

CAN MEMETICS RESOLVE THE TRAGEDY OF COMMONS?

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Abstract

The problem of social dilemmas stemming from the prevalence of externalities in the emerging socioeconomic system is investigated. The common wisdom that public goods and other externalities call for central planning and social control by political power is disputed. A game theoretic analysis is presented to support the conjecture that civic society is capable of resolving the tragedy of commons and explain the coexistence of different subcultures.

Keywords: *Tragedy of Commons, Social Dilemmas, Prisoner's Dilemma, Memetics, Cooperation.*

Introduction

Modern market economy based on commodity production has proved to be extremely adaptable self organizing system. Neoclassical theories, despite being criticized on various grounds over an extended period, still provide inspiration not only for system theoretically oriented sociological stances, but also in such varied fields as artificial intelligence and computational theory. The hidden hand of market self organization, it has been claimed, ensuring system level rationality and efficiency from the blind forces of competition and struggle among economic elements, has been the main factor for the achievement of continued development and adaptability during the modern era (Nercissians 2004). Theory holds that equilibrium prices in competitive markets represent accurate evaluations of the relative usefulness of society's scarce human and nonhuman resources. Economies are a paradigmatic example of emergent systems. With no single director or goal, an economy manages to organize the actions of billions of people in tens of thousands of different occupations. The rationalization of individual actions has been, according to this view, the result of the dominance of commodity relations over natural

and traditional economies prevalent in precapitalist modes of economic activity. The presence of externalities, a side-effect on others following from the actions of an individual or group, however, are thought to threaten market based self organization. A public good, in contrast to a private good, is non-depletable. This means that when it is used by one person, what is available to others is not depleted in quality or quantity. In the presence of externalities and public goods competitive market equilibrium could not be expected to yield socially efficient resource allocations and policy correctives are said to be needed to fix most inefficiencies of market economies. Public goods, for example, are thought to impose costs or benefits on outside the marketplace and their effects are only partially reflected in prices and the market transactions and so the market mechanism fails to reveal consumer preferences in social wants. Market failure is the standard economic rationale for government intervention. This provides the grounds for neoliberal thinking that calls for a mixed economy involving central planning and political intervention for reversing market failures caused by different externalities. Our study has been motivated by the fact that externalities and public goods seem to become prevalent in our era. Many social theorists hold that we have entered a new period that can be characterized by the convergence of economic and cultural spheres, increasing dependence on knowledge, omnipresence of computer and communication networks, and high levels of environmental risks (Lucas, and Nercissians 1987, 2003). In this new era, since the vast majority of productive and consumptive acts are social, it follows that they will involve externalities. The balance between public and private goods and roles has changed during the past decades. It would seem that knowledge is a public good and has positive externalities (Colman 1988, Putnam 2000). The absence or non-enforcement of property rights for resources with open-access characteristics can lead to use of the resource at rates that exceed the social optimum because individuals have no incentive to conserve the resource because there is no assurance that other users will do likewise. Will civic society become incapable of regulating individual actions in this new era when knowledge capital, social capital, and cultural capital seem to become the most important preconditions for development? Do we have to live under increasing levels of social control and compliance to plans enforced by political power?

Game Theory

In the Oxford Dictionary of Philosophy, game theory is defined as “the mathematical theory of situations in which two or more decision makers have choices of selecting their actions (strategies); where the outcome depends on all the strategies; and where each player has a set of preferences defined over the outcomes” (Blackburn 1996). Also, Bracanovic defines game as “various interactions between individuals, where each individual tries to act in an economically rational manner” (Bracanovic 2002). There are many games that are called non-zero-sum. The gain of one decision maker in such games is not necessarily achieved at the cost of other's loss. Depending on decisions made, it may be possible for all agents to win or lose. How can cooperation emerge in a game? It can be shown theoretically that the equilibrium outcome and the optimal outcome, if both existent, need not be the same. In other words, if all agents cooperate, the outcome would be socially optimal in the sense of Pareto. But that possibility would not happen in the absence of external forces since some agents will be able to improve their take by defecting. This fact seems to be providing further theoretical justification for the failure of market forces and the need for political intervention (Huberman, and Glance 1994) .

Prisoner's Dilemma

The prisoner's dilemma is a kind of game. Two or more agents involve in it and they have to choose whether they want to cooperate with other players or to defect. Based on their own choice and others' choices, each player receives a reward (or punishment). In this type of game, the reward of mutual cooperation is high, but the reward of defection while receiving cooperation from the opponent is even higher. So there is a temptation for defecting while hoping for receiving cooperation from others. For example, soldiers in a war are in a PD game. If a soldier stands in the front line and cooperates with others, he will increase the chance of winning in the war. But if he does not cooperate while others stand in the line, he will gain more benefit as there is a less chance of getting injured in the combat by not cooperating in the strike. Also, as the role of one soldier is negligible in the whole war, the chance of winning will not change that much by the defection of this particular soldier. If, however, all soldiers think in the same way – i.e.

rationally – no one remains in the front line. In fact, if players act rationally, there will be no cooperation in the PD game. But if the PD game is played iteratively, the situation may change. Now, there is a fear of revenge and the shadow of future can force the players to cooperate (Huberman, and Glance 1994).

