Fairness as an « incentive landscape » for cooperation

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Evolving utility functions: can evolutionary biology explain why homo is not economicus?

Nicolas Baumard
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Stéphane
Debove
(PhD Student)

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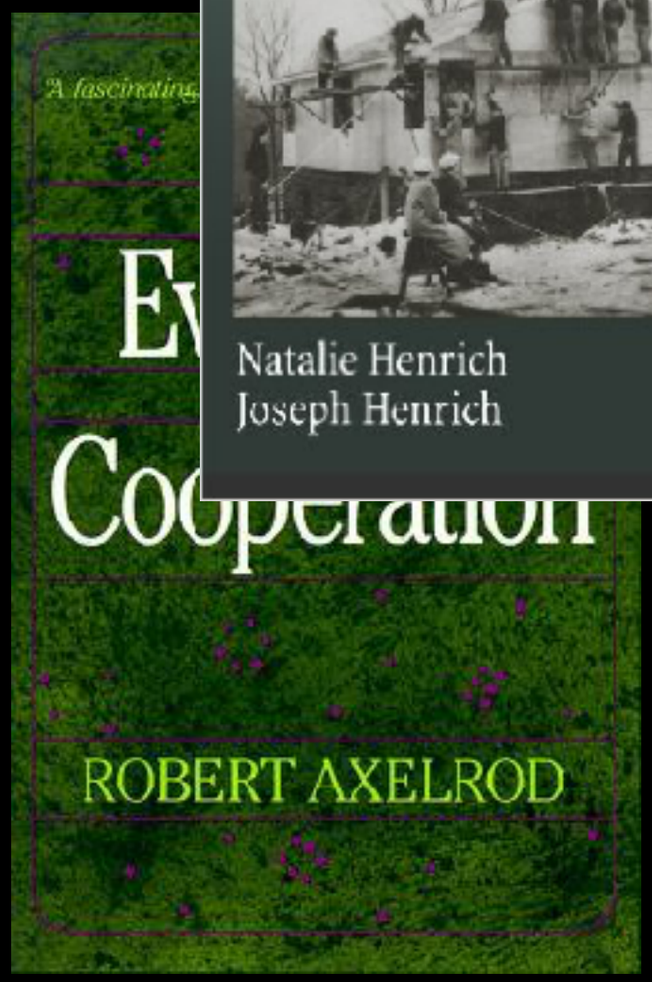
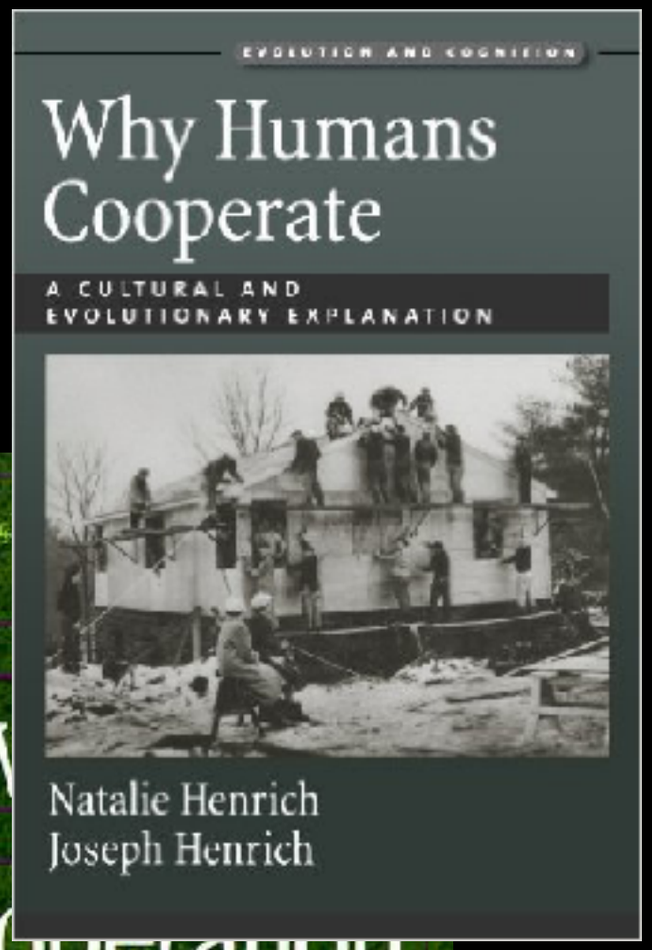
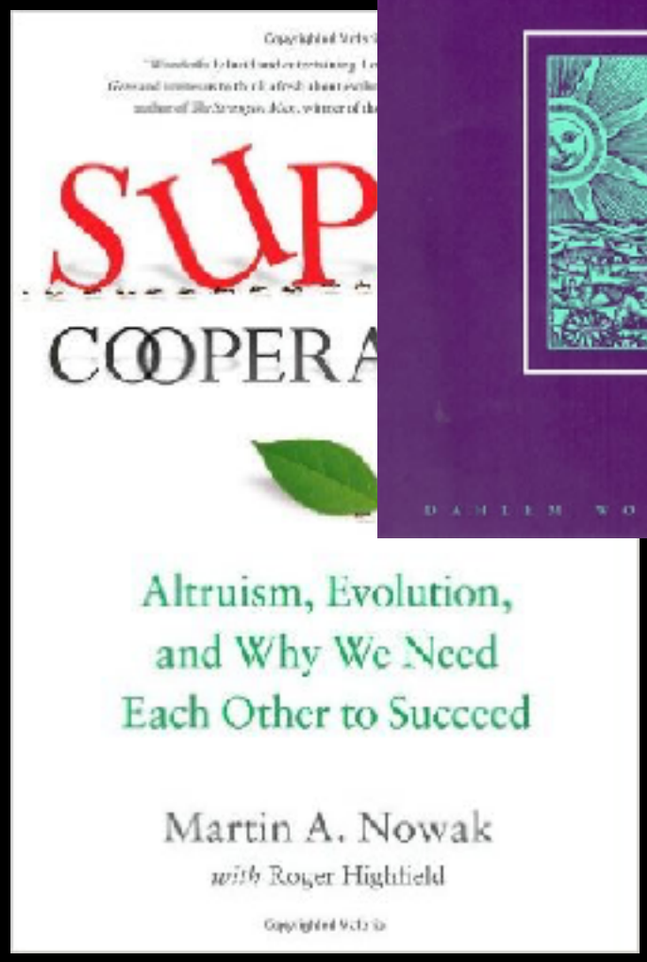
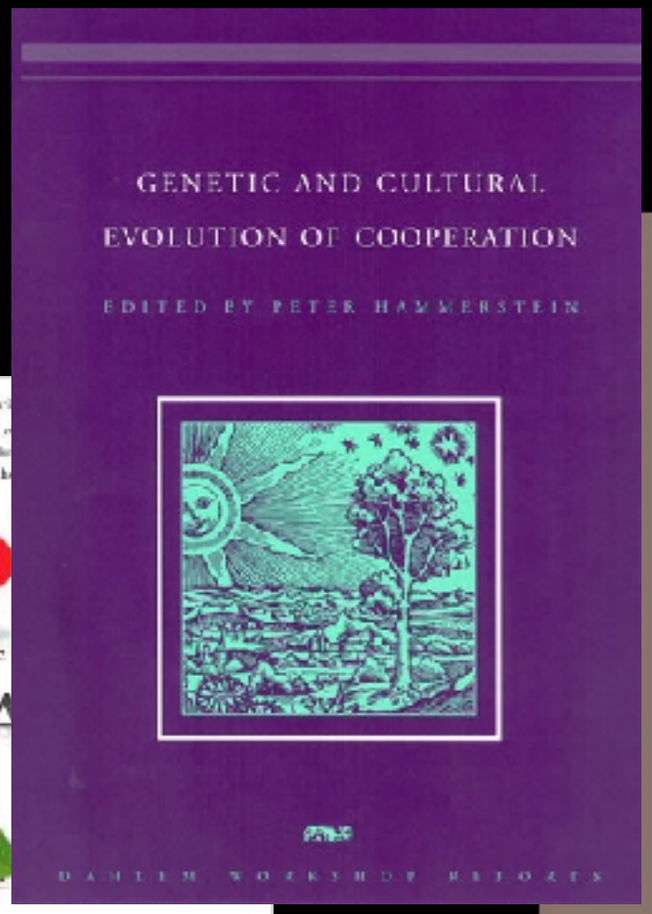

A fascinating
Cooperation
ROBERT AXELROD

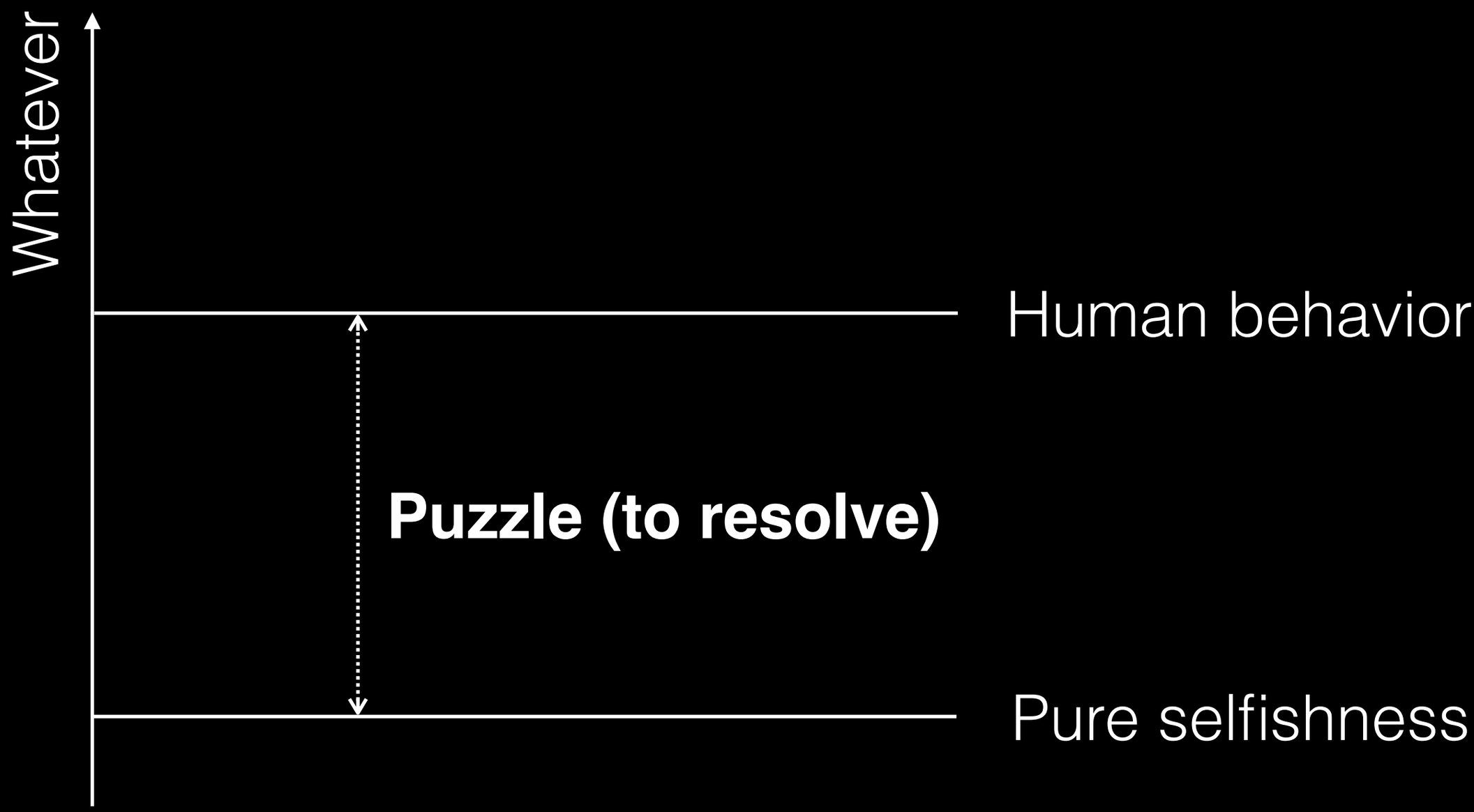

EVOLUTION AND COGNITION
Why Humans Cooperate
A CULTURAL AND EVOLUTIONARY EXPLANATION
Natalie Henrich
Joseph Henrich


SUP
COOPERA
Altruism, Evolution, and Why We Need Each Other to Succeed
Martin A. Nowak
with Roger Highfield


GENETIC AND CULTURAL EVOLUTION OF COOPERATION
EDITED BY PETER HAMMERSTEIN

BOSTON REVIEW
WHY WE COOPERATE
Michael Tomasello

Why is there *some* cooperation?


Whatever
Human behavior
Puzzle (to resolve)
Pure selfishness

Why we cooperate in *this* way?

Why we cooperate in *this* way?

- When to cooperate, and when not to?
- What shall be given
  in return of a given bout of helping?
- How to divide the surplus
  of a cooperative interaction?

Gijsbert invites me to this wonderful workshop

→ I must prepare a talk,
attend the others' talks, etc.

