

The emergence of cooperation in a heterogeneous world.

An evolutionary approach*

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Civil life is essentially a matter of cooperation. Neoclassical economic theory propounds a highly parsimonious view of cooperation as deriving exclusively from the calculation of individual interest. It follows from this parsimonious view that a person would never cooperate in a non-iterated prisoner's dilemma game. Should one then observe in the laboratory that some players cooperate even in a one-shot game, the explanation is simple: they played the 'wrong game' or, simply, they were irrational. This is the thesis put forward, for example, by Binmore: "the framing of the game triggers a social norm that players are accustomed to using when going about their everyday affairs" (Binmore 2006, p. 85). It is for this reason that agents may cooperate in a non-iterated prisoner's dilemma. If instead the game is repeated, the traditional theory justifies the cooperation simply by citing self-interest (this being the so-called 'folk theorem') or contracts with enforcement.

In reaction to this excessively parsimonious view of cooperation, recent years have seen development of a body of literature ('social preferences' theory) which instead seeks to explain why even in a one-shot non-cooperative game (i.e. the 'ultimatum' or 'trust game') it may be rational to play 'cooperatively'. The explanation, of which there are several variants, rests on the idea of a psychological payoff: in some types of interaction, certain non-tangible factors (for instance, an inequality aversion, reciprocity, etc.) may change the game's payoff structure. It is as if, besides the agent's utility function, there are further components (of a non-monetary kind) explaining the emergence of cooperative behaviour in contexts where the standard neoclassical theory would exclude it.[‡]

This is the explanation of cooperation advanced by behavioural economists (see Gintis (2004) and Bowles and Gintis (2004)), who base their analyses of cooperation on the theory of strong reciprocity (Fehr and Gächter (2000)). By 'strong reciprocity' they mean a social norm which, in a manner costly to the individual, rewards those who behave well and punishes those who behave badly. This theory of cooperation stands in methodological and cultural opposition to the mainstream economic theory: whereas standard economics (i.e. that of Binmore, 2005) envisages

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nothing but self-interest and monetary incentives, strong reciprocity theory explains the emergence of cooperation on the basis of a form of altruism which does not even require the game's repetition.

In this paper I adopt a different perspective. I propose a theory of cooperation which is anthropologically more generous than that of standard economics, but I do not embrace the strong reciprocity thesis. I put forward a pluralistic and multidimensional view of cooperation and consequently examine aspects hitherto insufficiently explored by economic and social theory. Specifically, I seek to show that, in certain settings, less 'altruistic' forms of cooperation may combine with more gratuitous ones.

I accordingly construct dynamic models which will enable us to analyse diverse patterns of cooperation or reciprocity. There are many such patterns, not all of them based on self-interest, but all of them important for understanding the dynamics of civil life.

I base the analysis on the Prisoner's Dilemma (PD) game, which is widely used to analyse cooperation because it lends itself well to the modelling of 'difficult' cooperation: the kind that occurs in situations where there is no enforcement and where there is always an incentive for non-cooperation. I believe that these situations are frequent and relevant – although in civil society individuals play many games, not only the PD – and that they are important in the real dynamics of cooperation in civil life.

In section 2 I analyse the evolution of cooperation in a 'one-shot' context, while in section 3 I apply the evolutionary analysis to repeated games. In section 4 I concentrate on analysis of situations in which four strategies interact (Gratuitous, Braves, Cautious and Nasty), also furnishing simulations. The paper concludes with a brief discussion on the results of our analysis. Main conclusions are the followings:

- (a) *The 'crucial' role of Gratuitous (G) types.* in my analysis G types should not be too numerous, because if they are they compromise themselves and also the survival, for example, of Braves (B). In populations where non-cooperation is possible (which is the case of all real ones), unconditional acts are essential, but when too numerous, they become counter-productive.
- (b) G types perform a vital role, for only they can activate the cooperation of Cautious (C). Without the presence of G types, Cs would never experience cooperation and therefore would never respond with an act of cooperation. G types are consequently valuable, but they should be protected. The success of numerous forms of cooperation – from firms to families – depends also, and sometimes above all, on the presence of a small number of unconditional reciprocators able to activate people who would never be so activated if they only interacted with conditional cooperators.

(c) *Alliances: C types*. These are ‘activated’ by Gs, but at the same time their presence is highly beneficial to Gs because it increases their expected utility. Gs, in fact, cooperate with Bs and with Cs, but they are exploited by Ns. In a four-strategy world, Cs protect the Gs against extinction.

Cooperation is therefore favoured by heterogeneity. From a mathematical point of view, it might be objected that G types are not necessary. The onset of cooperation would only require slightly more sophisticated Bs. But this was not the purpose (i.e. to study which strategies favour cooperation) for which the model was conceived. The analysis started from the assumption that behaviours like G exist in civil society. (And who could deny the presence in the real world of unconditional actions? Even Binmore (2006) with his orthodoxy and anthropological parsimony admits their existence). The model I present, has sought to analysis the conditions under which unconditional actions can not only survive but also perform a virtuous civil role.

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