Brothers in Arms: Cooperation in Defence

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MAX-PLANCK-GESELLSCHAFT

Puzzle: Cooperation Under Threat

In the lab

- Higher cooperation when a strategically irrelevant "rival group" is present, (Bornstein and Ben-Yossef 1994)

As a response to attacks

- "Rally round the flag" effect after military or terrorist attack: support for political incumbents increases
- Increase in blood donations after September 11
- Israeli Jewish judges favor Jewish plaintiffs on the days after terrorist attacks (Shayo and Zussman 2010)

Within conflicts

- Voluntary participation in warfare

By animals against predators

- Defensive rings, mobbing, alarm calls (Edmunds 1974)

A. Great War Volunteers B. Bulgarian irregulars
C. Musk Oxen defend against wolves D. Bush approval ratings, 2001-8

A Signalling Microfoundation for Cooperation in Defence

- Attackers are strategic, search out vulnerable groups
- A few groups are *truly* cooperative
- Other groups try to *appear* cooperative and deter attackers
- Group reputation is a public good with a weakest-link technology

Cooperation within Conflict

Setup

- There are many groups of **defenders**, of size N.
- An **attacker** makes up to T attacks against a randomly selected member of one group.
- During each attack, a randomly selected supporter may *help* or not, at a privately observed iid random cost c.
- A proportion π of groups are **"hunters"** who always help. The attacker does not observe group type.
- If helped, the target loses A and the attacker gains A. Otherwise the target loses $a<A$ and attacker gains a.
- After each attack, attacker may *move* to another random group or *stay* to attack the same group.
- Common discount rate δ.

Cooperation before Conflict

Setup

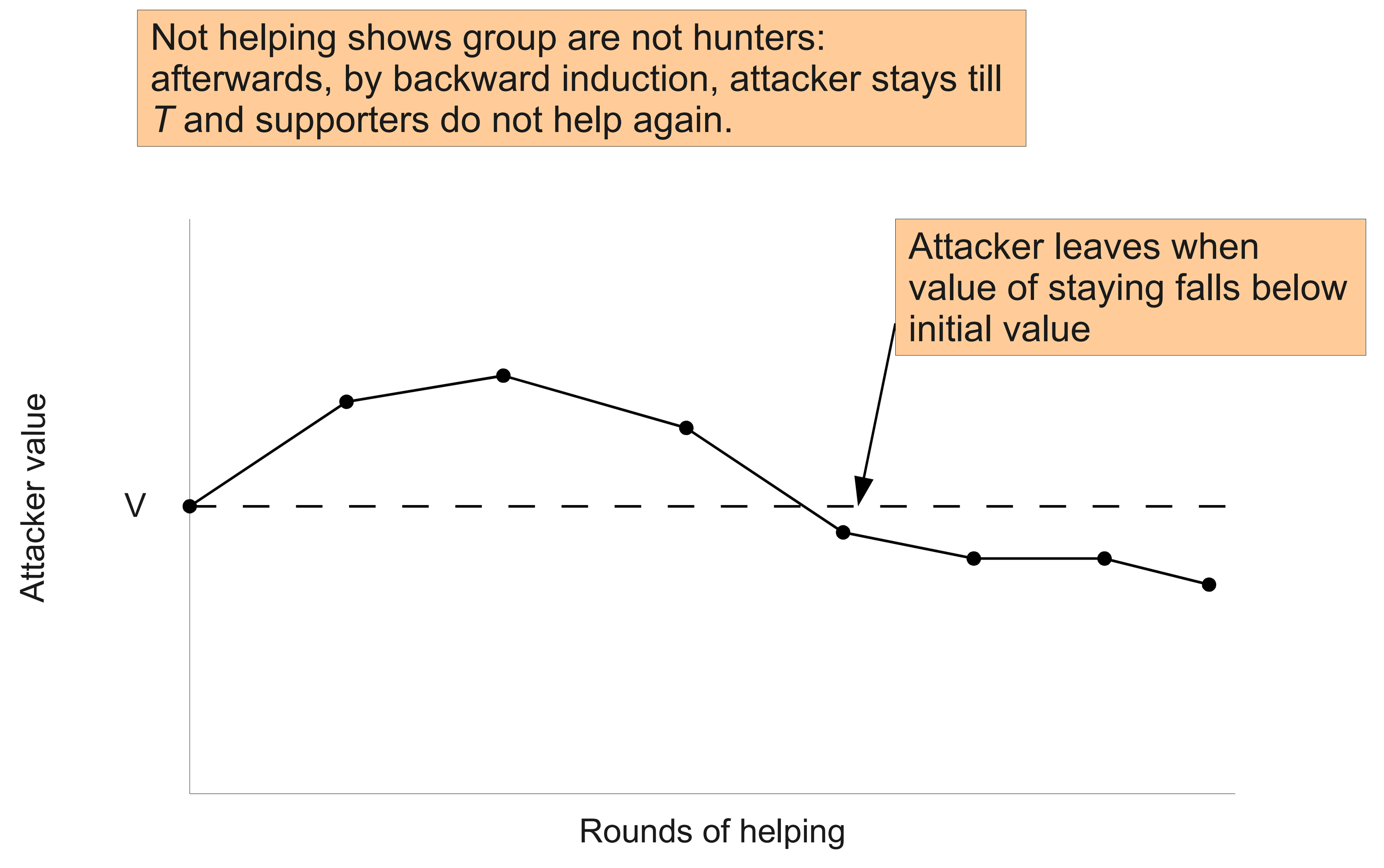
- A group of N defenders.
- K randomly selected group members play a **Prisoner's Dilemma**. Each member who cooperates generates R for all other group members. The (common) cost of cooperation q is random with cdf Ψ supported on $(R,1)$, and is observed only by defenders.
- The attacker observes play in the Prisoner's Dilemma, then either commits to *attack* for T rounds, or *moves* and receives an outside option worth P.
- π groups are hunters, as before; hunters always cooperate in the Prisoner's Dilemma, and always help.
- Attacks work as before. By backwards induction, non-hunters never help during attacks.