Fairness

Fairness is a cognitive device,
evolved to solve a specific problem
raised by cooperation

Being a cooperative species creates a *novel* adaptive problem

Be good

- In a cooperative species,
  others are a potentiel source of benefits

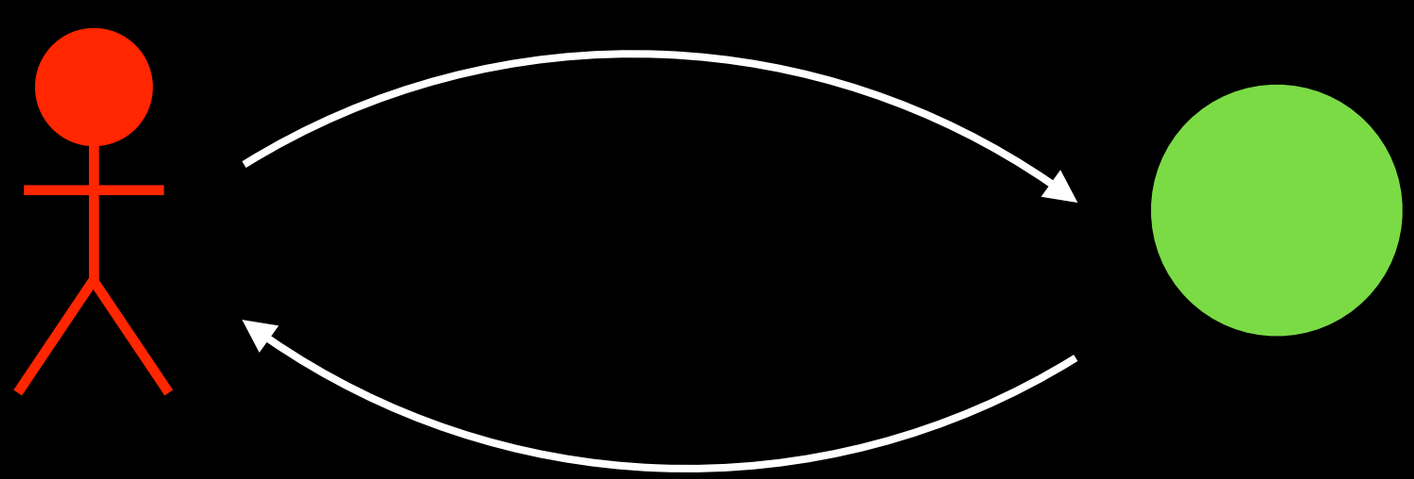
- This generates a selective pressure
  to be expert at *attracting these benefits*

- By building and maintaining the reputation
  of being a « good partner »

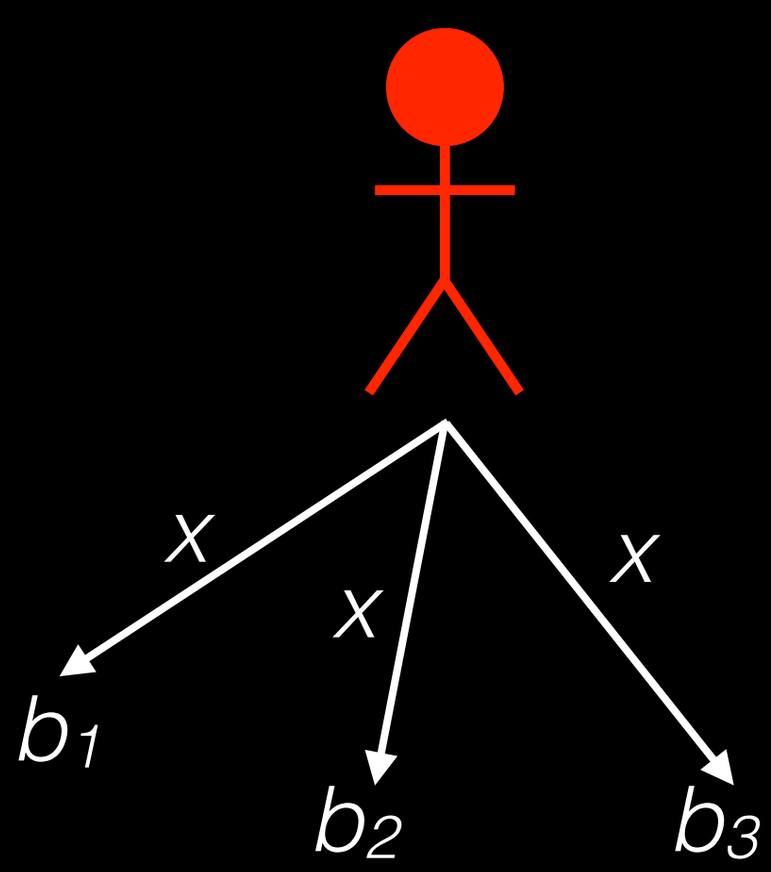
Aktipis 2004; Barclay 2007; Baumard 2008;
André & Baumard 2011a,b ; Baumard et al. 2013; Debove et al. 2015

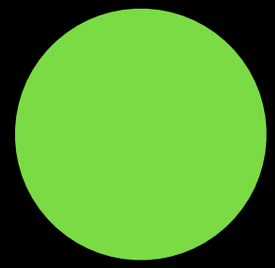
But, what is a « good partner » exactly?

What is a good investment in general?

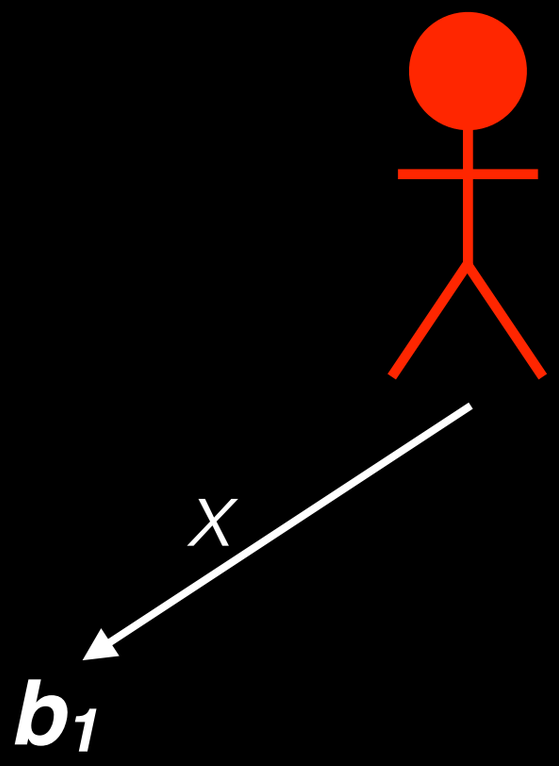


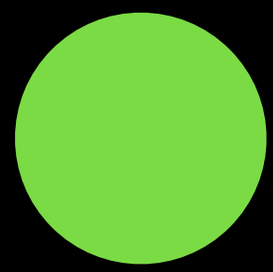
Outside options





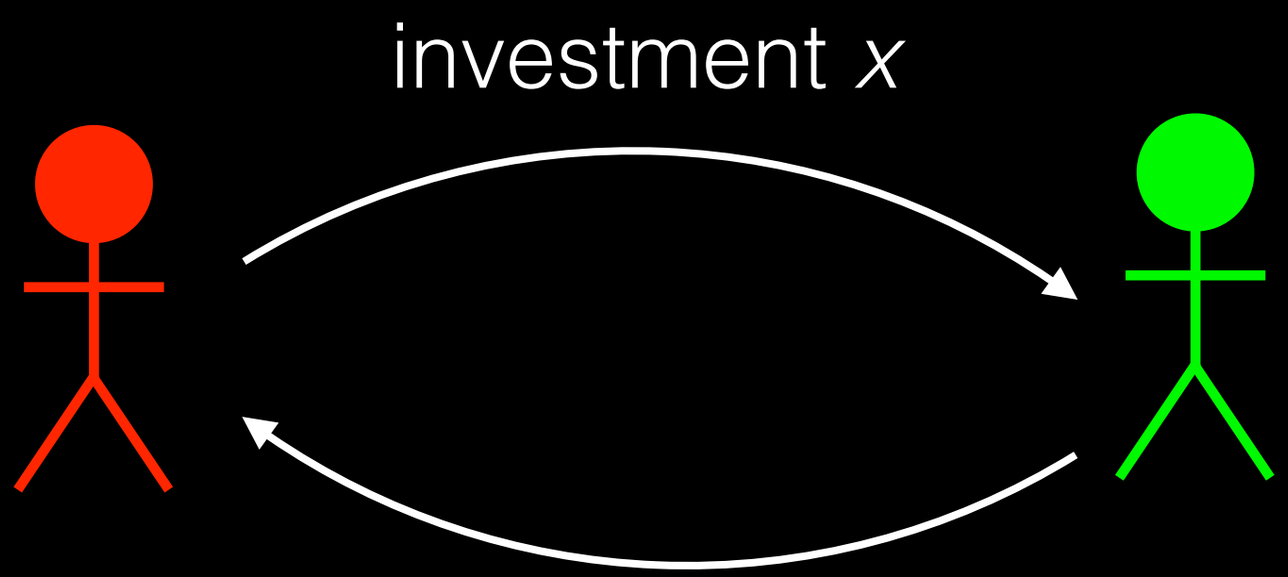
Best outside option





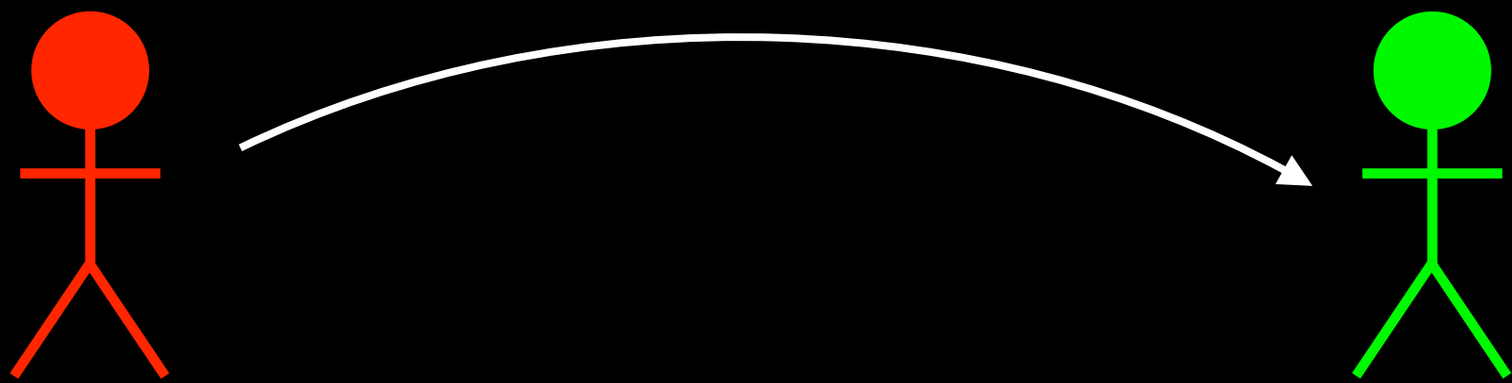
b_1 is also called
the *opportunity cost* of the investment

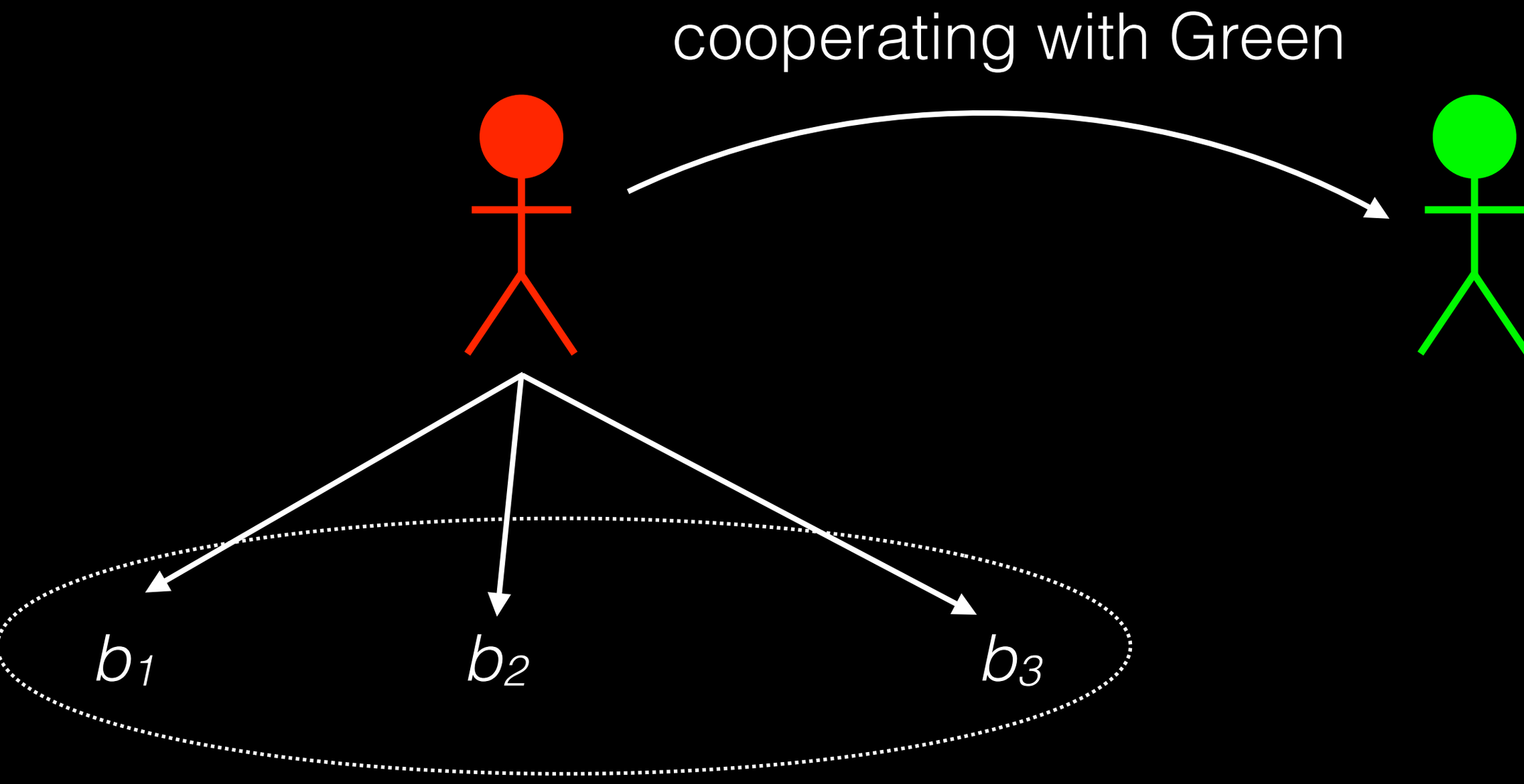
A good investment is better than his best outside option



