

The War of Attrition

- ### Game
- \$20 bill up for grabs
 - Anyone can volunteer to participate now.
 - Game proceeds in rounds.
 - Each period presents choice of donating \$2 to GSB or exiting.
 - Last person in game gets \$20.
 - Tie for last: 2 get \$10 each; 3-4 get \$5 each, 5 or more get nothing

- ### Examples
- Microsoft v. Netscape
 - US Civil War
 - Telecoms lobbying FCC
 - Off shore oil drilling (attempt to go last)
 - Elk
 - Lawsuits
 - BMC, Holly
 - Competition in takeovers

War of Attrition

- War of attrition is situation where one must lose
- No splitting of the proceeds
- Races to be first to patent critical technology
- Race to set standard
- Race to be first supplier of satellite TV

Formal Model

- Prize worth \$1, cost c to fight per period
- Each player chooses probability p of exiting per period
- If both exit, split prize
- Best response requires
$$\frac{1}{2}p = p - c + (1 - p) \frac{1}{2}p.$$
- Value of exit = value of staying in

Solution

$$p = 1 - \sqrt{1 - 2c}$$

How long does war last? Turns out this is $1/2c$. Thus, for $c=.1$, war lasts five years on average

- Expected profits are $\frac{1}{2}p$. Small!
- Profits are *increasing* in c .
 - Effect on competitor outweighs own effect

Properties of War of Attrition

- Wars can last a long time
 - No definite end, once started
- Even winner may lose money
 - Random termination
- Reduce cost of fighting and the war lengthens
 - expected cost of fighting the same
 - reduced profits

Solutions to War of Attrition

- Merger
- Pay-off
- Split market
- Don't fight in first place
- Convince other guy not to fight in the first place