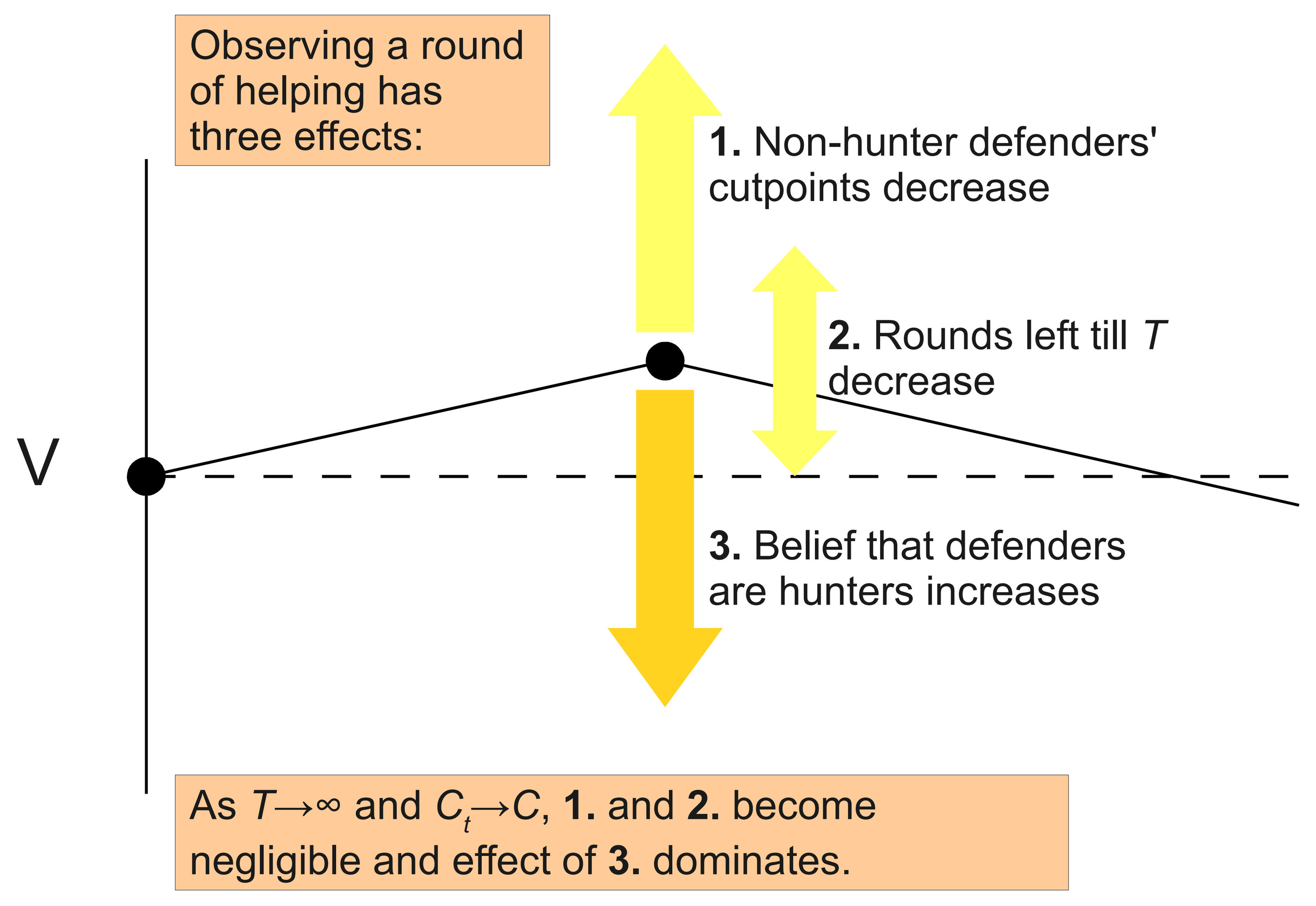
Equilibrium

For T high enough, there is a unique sequential equilibrium:

If supporters have always helped, attacker *moves*.
Otherwise attacker *stays*.
Supporters help at period t iff (1) previous supporters always helped, and (2) $c \leq C_t$.
C_t is decreasing in t; for fixed t, C_t approaches $C = A\delta/N(1-\delta)$ as $T \to \infty$.

Intuition





Comparative Statics

- Defenders' cutpoints (i.e. cooperation levels) are **independent** of proportion of hunter groups π.
- Cutpoints depend on cost of being attacked A.
- Holding A constant, they **do not depend on benefit of helping** A-a.
- Cutpoints depend on group size N.
- For T and δ high enough, **any level of cooperation can be sustained in equilibrium.**

Equilibrium

- Always an equilibrium with no cooperation.
- A set of equilibria in which non-hunter defenders cooperate in the Prisoner's Dilemma if

$$q \leq Q,$$

and the attacker attacks iff he observes any non-cooperation.

- The cutpoint Q must satisfy

$$Q \leq R + \sum^T \delta^t A/N$$

and

$$Q \leq \Psi^{-1}\left(\pi/(1-\pi) \sum^T \delta^t (A-a)/N \,/\, \left(\sum^T \delta^t A/N - P\right) \right)$$

- Upper bound for Q
  – may be **increasing or decreasing** in A
  – is weakly **increasing** in π, P and R, and Ψ (in sense of f.o.s.d.)

Conclusions

- Substantial levels of altruistic group defence can be sustained as an equilibrium of a game with a few genuine altruists
- The model has surprising comparative statics. There may be helping
  - when the costs exceed the direct benefit to the helped individual...
  - even with a very small proportion of genuine altruists
- We can also explain why within-group cooperation increases in the face of external threats.
- Human group psychology may have evolved in strategic situations similar to our model.
- Our results may interest:
  - **Social psychologists** researching the interplay of group identity and outside threat.
  - **Biologists** explaining cooperation among unrelated animals.
  - **Political scientists** seeking microfoundations for conflict participation.
  - **Economists** building models of reputation in repeated games.