A good partner is someone
with whom cooperation pays more
than his best outside option

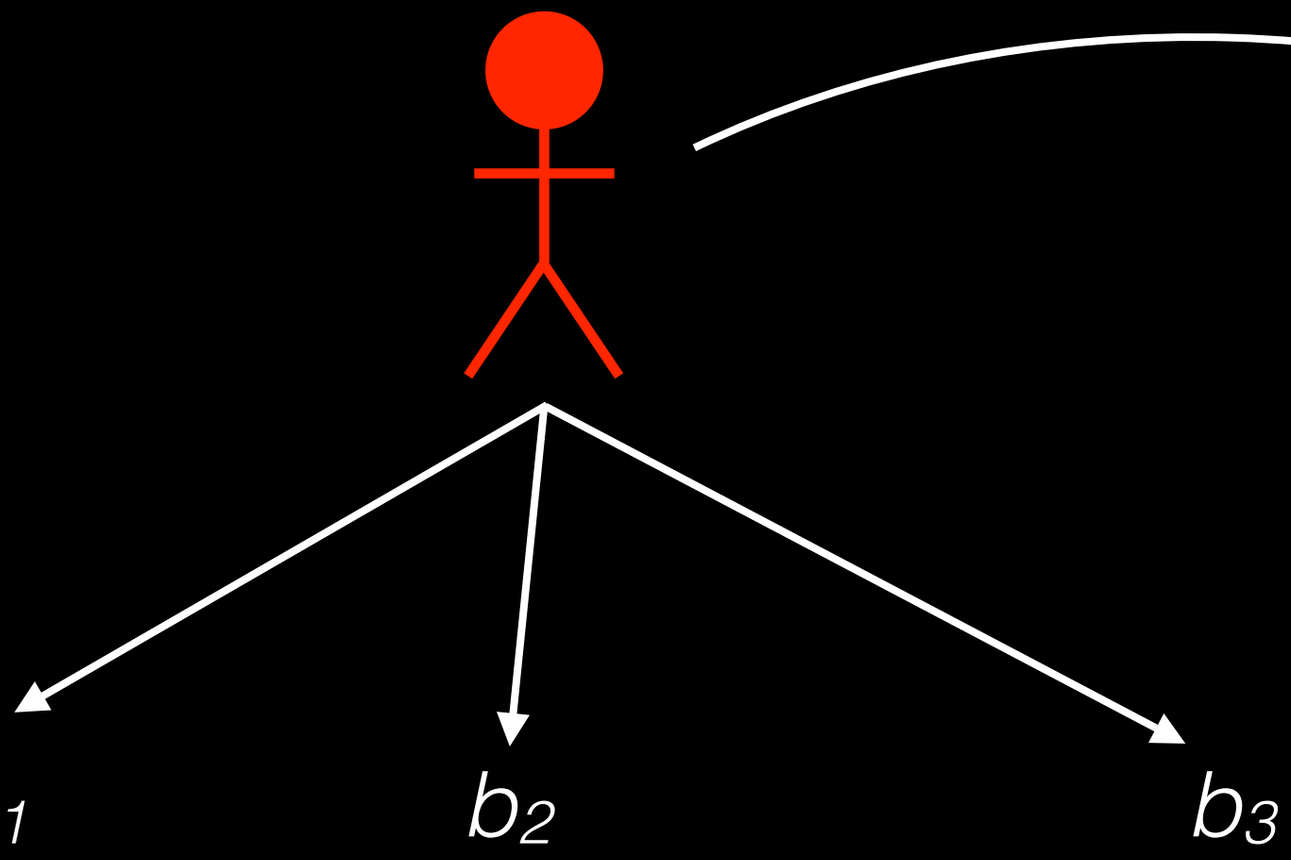
cooperating with Green





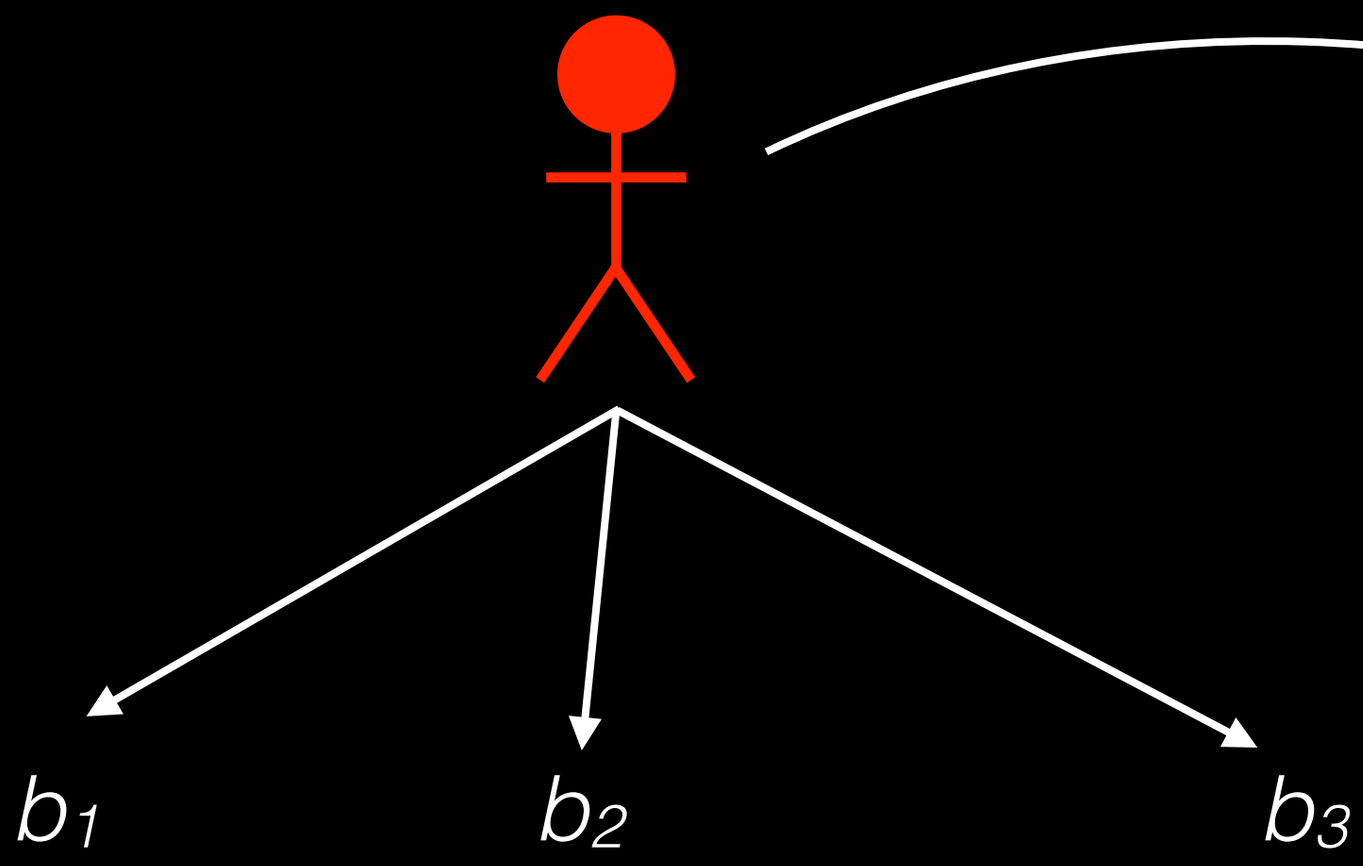
Outside options of « cooperating with Green »

cooperating with Green



defecting
with the same partner (Green)

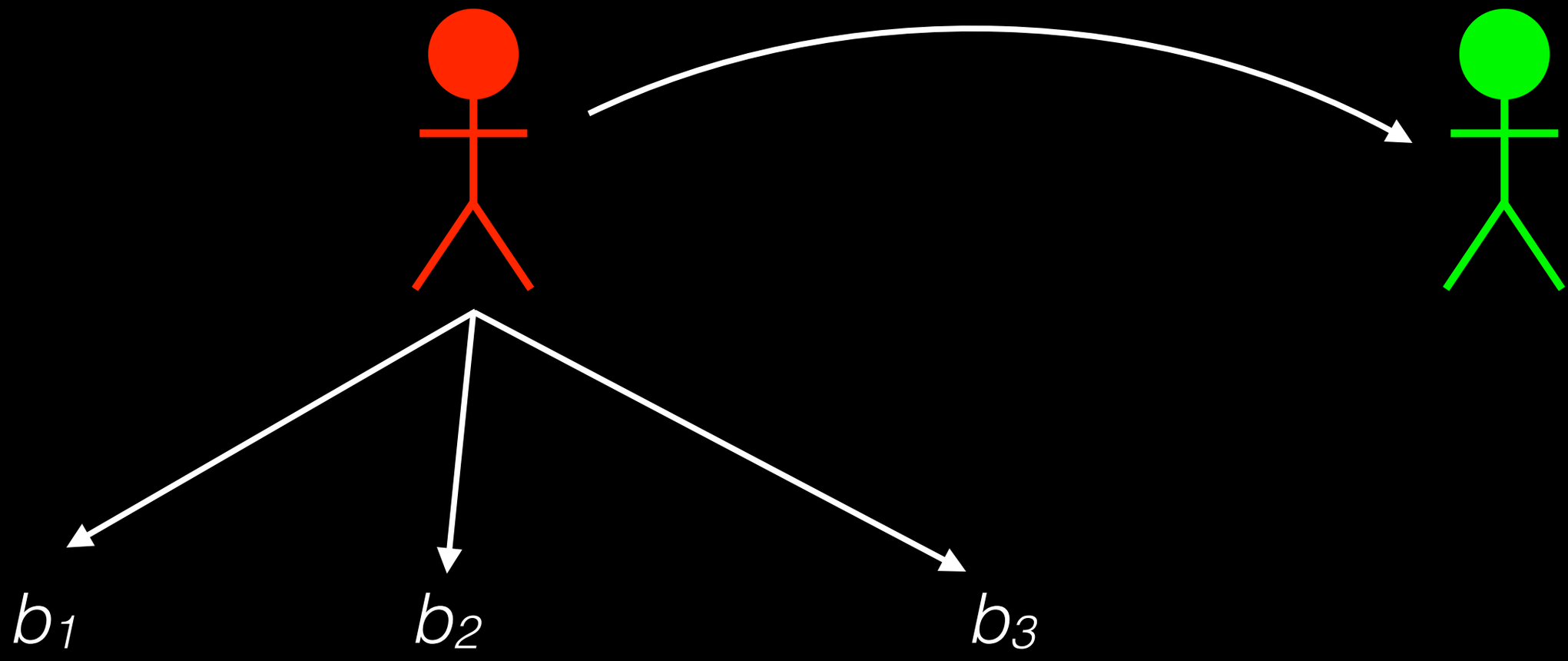
cooperating with Green



b_1 b_2 b_3

doing something
entirely different

cooperating with Green



waiting to find another partner
and cooperating in a similar way with her

The function of fairness

- In order to be seen as a good partner,
  Green must evaluate Red's outside options,
  and at least outbid the best one

- This is the evolved function of fairness

An incentive landscape for cooperation

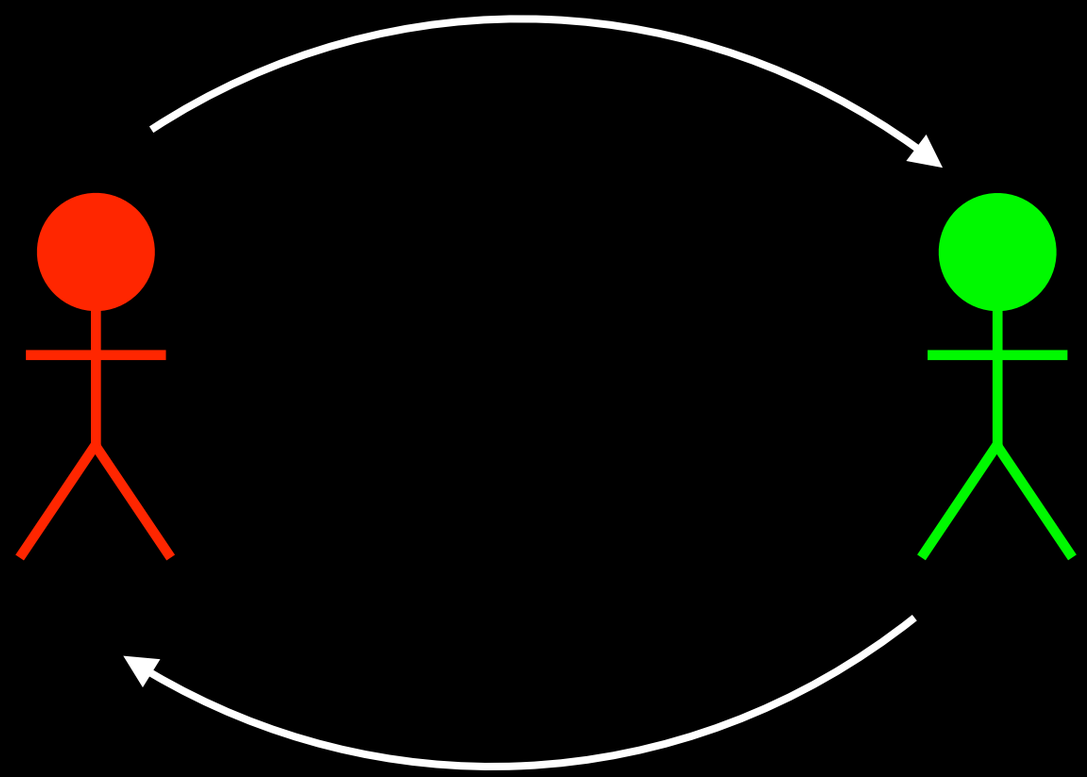
- With reputation and plasticity,
  others can adapt their behavior with oneself
  in function of the incentives one provides

