

Open Discussion: Integrating Behavioral and Environmental Economics

The main themes that have emerged in the workshop, with respect to the integration between behavioral and environmental economics, can be summarized as follows:

1. The role of the discount factor in shaping individual and collective decision: how do we trade off the interests of the current generations with those of future generations?
2. The issue of scale and context in the achievement of cooperation among agents interacting in complex adaptive systems (CAS) with dynamically changing landscapes.
3. The importance of the often neglected diversity of behavior: can we advance in our modeling efforts by resorting to a combination of bounded rationality and optimization?

For what concerns the first point, much discussion has been directed to the problem of aggregation of individual discount factors and whether the resulting measure can be thought of as an instrument in the hands of policy makers. Empirical, neuroscientific and theoretical evidence seems to suggest that we discount the future differently at different points in time, and that the integration of heterogeneous opinions leads to hyperbolic discounting at the society level. However, it is not trivial to assess what happens at the individual level; it may be the case that a hyperbolic discount rate results from the aggregation of exponential ones at the individual level, or that the hyperbolic discounting also takes place at the disaggregate level. Another open question concerns how to incorporate the discount factor in a dynamic view of cooperation in time and space, something overlooked by most related literature. One suggested possibility is to use simulations to look at how different rates result in population-wide (average) behavior.

Regarding the evolution of cooperation in the commons, possible mechanisms that have been discussed to explain it range from genetic relatedness to reciprocal altruism, viscosity leading to clusters of cooperation and social norms arising within groups. Important factors ultimately determining the successfulness of the above are played by modularity, scale (local vs. global), as well as topology and network structure. In a further level of investigation, one may ask how networks arise. Moreover, one emergent conclusion from the discussion concerns the importance of variation and its maintenance in order to guarantee the robustness of CAS and avoid their collapse. Another commonality in the body of work presented in the workshop concerns the need

of incorporating norms as endogenous to the models. Such norms, and the agents who are confronted with them, are embedded in specific contexts: the way they are perceived may ultimately affect their effectiveness in promoting cooperation, as magnetic resonance (fmri) experiments on human and animal brain suggests. This is why thinking about norms means more than averaging individual behavior: they have a life of their own which is deeply interconnected with collective behavior. In order to tackle such complexity, the participants propose to allow the modeling efforts to be informed and feedback into experimental and empirical work.

Such considerations pave the way for the third pointed highlighted above, that of bounded rationality; moreover, even the considerations on the discount factor are pertinent, as the behavioral foundation of hyperbolic discounting lies in the preference for immediate rewards (and aversion to delayed gratification). More generally, behavioral evidence suggests that in many domains humans follow heuristics rather than optimization in solving their “games”. This since in reality individuals are confronted with metagames with a high degree of uncertainty: that is one doesn’t know what game he or she will play, and therefore resorts to heuristics that work well on average. One such example is that of imitation of successful behavior, which has been much employed in the models presented here in the form of replicator dynamics. Heuristics can arise as conventions to solve coordination problems, like those inherent in the management of the commons. Their emergence is strictly linked to the social pressure needed to enforce them: the convention of driving on one side of the street is maintained on the grounds of the sanctioning of violators in the response to the harm caused by the deviant action. The question arises about the cause of sudden changes in norms: one key actor is the external regulator, who has the power to influence individual behavior, for example in the management of the commons. One way to incorporate this idea in models is to allow for a deliberative process of reasoning to lay down the rule (for example by recurring to optimization techniques assumed to be in the hands of the environmental regulator), and then to have the enforcement stage to assess whether the rule becomes a norm which successfully fixates in a boundedly rational population (characterized for example by replicator behavior. In today’s large communities it may be the case that the formation of norms takes this top-down route in place of the canonical bottom-up pattern characteristic of smaller communities. Two dimensions have been recognized an important role in the above discussion: time and space. For what regards the former, it should not be forgotten that the life-time of individuals and institutions is different, therefore it may not only

be a matter of different levels of rationality, but of horizon, uncertainty and ultimately discount factor. Regarding the spatial aspects, the network structure impacts the enforcement of a norm: for example those deviating from traffic rules may have similar characteristics, and their relative abundance and topology may determine whether they are subject to social pressure or not. Lastly, it should be noted that in the absence of a legitimate institution solving the coordination problem in the commons, a decentralized process may lead to the emergence of a sub-optimal norm. Such process, however, may not be an option if the scale of the coordination problem is too large: the climate change problem (which due to its nature of threshold public good game can be seen as a coordination game), for example, requires a regulator since actors are institutions and enforcement is expensive.