Evolutionary Stable Strategies

“An ESS is a set of rules of behavior that, once adopted by members of a group, is resistant to replacement by an alternative strategy” (Cartwright 2000). For example, consider a society of people which play a PD game with each other. Assume that they always cooperate. Now, if a new person emerges in this society which never cooperates with others, he will propagate rapidly in the gene pool of the society as he receives the benefits of cooperation from the others while he does not pay anything as he always defects. Thus, after a while the society changes from cooperative people to defective people. On the contrary, in a society of defective people, if a cooperative one emerges, he will be extinct rapidly because he gains no reward while others gain more. In this example, a full defective society is an ESS while the full cooperative society is not (Dawkins 1999).

Commons, Public Good and Externalities

“A commons is a shared resource that every one can use. Internet, open source software and scientific knowledge are some examples of commons” (Rheingold 2004). If a good cannot be charged for or it’s difficult to charge for it, then it is a public good. A lighthouse is a famous example of the public good. Public goods have nonexcludability and nonrivalrous consumption. Nonexcludability means that one cannot exclude non-payers from the benefits of the good, e.g. if a ship does not pay for the lighthouse, it cannot be excluded from using the service. Nonrivalrous consumption means that if one uses a commons, it doesn’t diminish someone else’s opportunity of using it.

If we do an action which affects other people but the benefits and costs do not reflect in the market, that action is an externality. For example, one’s car makes pollutions but no

one charges him for the costs that he has imposed on others. In fact, it's impossible to do so. If every one can get together and agree on a contraction, then they can use the commons without any problem but these agreements are hard to be established and also people usually do not consider them. The tragedy arises when using public goods turn into a prisoner's dilemma. In this situation, people want to use the benefits of commons but do not contribute in producing or maintaining them. For example, we like to use the benefits of clean air, but we don't share our part with the society (by fixing our old car). As this is a PD game, if all the people act rationally, no cooperation will arise in the society.

In old societies, people were only responsible for their own countries. Also, the government was only responsible for maintaining protection and good economy for its own civilians. The people and the government were agreed upon these things and there was no need to be worried about other people in other countries. Nowadays, people have new demands. They expect from their governments to act ethically in relation with other nations, they believe in human rights and they want to keep the environment from pollution and misuse. As a result, governments are facing with a variety of different needs and beliefs. On the other hand, people do not sacrifice themselves for these common goods. They expect others to do so. Therefore, a PD game arises which in one hand no one cooperates for saving common goods and on the other hand, everyone expects to benefit from them. For example, an open encyclopedia like Wikipedia is a common good. People prefer just to use it and not to contribute in expanding it. But if no one cooperates in the project, the encyclopedia will not grow.

Different ideas have been suggested for dealing with commons tragedy. Using marketing itself is one of the solutions. In this manner, commons are altered into personal properties. For example, Zimbabwe has let the ownership of elephant herds. Since then, number of elephants has increased in this country. On the other hand, Uganda has banned the possession of elephant herds and opposite results has been achieved. The main shortcoming of this method is that it is not always possible to change commons into personal properties. Another solution is in the use of religion and morality. Although this was an efficient solution in the past societies, nowadays it is hard to obligate people in obeying the rules of religion. Government is another suggestion for the tragedy of

common goods. But they rely on bureaucracy and usually they don't serve customers well as it was a regular problem in communist regimes. Another method is in preventing nonpayer from using the service or tiding public goods to the selling of private goods. For example, cable TVs try to limit their broadcasting for only those who have paid for the service and shopping malls offer free parking lots. These methods are not applicable to every situation too.

Memetics, Viscosity and Cultural Diversity

Richard Dawkins, in the book of "the Selfish Gene" (Dawkins 1999), defines memes as "a unit of cultural transmission, or a unit of imitation". Ideas, Fashions and ... are some examples of memes. He also mentions "Just as genes propagate themselves in the gene pool by leaping from body to body via sperms or eggs, so memes propagate themselves in the meme pool by leaping from brain to brain via a process, which, in the broad sense, can be called imitation." This idea is based on the brain's ability of imitation. For example, when we hear a new idea, we can accept it or not. By accepting it, a copy of that idea comes into existence in our brain. When we speak about our ideas with someone else, we are trying to propagate our memes. Also, this propagation is prone to mutation. In fact, memes are highly mutative as our copy of the original meme is usually different from it in some aspects. Thus, the rules of evolution can be applied on emetics too.