- Our very own psychology
  is an incentive landscape for others' behavior

- Fairness is the evolved tool
  that performs this task

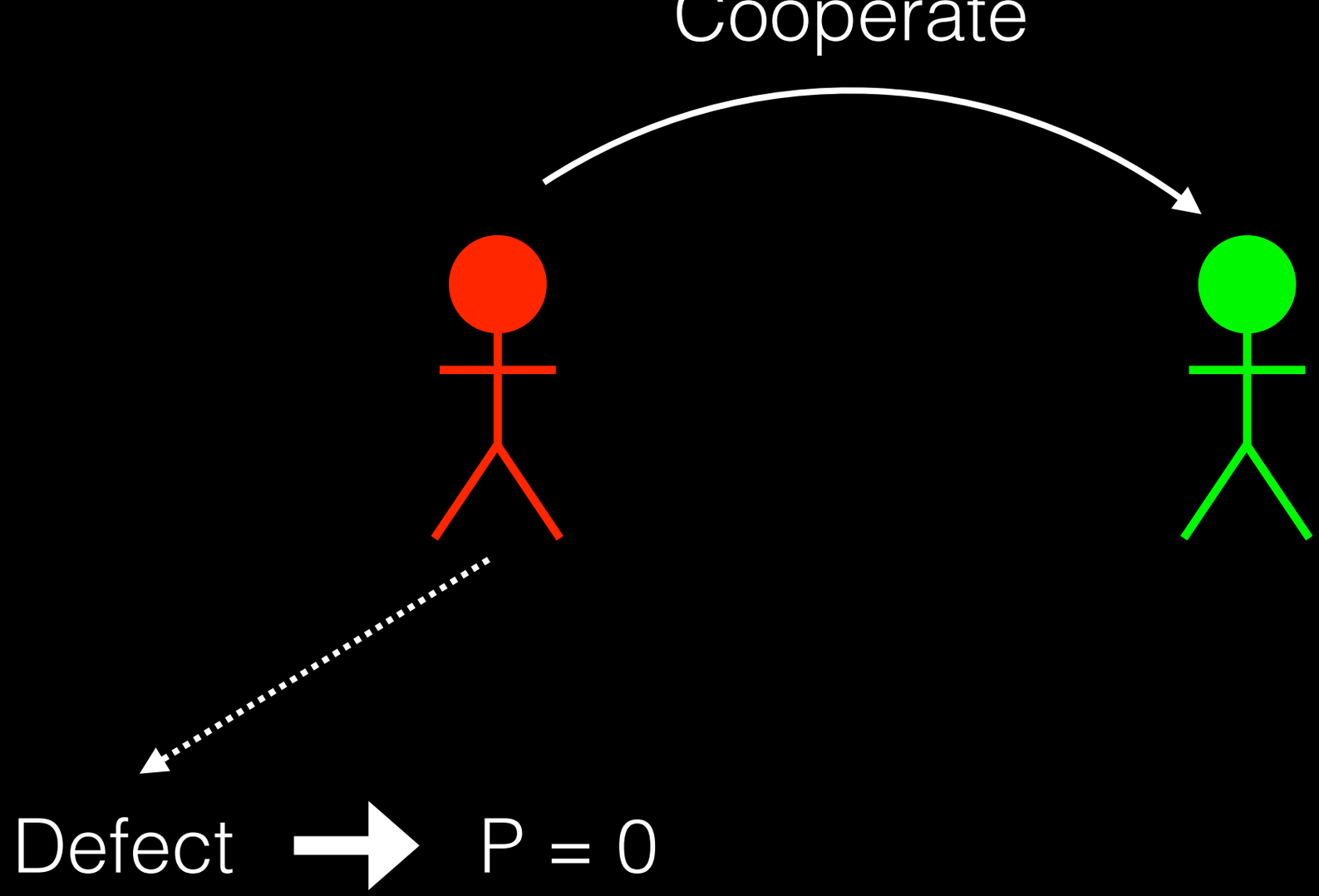
Fairness in the prisoner's dilemma

Cooperate or Defect ?

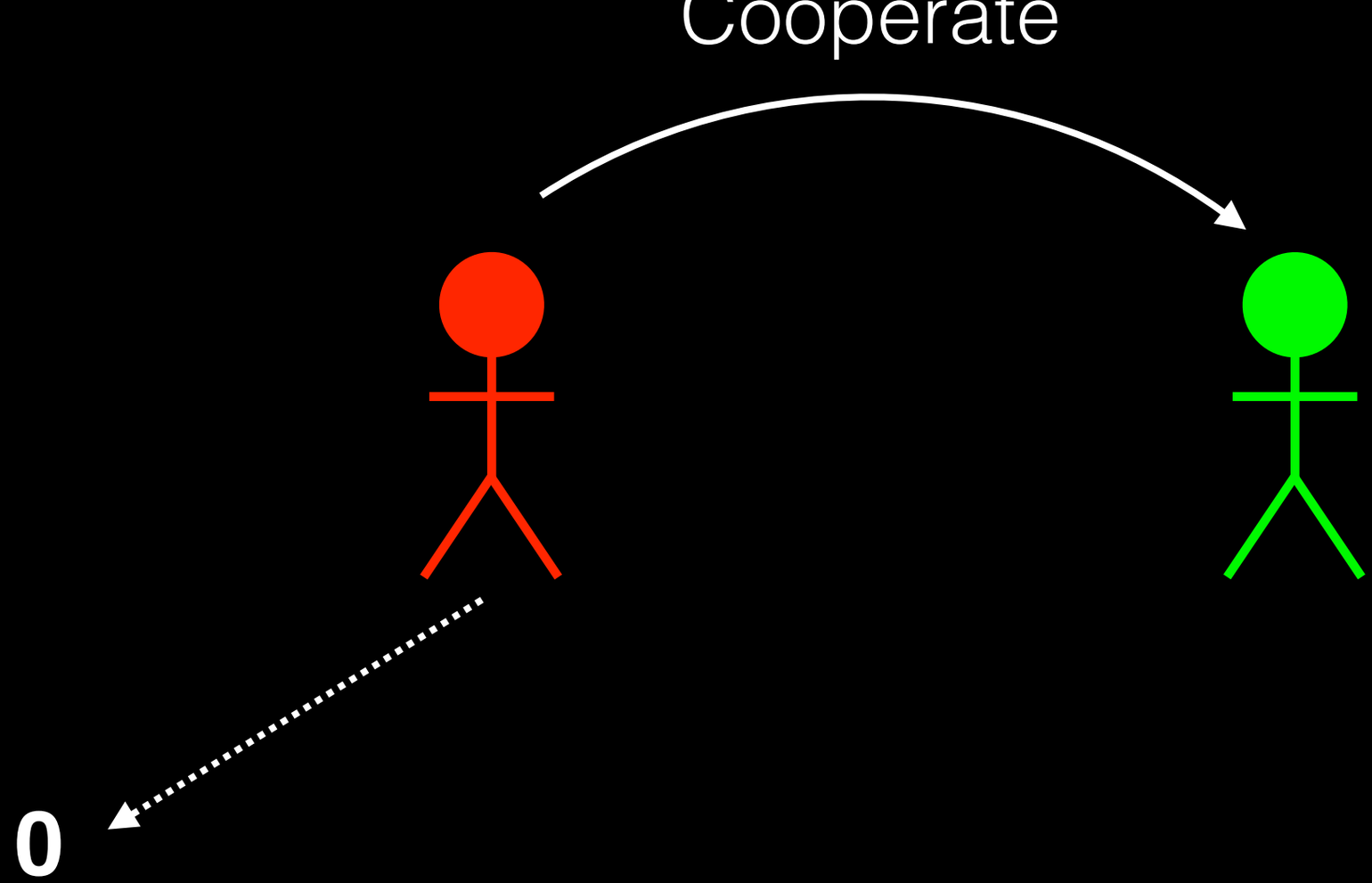


What in return?

