

## Answers to Problem Set 2: More Static Game Theory

May 8, 1997 © David K. Levine

### 1. Nash Equilibrium

a) Chicken

|           |           |       |
|-----------|-----------|-------|
|           | lose face | fight |
| lose face | 6,6       | 2*,7* |
| fight     | 7*,2*     | 0,0   |

b) First Price Auction

Seagull = row player, VandeCamp = column player

|       |            |           |           |             |           |              |
|-------|------------|-----------|-----------|-------------|-----------|--------------|
|       | 0          | 500       | 1000      | 10000       | 20000     | 25000        |
| 0     | 10000,500* | 0,500*    | 0,0       | 0,-9000     | 0*,-19000 | 0*,-24000    |
| 500   | 19500*,0   | 9750,250* | 0,0       | 0,-9000     | 0*,-19000 | 0*,-24000    |
| 1000  | 19000,0*   | 19000*,0* | 9500,0*   | 0,-9000     | 0*,-19000 | 0*,-24000    |
| 10000 | 10000,0*   | 10000,0*  | 10000*,0* | 5000*,-4500 | 0*,-19000 | 0*,-24000    |
| 20000 | 0,0*       | 0,0*      | 0,0*      | 0,0*        | 0*,-9500  | 0*,-24000    |
| 25000 | -5000,0*   | -5000,0*  | -5000,0*  | -5000,0*    | -5000,0*  | -2500,-12000 |

c) Dominance and Pareto Dominance

|   |         |         |
|---|---------|---------|
|   | 1       | 0       |
| 1 | $x,x$   | $x-2,2$ |
| 0 | $2,x-2$ | 0,0     |

When  $x=1$  this is an ordinary Prisoner's Dilemma, so the unique dominant strategy equilibrium is 0,0.

When  $x=3$  the unique dominant strategy equilibrium is 3,3.

## 2. Duopoly

profits are

$$\pi_i = a + (b - c)x_i - e(x_i)^2 - fx_i x_{-i}$$

$$\frac{d\pi_i}{dx_i} = (b - c) - 2ex_i - fx_{-i} = 0$$

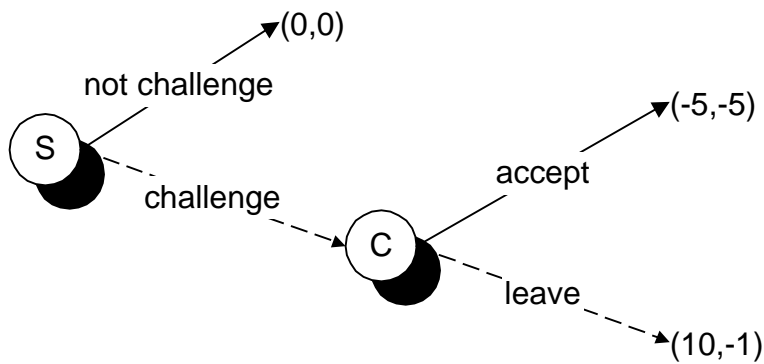
in the symmetric equilibrium  $x_i = x_{-i}$

$$x_i = \frac{b - c}{2e + f}$$

As  $f$  increases the equilibrium level of film violence goes down.

## 3. The Challenge

extensive form with subgame perfect choices marked with dashed lines



normal form with best response correspondence and Nash equilibria marked

|               |        |         |
|---------------|--------|---------|
|               | accept | leave   |
| challenge     | -5,-5  | 10*,-1* |
| not challenge | 0*,0*  | 0,0     |