A society can be regarded as a pool of memes. When a new idea emerges in the pool, it propagates through the means of imitation. If it receives higher fitness values – i.e. people imitate it more frequently – then it will survive. But as the society is made up of different games, the affect of other memes has a vital role in the acquired fitness value. It means that a single meme can do well in the presence of some other particular memes and the same meme can score low in the absence of them. For example, in a society of defectors, a cooperator meme cannot survive as it gains no score in the PD game. But if it emerges in a colony of cooperators, it can survive for a while and it has the chance of propagation through the meme pool.

But how can sub-cultures (colonies) emerge in a society? Dawkins suggests a viscosity in the propagation of memes. This viscosity results in more survival chance for new memes

because the new meme has to compete only with its neighbors not the whole majority of the society. This idea has been simulated in a PD game (Amirpour et al. 2007)

In this paper, a society of agents is created. These agents live in a grid world. The game consists of iterative turns. In each turn, an agent must decide between cooperation and defection with its immediate neighbors. The same decision is made by the neighbors regarding the agent. At the end of each turn, a credit is calculated for each agent. This credit assignment obeys the rules of a PD game. In result, if an agent cooperates with a particular neighbor and the neighbor answers back with cooperation too, then both agents receive a high credit. But if the neighbor defects in response to the received cooperation, the defector gains more credit while the cooperator receives nothing. At the end of each turn, agents evolve based on the rules of Darwinian evolution. The more an agent gains credit in a turn, the more it has chance of survival (Unemi et al. 2003).

In order to provoke the agents for cooperation, each agent has a set of believes. This believes form the chromosomes structure and dictate the behavior of the agent. They consist of four ideas:

1. If a neighbor has cooperated with the agent in previous turns
2. If a neighbor has defected with the agent in previous turns
3. If a neighbor has more credit than the agent
4. If a neighbor has less credit than the agent

This set of beliefs has some similarities with what is seen in a real society. People usually consider past record as an important factor for loyalty. Also, the amount of resources which are in the possession of a person, result in different risk probabilities and thus alter the behavior of the possessor.

In each turn, by using Sugeno Integral as the information fusion tool and these believes as the basis of the behavior, an agent decides between cooperation and defection with the other neighbors (Sugeno 1977, Marichal 2000).

The main idea of the paper (Amirpour et al. 2007) is laid in the viscosity of memes in propagation in the meme pool. It means that an agent affects and is only affected by its neighbors. So if a new meme (idea) emerges in the society, it must only compete with its

neighbors, not the whole society. This gives the agent a chance of survival. The paper shows that by using the idea of viscosity, new ideas can survive in the meme pool and shift the majority of memes toward their own interests. This results in a cultural diversity and prevents the community from sticking to defection ESS deadlocks. The same thing can happen in a society in order to solve the problem of commons tragedy. By allowing subcultures to survive, a dynamic meme pool arises. This dynamicity prevents the society from behaving rationally and sticking to defection deadlocks. Thus, new ways of cooperation emerge in the system.

Conclusions

Social Dilemmas result from the situation in which a group shares a common output and towards which each individual must decide to contribute or not. Traditionally, common resources have mainly referred to the immediate problems of irrigation or grazing; but in recent times we are increasingly becoming more aware of factors like knowledge, and environment as common resource. Our society and all of its institutions are in continuous processes of transformation. We must become able not only to transform our institutions, in response to changing situations and requirements; we must invent and develop institutions which are learning systems: systems capable of bringing about their own continuing transformation (Senge 1990). Cooperation, social cohesion, and norms of reciprocity are aspects of culture that determine the overall economic well-being of a community. Social capital is a term developed primarily by sociologists to describe features of social organization such as networks, norms, and social trust that facilitate coordination and cooperation for mutual benefit. Origins of social capital are complex and rooted in culture. Individuals create or contribute to social capital when they cooperate for the common good. Groups that learn to solve complex nested collective action dilemmas can harness more resources and create a larger pool of wealth, spread more widely, than groups that fail. In order for individuals to create social capital or develop norms of reciprocity, there are certain prerequisites such as common goals and shared work or recreational experiences. The main argument presented in this paper has been to demonstrate via evolutionary game theoretic analysis, that economic rationality

does not necessarily encompass myopic neglect of the advantages of cooperative action. There is no need for central and political intervention for promoting cooperation and civic society through selecting rational actions in evolutionary sense, is capable of sustaining and developing cultural diversity, subcultures of solidarity and mutual trust that can be reinforced by the experience of benefits obtained through cooperative strategies.

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