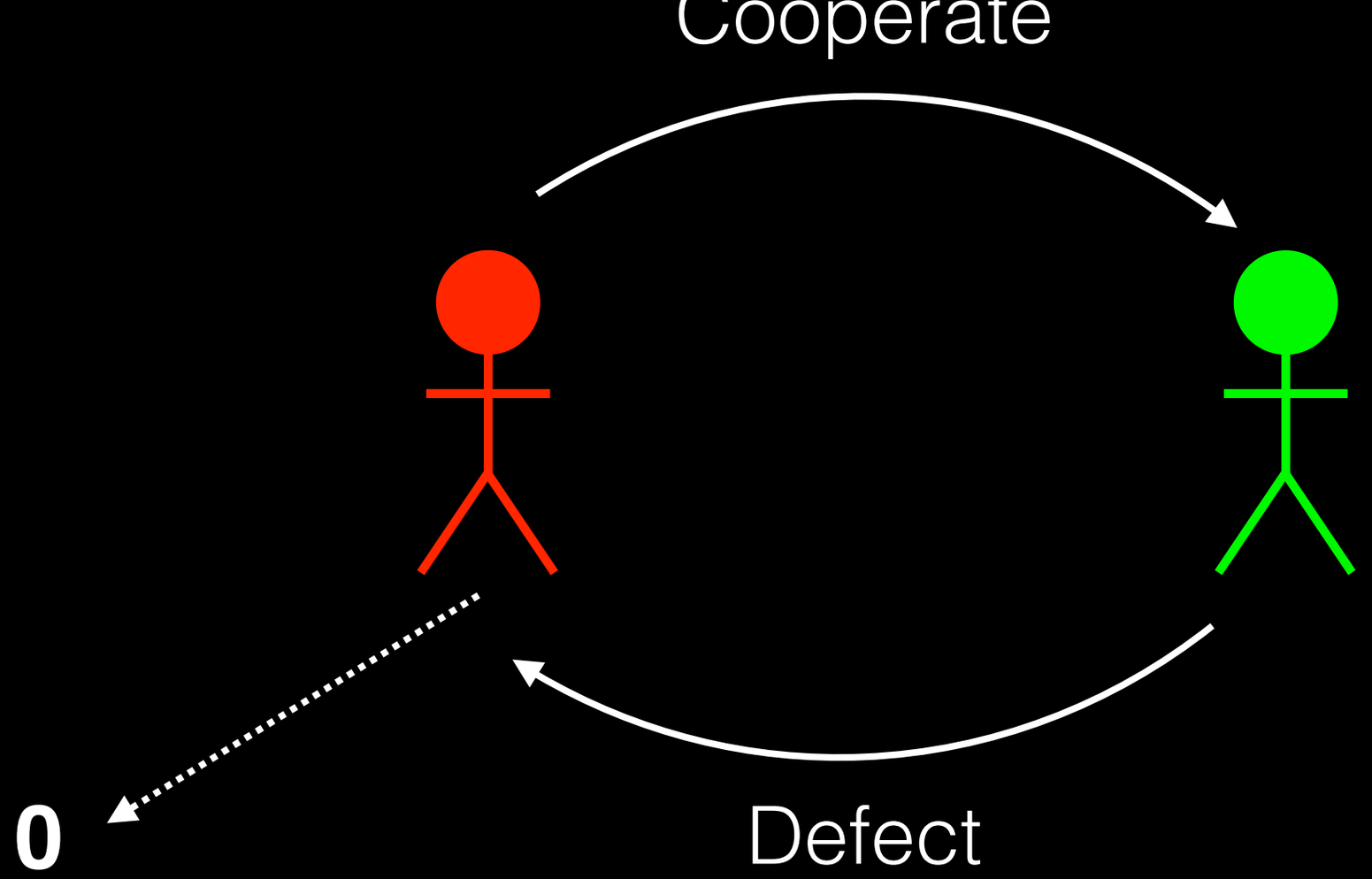
Fairness in the prisoner's dilemma



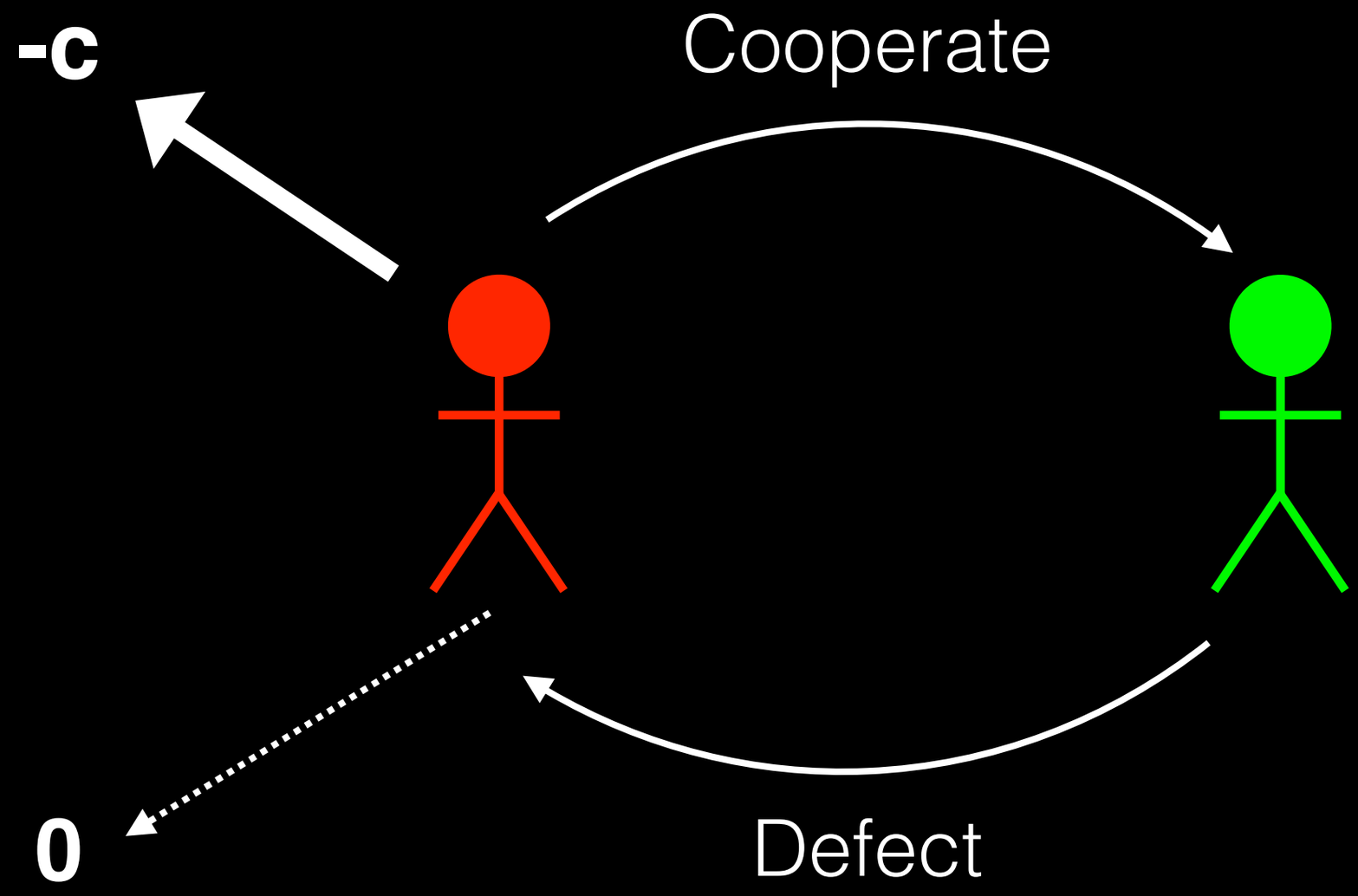
Fairness in the prisoner's dilemma



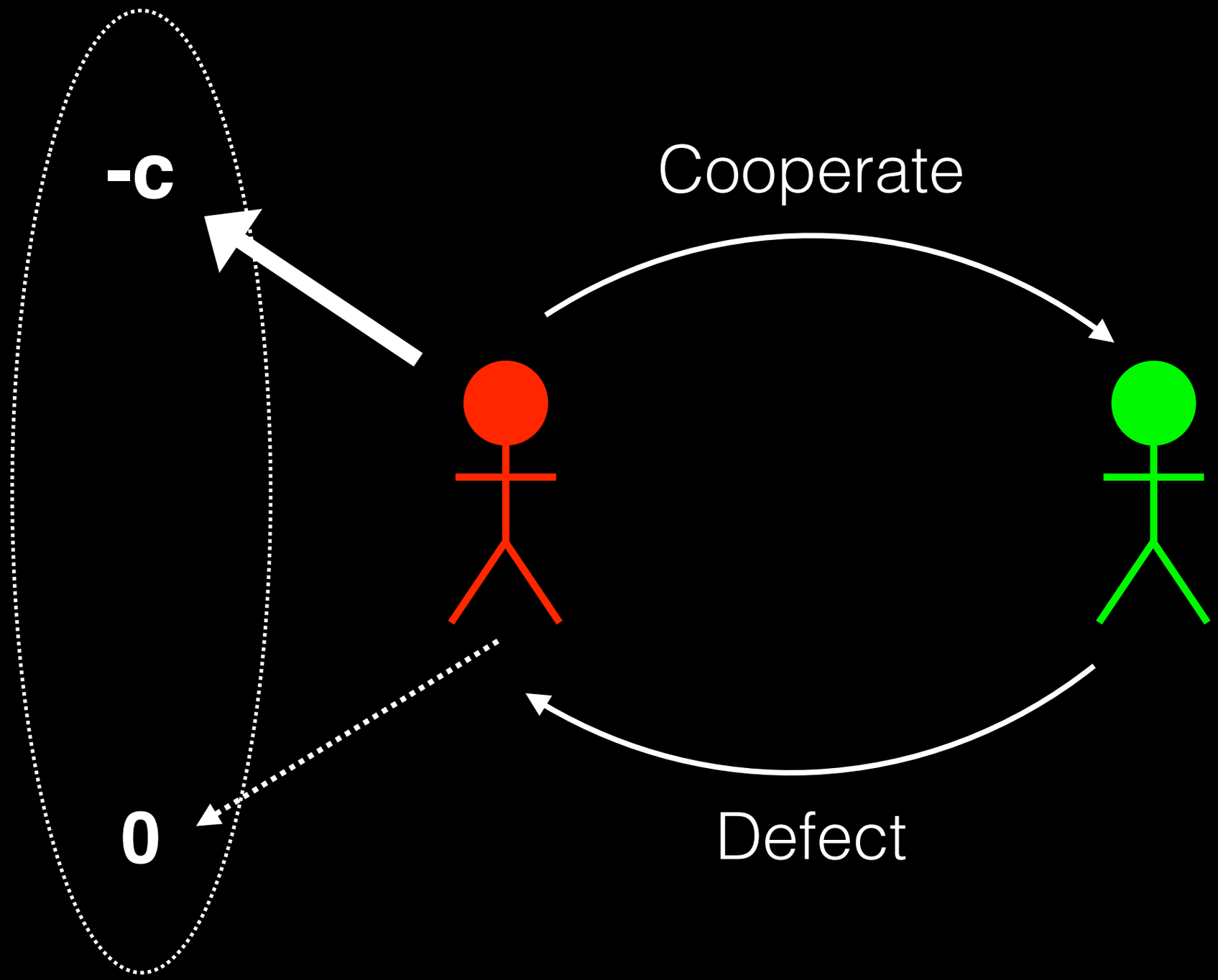
Fairness in the prisoner's dilemma



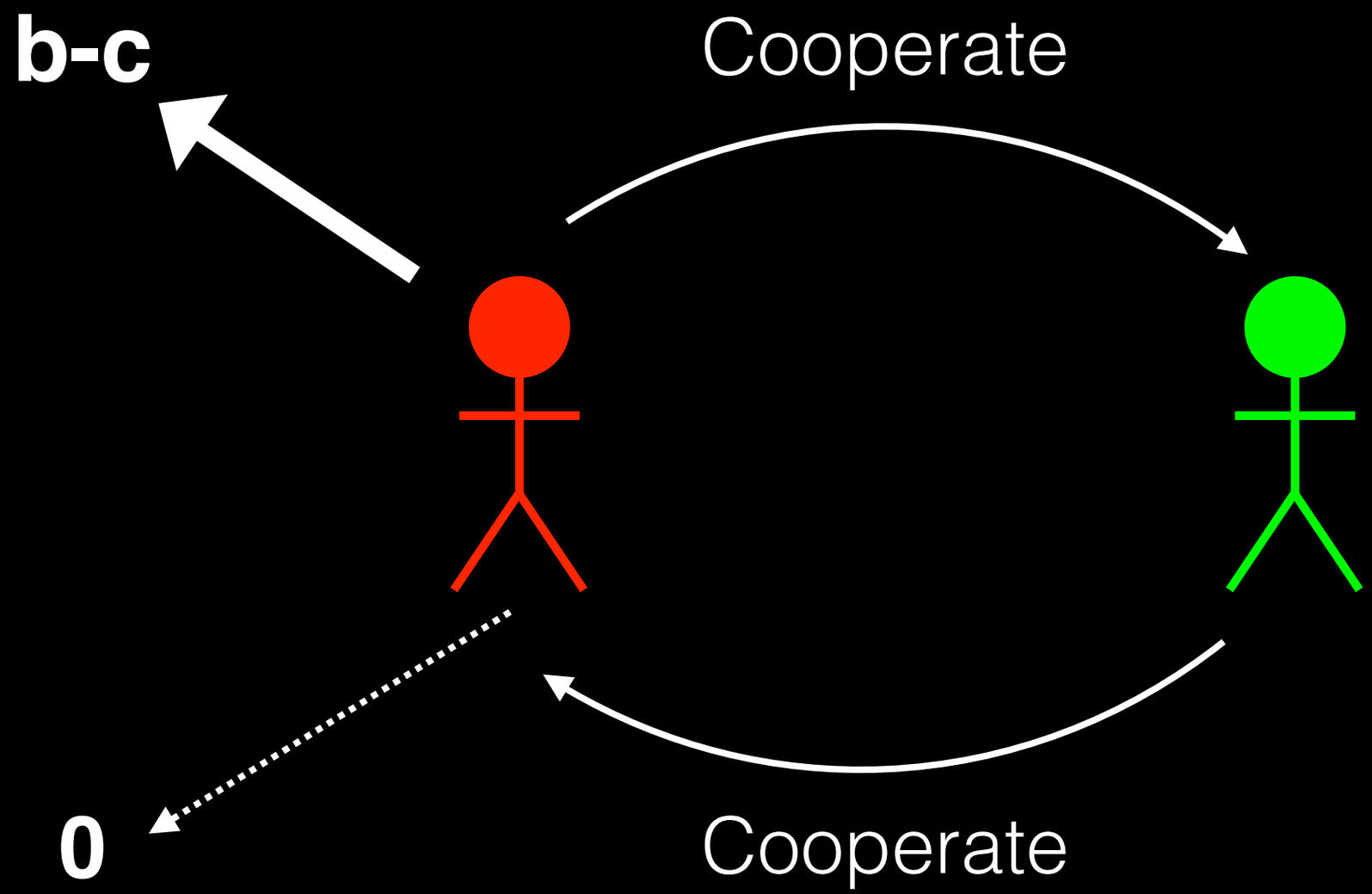
Fairness in the prisoner's dilemma



Fairness in the prisoner's dilemma



Fairness in the prisoner's dilemma



Fairness in the prisoner's dilemma

Incentivizing cooperation entails conditionality:

You cooperate → I cooperate
You defect → I defect

Social outside options

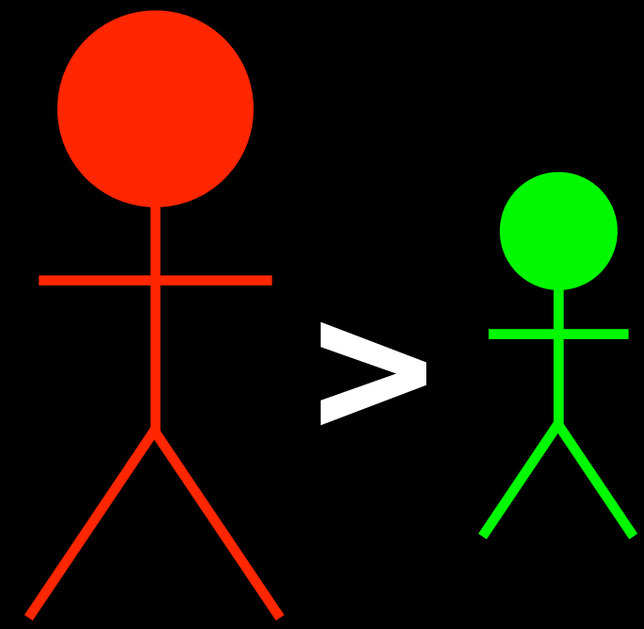
- The « outside options » of cooperation can be within the current interaction (e.g. Defect instead of Cooperate)

- They can also be *outside the interaction*: doing something entirely different, or cooperating with a different partner

Why force shall not pay

Model

- Two types of players, in fixed frequency
- They can cooperate in pairs
  to produce a sharable resource
- The bigger player always dominates
  asymmetric interactions
- In symmetric interactions,
  the dominant is chosen randomly

