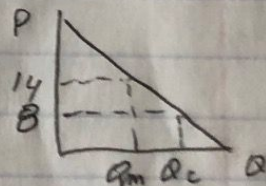
$$3 = q = q_1 = q_2 = q_3$$

$$Q_c = 9$$

Collude:  $\pi = (26 - 2Q)Q - 2Q$

$$26 - 4Q - 2 = 0$$

$$24 = 4Q \quad Q_m = 6$$



Not Prisoner

Dilemma.

27.2) a)

		Sit	Stand
P1	Sit	1, 1	2, 0
	Stand	0, 2	0, 0

b)

		Sit	Stand
P1	Sit	1, 1	0, 2
	Stand	2, 0	1/2, 1/2

Prisoner Dilemma

c) Part a) described comfort. Part b) described preference over other's comfort (Sit, Sit) more comfortable than (Stand, Stand).

30.1)  $2 \leq m < n$  need to pursue stag to catch  
a)  $(\frac{1}{n} \text{ stag}) \geq i$  have. All stag  $\geq$  all hare.  
Others?

- $\hookrightarrow$  Say asymmetric and don't catch stag. Not Nash.
- $\hookrightarrow$  Say asymmetric and do catch stag. Not Nash.

b)  $(\frac{1}{k} \text{ stag}) \geq i$  have  $\geq i$  (any smaller portion).  
All hare  $\geq k$  go for stag. Notice all stag  
is no longer one. Others?

- $\hookrightarrow$  Asymmetric and don't catch stag. Not Nash.
- $\hookrightarrow$  Asymmetric and more than  $k$  catch stag. Not Nash.
- $\hookrightarrow$  Asymmetric and  $S$  go for stag,  $m \leq S < k$ .  
Not Nash.

(cannot-Hard) From previous problem, is it clear  
whether colluding firms make more profit?

Inhibition 1: They should. Because they work together  
to maximize joint profits (monopoly solution).

Inhibition 2: Maybe not. There is "decreasing  
returns to scale" because marginal costs  
are rising. 3 firms more efficient than one.  
Assume they close 2 factories

Voting) Say there are 3 candidates A, B, and C. Ties broken  
Find a Nash where a citizen does not vote alphabetically  
favorite, yet that action not weakly dominated.  
Say  $A \succ B \succ C$ . Vote B.

When B gets same votes as C, greater by 2 than A.

$\hookrightarrow$  If C, C wins (bad).

$\hookrightarrow$  If A, C wins (bad).

All B voters got best choice.

All C voters prefer  $C > B > A$ .

All A voters prefer  $A > B > C$ .