

The evolution of strategic timing in collective-risk dilemmas

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In collective-risk dilemmas, a group needs to collaborate over time to avoid a catastrophic event. This gives rise to a coordination game with many equilibria, including equilibria where no one contributes, and thus no measures against the catastrophe are taken. In this game, the timing of contributions becomes a strategic variable that allows individuals to interact and influence one another. Herein, we use evolutionary game theory to study the impact of strategic timing on equilibrium selection. Depending on the risk of catastrophe, we identify three characteristic regimes. For low risks, defection is the only equilibrium, whereas high risks promote equilibria with sufficient contributions. Intermediate risks pose the biggest challenge for cooperation. In this risk regime, the option to interact over time is critical; if individuals can contribute over several rounds, then the group has a higher chance to succeed, and the expected welfare increases. This positive effect of timing is of particular importance in larger groups, where successful coordination becomes increasingly difficult.

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