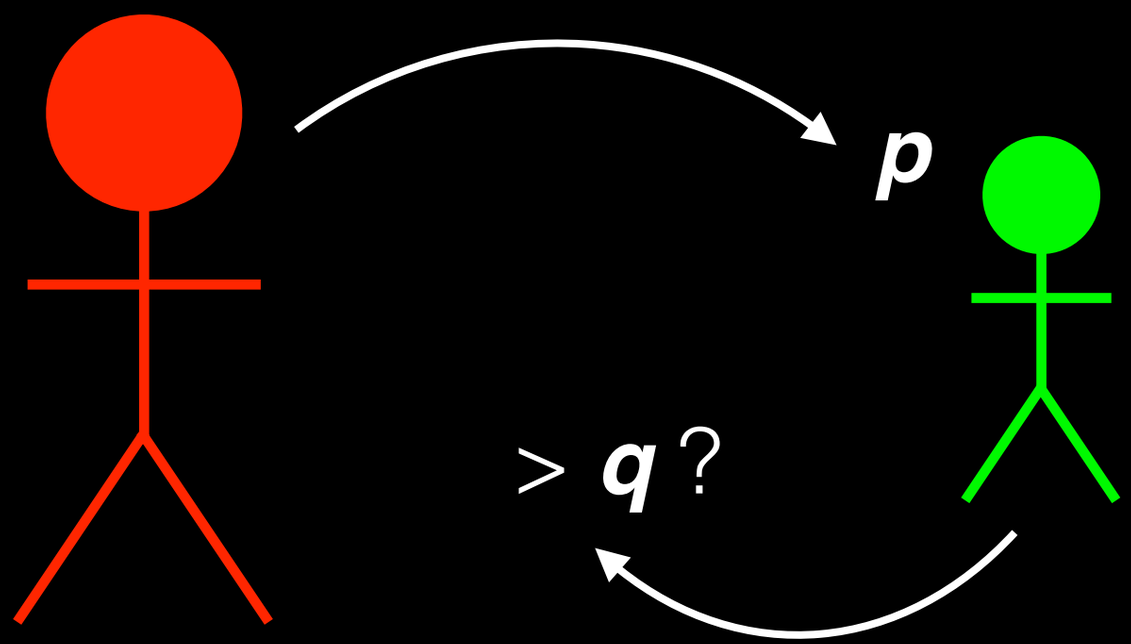


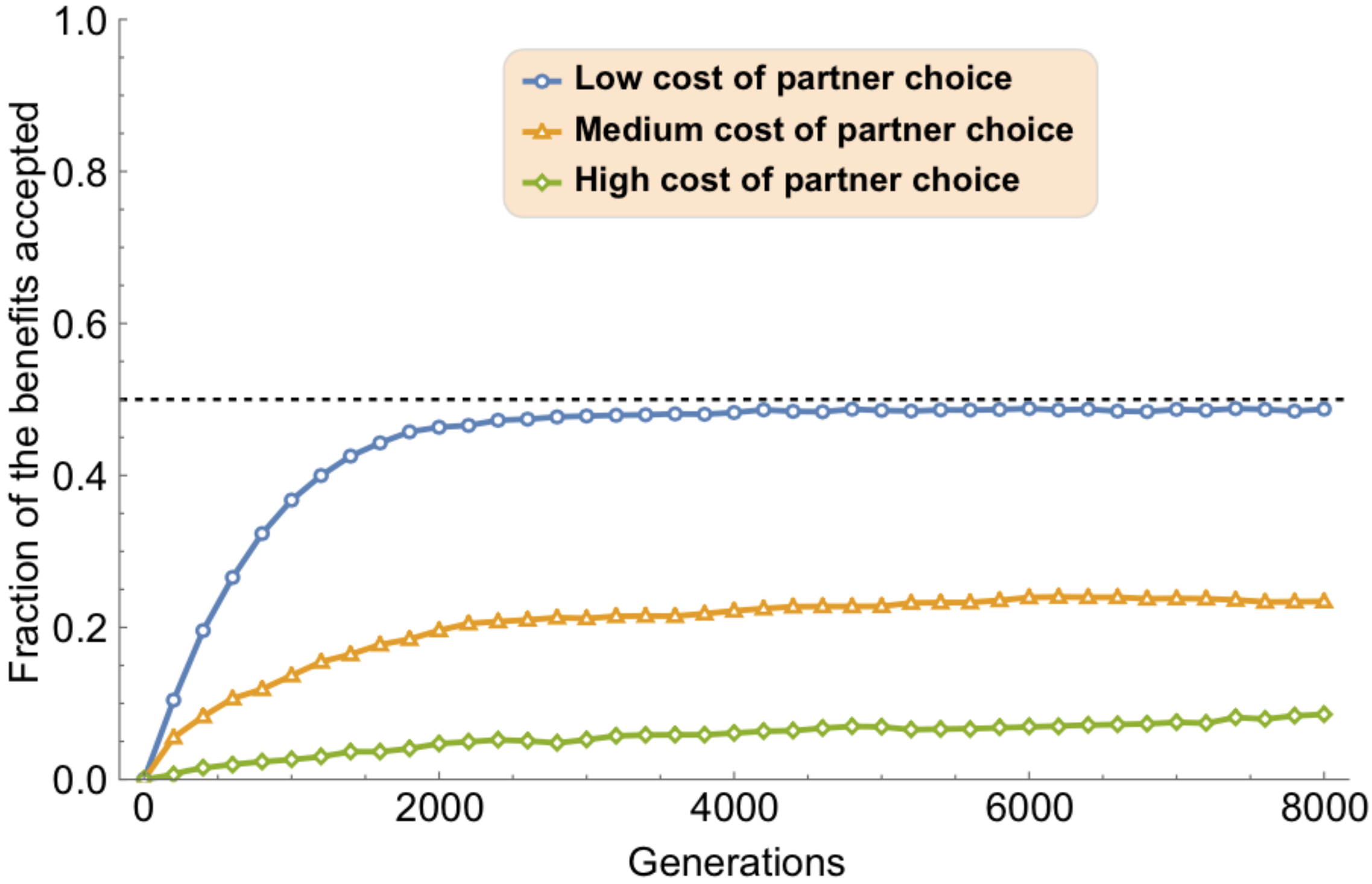
Debove et al. 2015a

Model

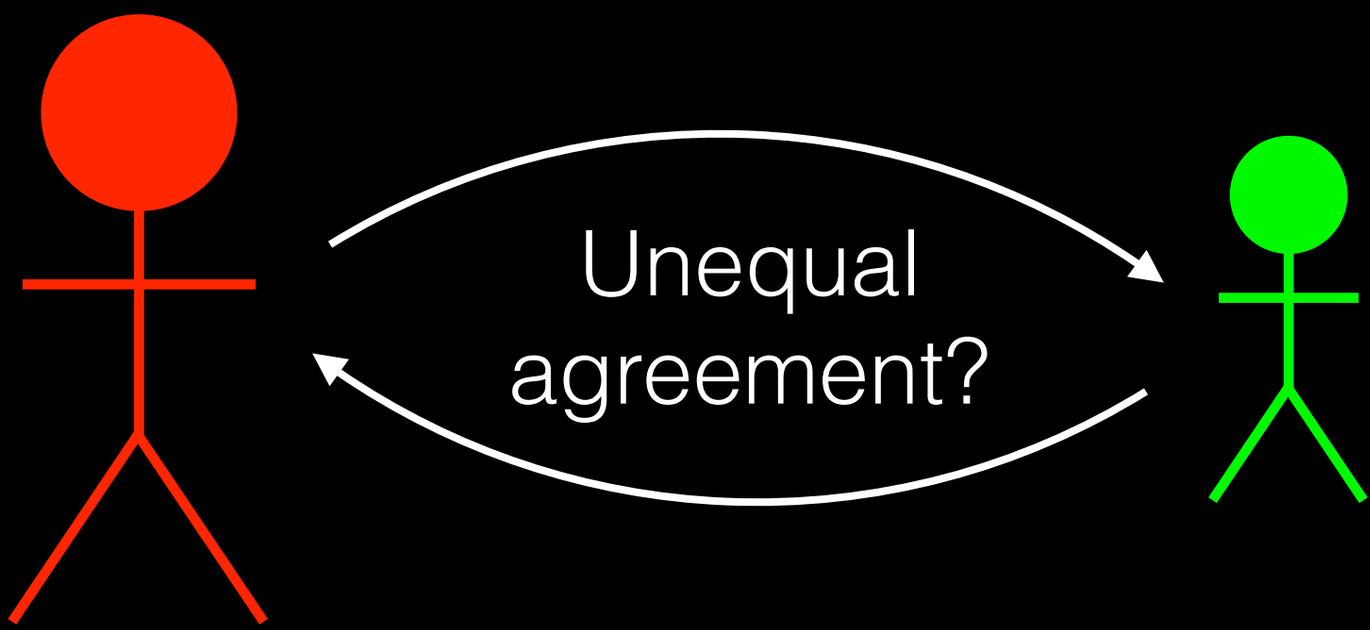
Each individual is genetically characterized by:

- the offers they make when they are dominant
- the minimum offer they are ready to accept (through reputation) when they are subordinate



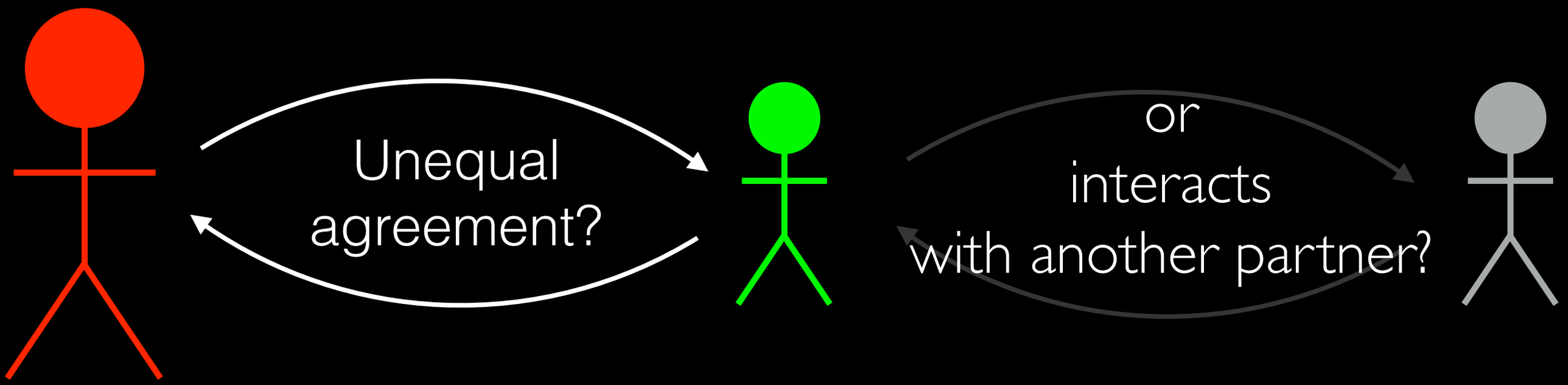


Debove et al. 2015a



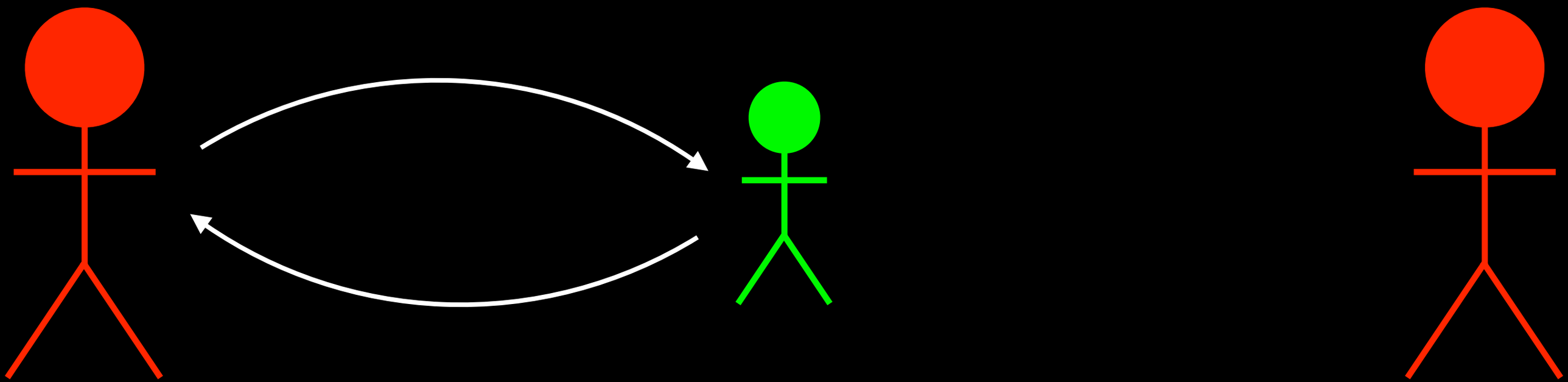
Gains
1/2 + δ

Gains
1/2 - δ



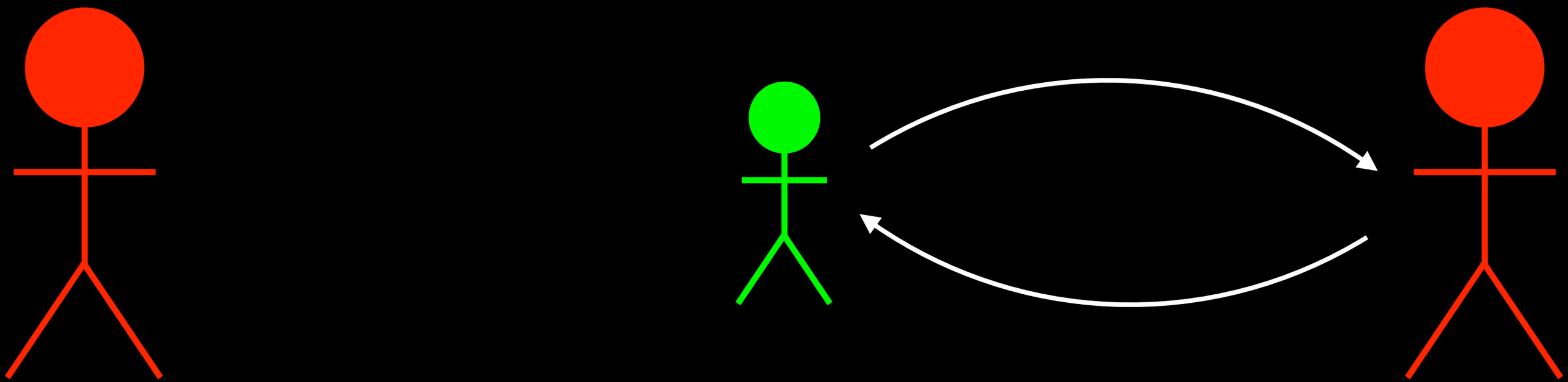
Gains?

