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Comment

Dangerous climate change and collective action Comment on "Climate change governance, cooperation and self-organization" by Jorge M. Pacheco, Vítor V. Vasconcelos, and Francisco C. Santos

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Climate change perhaps is the greatest collective action problem mankind has ever faced and the international community is still at a loss for how to get the ever rising greenhouse gas emissions under control. Does the risk of crossing a "dangerous" climate threshold improve the prospects of collective action?

A literature has recently developed to answer this question. Using game theoretic models and experiments, these studies have strived to show whether the risk of crossing a dangerous threshold is good or bad news for the climate negotiations. Experimental studies have shown, for example, that the existence of a dangerous climate threshold helps cooperation as compared to gradual climate change alone [1]. Contributions to protect the global climate increase with higher damages of crossing a threshold [2]. Player inequality and uncertainty about the damage have only little effects on collective action [3,4], whereas uncertainty about the threshold has a strong negative effect [5].

Jorge M. Pacheco, Vítor V. Vasconcelos, and Francisco C. Santos analyze the same kind of questions in the framework of evolutionary game theory [6]. In this dynamic environment, individuals start the game as a certain type of player, e.g. cooperator or defector, and they copy the behavior of the other players in the population whenever these appear to be more successful.[1] The results confirm that the expected damage of crossing a threshold and threshold uncertainty are key determinants of collective action. Starting with this "diagnostic" analysis, Pacheco, Vasconcelos, and Santos proceed to investigate settings and strategies that have not been tested in experiments. Using an N-person public goods game, they can distinguish between a global setup, in which the population Z constitutes the sole group of size $N = Z$, and a local setup, in which individuals interact in several smaller groups with $N < Z$. Their main conclusion is that local institutions beat global institutions. The key insight here is that cooperation can only thrive if at least some cooperators in the population do better than the defectors. This is more likely to happen in the local setup because it allows for more variation in behavior. To provide some simple intuition, consider first the global setup. There is only one large group and it either avoids the dangerous threshold or not. In either case, defectors do

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[1] This is the main difference to game theory and experiments. Standard game theory assumes that players are rational and purely self-interested and optimize their action given the behavior of others. Experiments do not make any assumptions about players' preferences and strategies, but reveal how real people with real preferences behave.

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better than cooperators because they don't contribute to the avoidance of the collective damage. The only role model in this situation is defection and cooperation cannot spread. Now, suppose that there are many small groups, and some of which manage to avoid the dangerous threshold. The players in these successful groups set an example for the players in the unsuccessful groups, and so cooperation can spread. By a similar logic, local sanctioning institutions work better than a global sanctioning institution.

The review by Pacheco, Vasconcelos, and Santos highlights the informational value of local institutions. The local setup allows players to experience the good and the bad, and to build upon the good. However, in reality, local institutions cannot ensure that dangerous climate thresholds are avoided. This depends on *global* emissions. For this reason, local efforts should not replace the efforts to reach a global agreement but complement them. Role models at the local level hopefully make others to follow suit and provide some leverage for the international climate negotiations.

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