

## Generosity, selfishness and exploitation as optimal greedy strategies for resource sharing

There is increasing evidence that fairness and generosity are not exclusive human traits. Indeed, several experiments on chimpanzees, monkeys and other mammals show an inequity-aversion behavior.

Namely, if some valuable resource, e.g. food, is unevenly divided between two individuals, the one who gets a smaller share may reject the reward, and, in some cases, there can even be an attempt of the animal with the larger share at equalizing the division.

Therefore, animals can deliberately lower their gain in name of an apparent sense of fairness.

Here we show the emergence of generosity in a resource-gathering-and-sharing game inspired by animal behavior. The players act greedily, that is, they try to individually maximize only their personal income. Nonetheless, the analytical solution of the model shows that three optimal behaviors emerge depending on conditions. Besides the obvious case when players are selfish in their choice of resource division, there are conditions under which both the players are generous. Moreover, we also found a range of situations in which one selfish player exploits another generous individual, for the satisfaction of both players.

Our results show that inequity aversion is favored by three factors: a long time horizon over which the players try to optimize their own game, by the similarity among players in their ability of performing the resource-gathering task, as well as by the availability of resources in the environment. These concurrent requirements lead to identify necessary conditions for the emergence of generosity.

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