The alternative partner is also strong



1/2 + δ

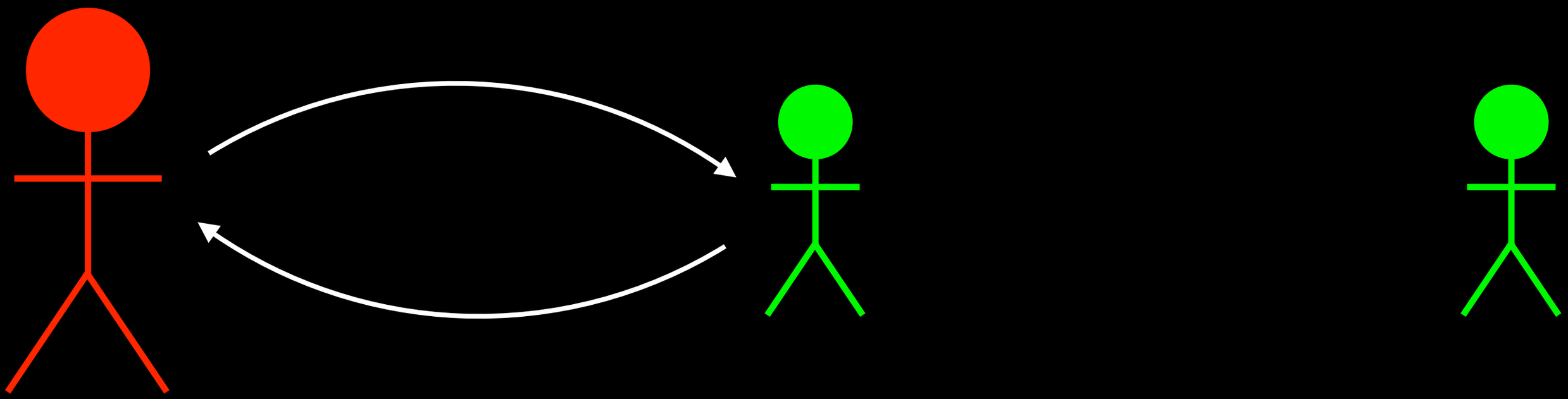
1/2 - δ



1/2 - δ

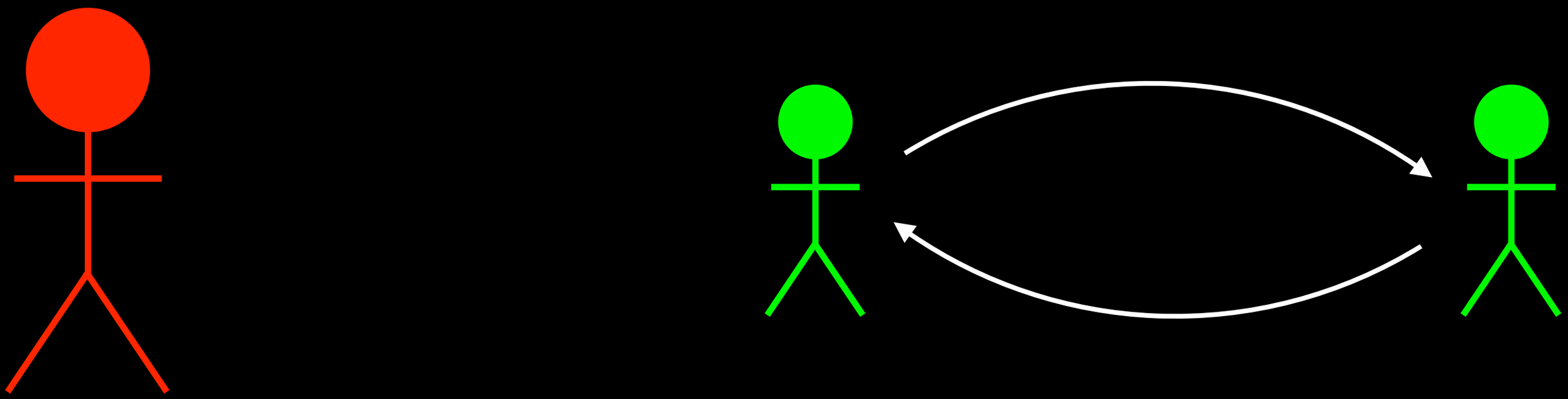
1/2 + δ

The alternative partner is weak



1/2 + δ

1/2 - δ



1/2

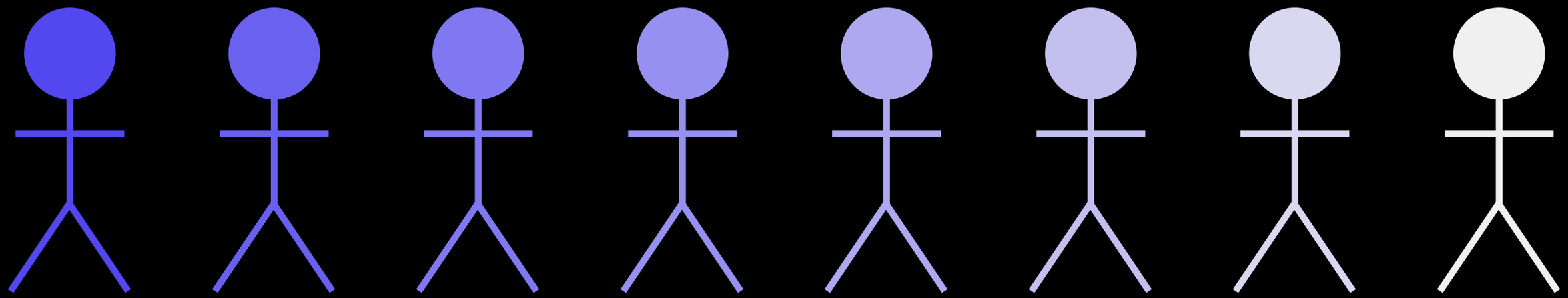
1/2

Why force does not pay

- A weaker individual always has the outside option of getting 1/2 with another weak partner
- Strong individuals who would impose an unequal distribution are not matching the BOO that their partner had before entering the interaction
- Fairness entails that both individuals must always be rewarded equally

