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# The War of Attrition

A prize is worth \$10. Two players each period must decide whether to maintain a claim to the prize or let the other player have it. It costs \$1 to stay in the game. The game continues until one player claims the prize or both drop out.

Pure strategy equilibrium: one player takes the prize in every period. The other player gives in in every period.

Symmetric mixed strategy equilibrium: let  $p$  be the probability of continuing. Let  $V$  be the expected utility from continuing.

In equilibrium each player indifferent between claiming prize or give in.

Expected payoff from claiming the prize today:

$$V = -1 + (1 - p)10 + pV \text{ so}$$

$$V = -\frac{1}{1 - p} + 10$$

Expected payoff from giving in is 0, so indifference means  $V = 0$ . Solve to find  $p = .9$

# If We Were All Better People The World Would Be A Better Place

- self-evidently true?
- fallacy of composition: just because a statement applies to each individual person it need not apply to the group
- use game theory to give precise meaning to the statement of
  - what it means to be better people
  - what it means for the world to be a better place
- prove or disprove the statement
- If We Were All Better People The World Need Not Be A Better Place, can be shown by a variation of the Prisoner's Dilemma

## Prisoner's Dilemma

	not confess	confess
not confess	5,5	-4,10
confess	10,-4	1*,1*

## *The Pride Game*

	proud	not confess	confess
proud	4.0*, 4.0*	5.4, 3.6	1.2*, 0.0
not confess	3.6, 5.4	5.0, 5.0	-4.0, 10.0*
confess	0.0, 1.2*	10.0*, -4.0	1.0, 1.0

## Add the strategy of being proud

proud = will not confess except in retaliation against a rat-like opponent who confesses

- if I stand proud and you confess, I get 1.2, because we have both confessed and I can stand proud before your humiliation, but you get 0, because you stand humiliated before my pride
- if we are both proud, then neither of us will confess, however, our pride comes at a cost, as we both try to humiliate the other, so we each get 4, rather than the higher value of 5 we would get if we simply chose not to confess
- if I choose not to confess in the face of your pride then I lose face getting 3.6 instead of 4, and you, proud in the face of my humiliation get 5.4

the pride game is dominance solvable as not confess is strictly dominated by proud

	proud	not confess	confess
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not confess	3.6, 5.4	5.0, 5.0	-4.0, 10.0*
confess	0.0, 1.2*	10.0*, -4.0	1.0, 1.0

## ***A theory of being better people***

we care more for each other

Place weight on your utility as well as mine, but twice as much weight on mine as yours

I get a weighted average of your utility and my utility with weight  $2/3^{\text{rd}}$  on my utility,  $1/3^{\text{rd}}$  on your utility

if in the original game payoff are (3,6) then in the altruistic game player 1 gets  $2/3*3 + 1/3*6 = 4$  and player 2 gets  $1/3*3 + 2/3*6 = 5$  so that the payoffs in the altruistic game are (4,5)

because we are altruistic our interests are more aligned with each other



## *The Altruistic Pride Game*

	proud	not confess	confess
proud	4.00, 4.00	4.8, 4.20*	0.80, 0.40
not confess	4.20*, 4.80	5.00, 5.00	0.67, 5.33*
confess	0.40, 0.80	5.33*, 0.67	1.00*, 1.00*

Unique pure strategy equilibrium: confess/confess

We are better people and the world is unambiguously (pareto dominance) a worse place

## ***What about Mixed Equilibria?***

Cannot be an equilibrium that puts weight zero on confess

Why? Because then both players strictly prefer to play not confess, and the best response to not confess is to confess

The only equilibrium that puts weight zero on proud is the unique pure strategy equilibrium

Why? Without proud, we just have a prisoner's dilemma game

What about an equilibrium that puts weight on proud and confess?

There is one: obviously gives utility less than 4 to both players.

What about an equilibrium that puts weight on all three? There is one, gives utility of 2.31

Compute using McKelvey, McLennan and Turocy open source Gambit program

day-to-day life

- all more altruistic we would choose to forgive and forget more criminal behavior
- behavior of criminals complicate
- more altruistic criminals would choose to commit fewer crimes but also tempted to commit more crimes, since crime is not punished so severely
- if in the balance more crimes are committed, the world could certainly be a worse place. The example shows how this might work.

Based on Sung-Ha Hwang and Samuel Bowles called "Is Altruism Bad For Cooperation?"