Why productivity shall pay

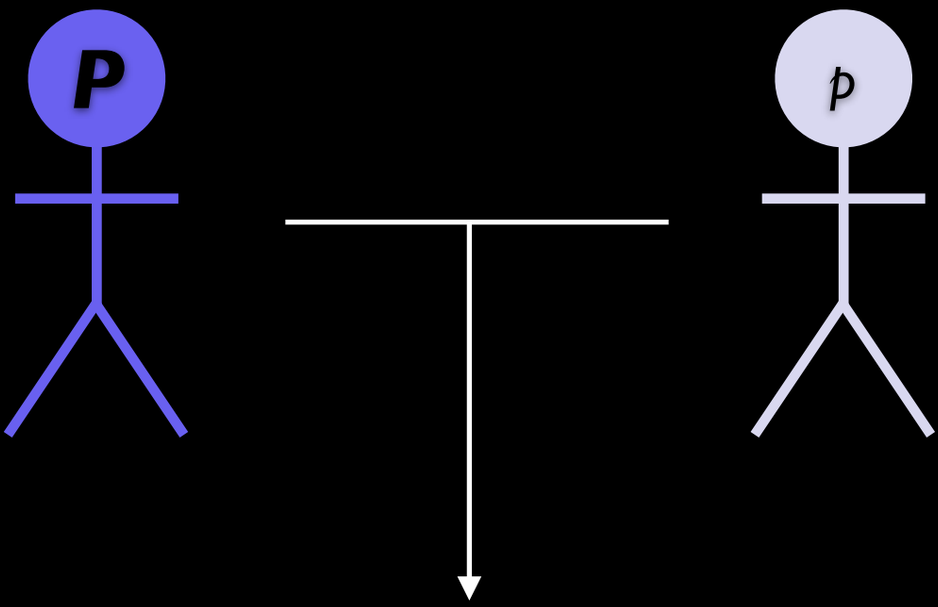
Model



Continuum of individuals with varying productivity

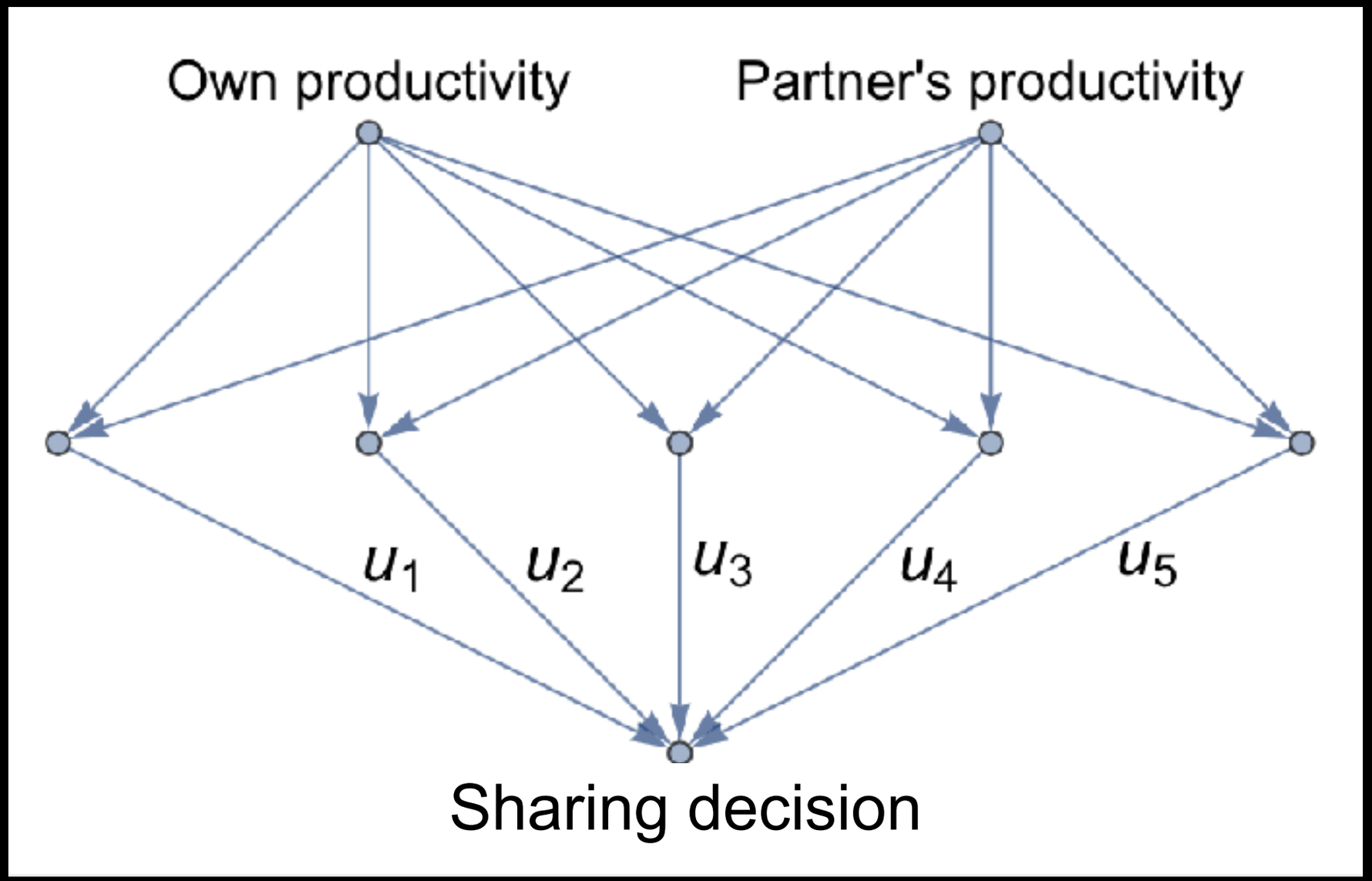
Debove et al. 2017

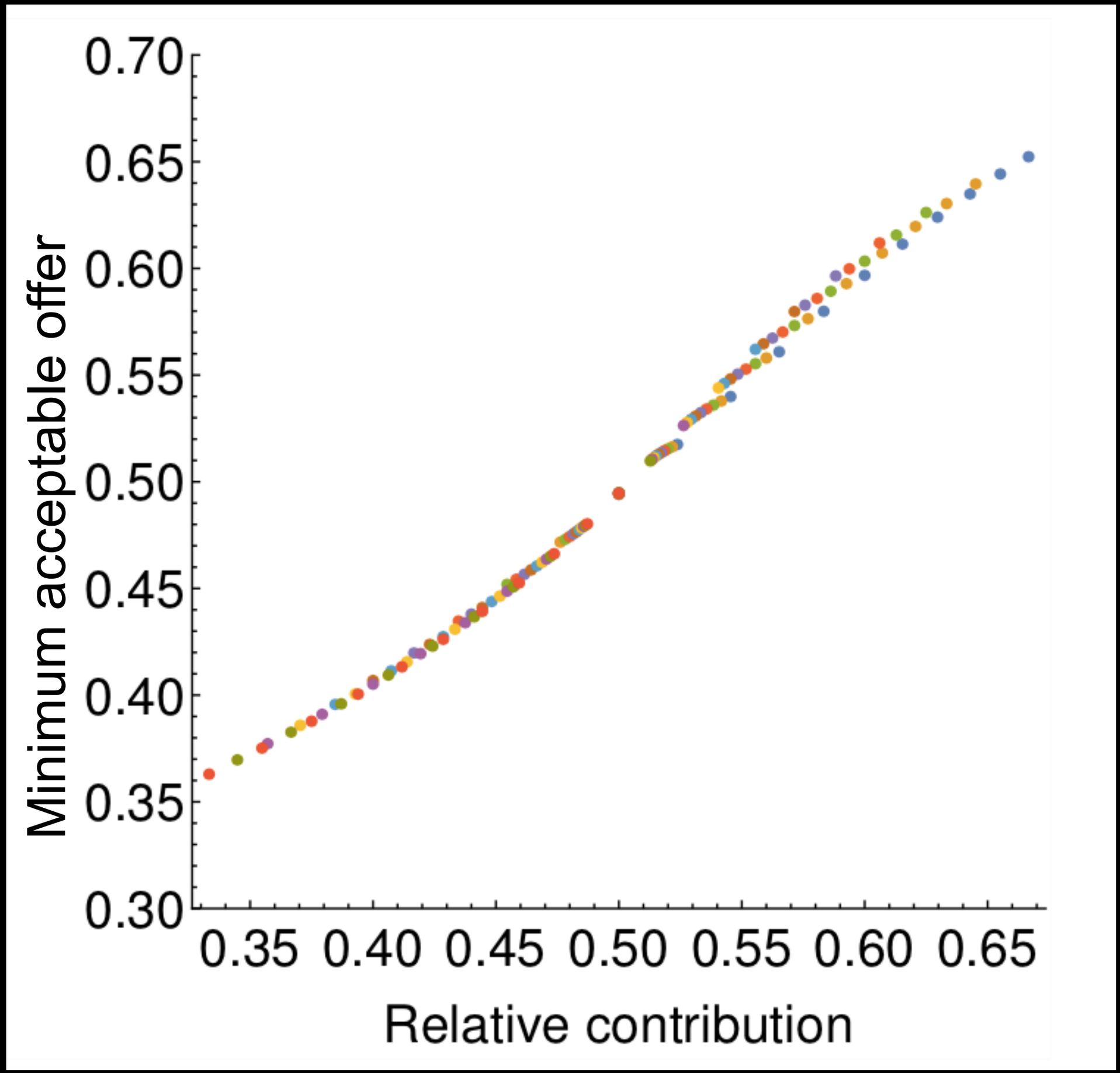
Model

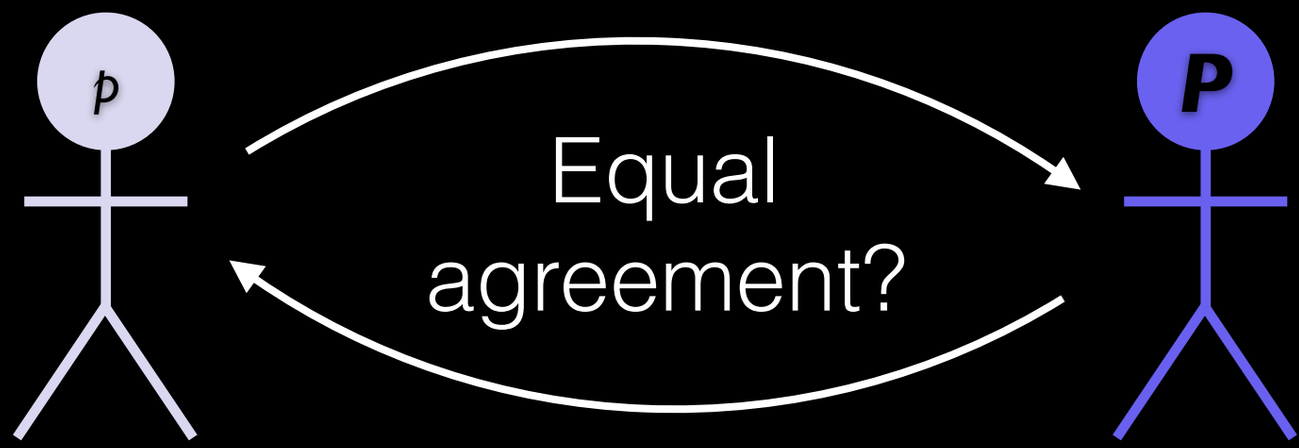


Total production of the pair = ***P*** + *p*

Decisions are made by artificial neural networks

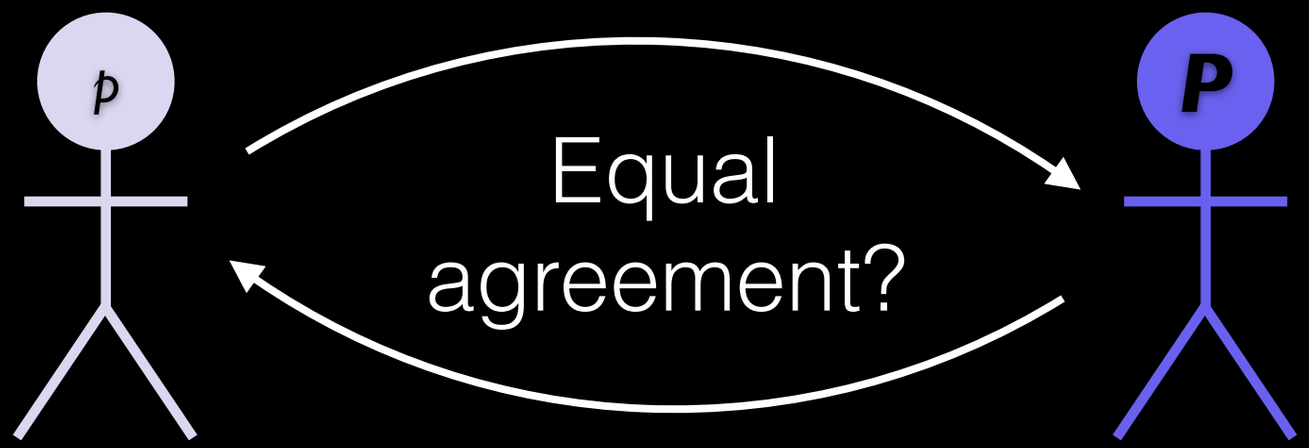



Minimum acceptable offer
0.70
0.65
0.60
0.55
0.50
0.45
0.40
0.35
0.30
0.35
0.40
0.45
0.50
0.55
0.60
0.65
Relative contribution

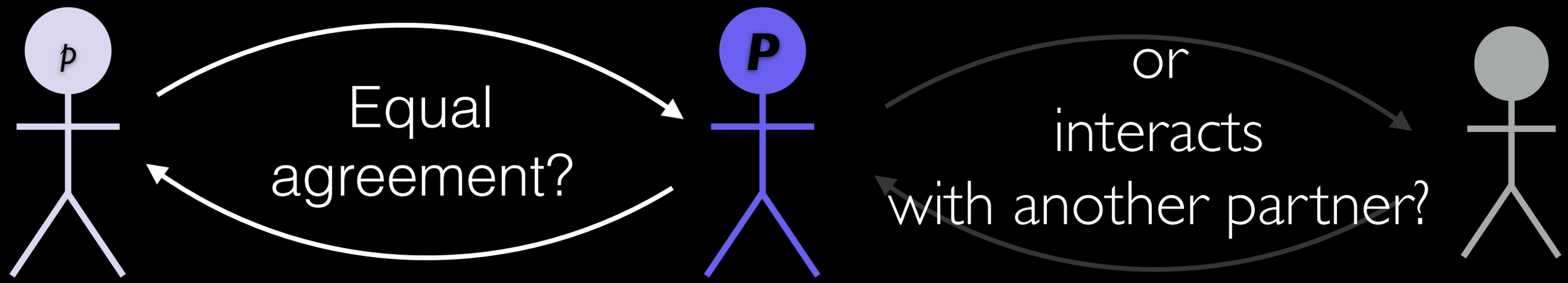


1/2 (*P* + *p*)

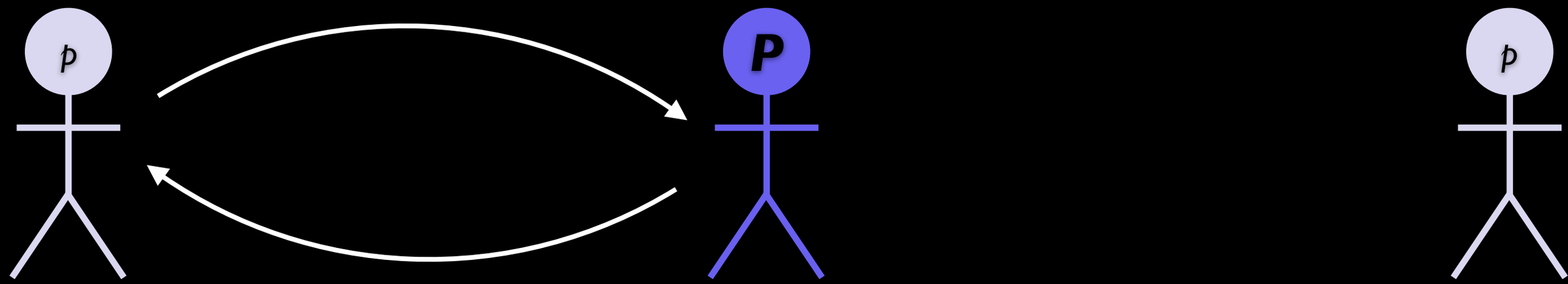
1/2 (*P* + *p*)



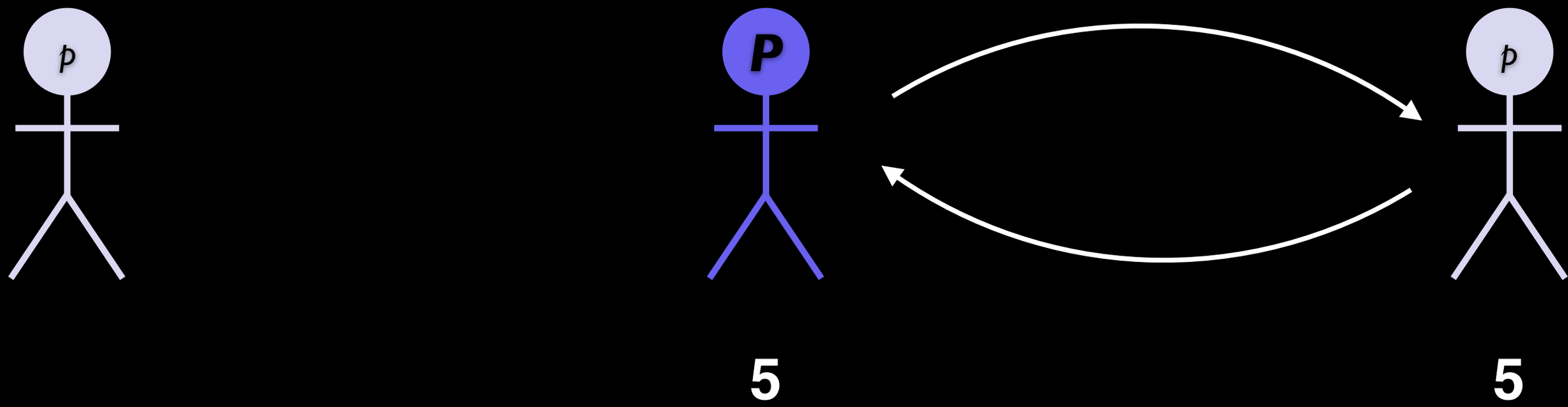
P = 8 ; *p = 2*


p
Equal
agreement?
P
or
interacts
with another partner?

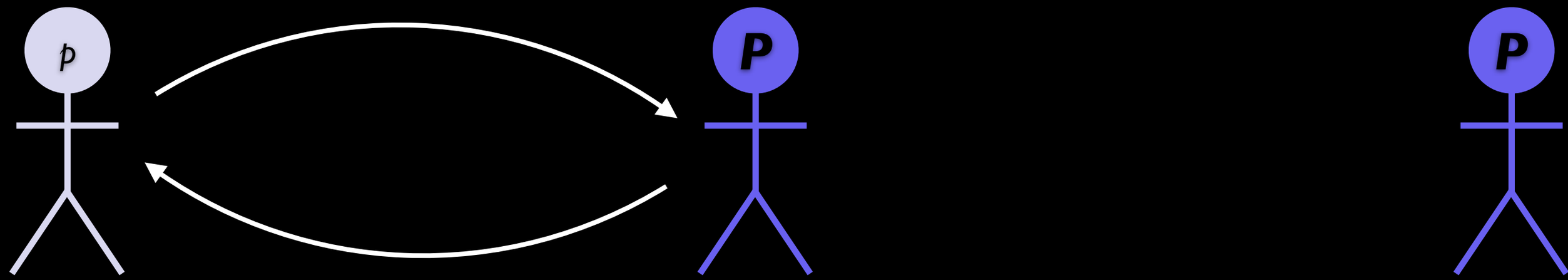
The alternative partner
is poorly productive



$P = 8$; $p = 2$

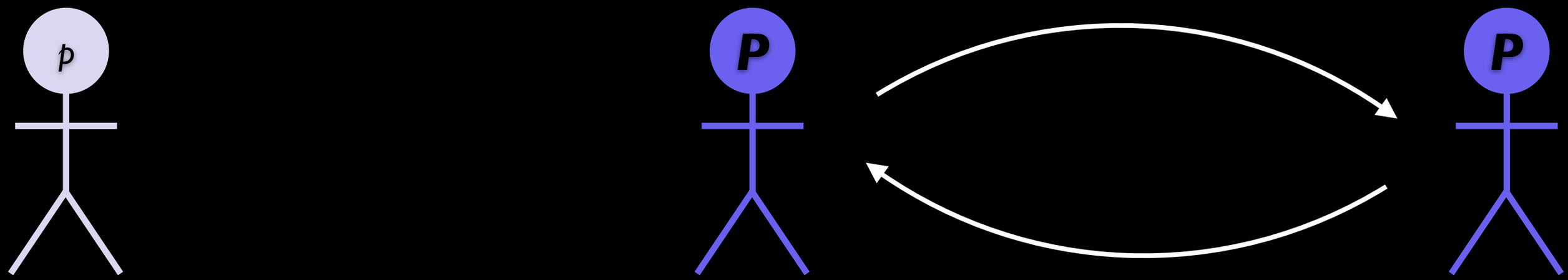

p
P
p
5
5

The alternative partner
is highly productive



5

5



P = 8 ; *p = 2*

Why productivity pays

- In average, highly productive individual have better outside options than others
- They must be rewarded in proportion to these higher outside options

Search & matching models

- Search & matching models with transferable utility can be adapted to study this problem (e.g. Becker 1973; Diamond 1982; Gale 2000)
- They confirm our results in a more general context

Félix Geoffroy

Geoffroy et al. *submitted*

Cooperation entails a contract

→ I must prepare a talk, attend the others' talks, etc.

Or, Gijsbert will regret to have invited me.
He *had* the outside option to invite someone else instead,
and I must at least repay this *past* outside option

Contracts
can be in the long-term

Having a friend

→

Some day,
I will have to do that

Or, my friend will regret to have developed a friendship with me.
He *had* the outside option to choose another friend instead,
and I must at least repay this *past* outside option

A hardware store has been selling snow shovels for \$15. The morning after a large snowstorm, the store raises the price to \$20.

Completely fair	Acceptable	Unfair	Very unfair
18%		**82%**	

Summary

- Human cooperation is shaped by the logic of fairness
- The function of fairness is to incentivize others' cooperation with oneself
- This entails that others should be rewarded in function of the outside options they had before they decided to cooperate with oneself

Acknowledgements

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