

An experimental analysis of social networks and decentralized sanctioning

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Extended abstract

Sanctioning institutions are critically related to the enforcement of optimal outcomes in social dilemma situations. Beginning with Fehr and Gächter (2000), evidence collected both in the field and in the laboratory suggests that many economic agents are willing to exert costly sanctions to keep free riders under control. Significant increases in cooperation rates are obtained when a horizontal punishment institution is introduced. However, the efficiency gains are limited due to the existence of punishment costs and the emergence of retaliation. Moreover, an exogenous complete informational network provides subjects with full, costly information about all individual decisions.

To the best of our knowledge, very little is known about how this horizontal decentralized punishment institution relies on the features of the underlying network. On the one hand, the analysis of punishment (as in the above mentioned Fehr and Gächter (2000), or in the more recent papers by Page et al. (2005) or Masclet et al. (2003)) has considered an exogenously determined, complete network as the natural framework. On the other hand, most of the experimental analysis of networks (as Kosfeld et al. (2006), Goere et al. (2006) or Corbae and Duffy (2006)) has focused on the formation of endogenous networks.

In this paper we investigate the link between punishment and networks from a novel perspective. We do not analyze the properties of endogenous networks, generated by the repeated, complex interaction of subjects. Instead, we check the properties of incomplete, symmetric and non symmetric, networks relative to a complete one. The complete network is not the only one considered, but all

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networks are still exogenous and cannot be changed by subjects. Our purpose is to analyze the efficiency of horizontal sanctioning institutions under different networks.

We run 4 different treatments, all of them based on a simple linear team production game, repeated for 20 rounds. They differ in the underlying network: complete, linear, circle and star. All treatments are run under two different conditions: *cooperation failure*, where the positive effects of decentralized sanctioning is analyzed after 20 rounds of a standard team production game (with no punishment and cooperation decline), and the *sanctioning game*, where the punishment institution is present from the beginning. The 2x4 design allows both for within and between subjects analysis.

Around 300 undergraduate students with no previous experience in similar experiments participated in the experiments, run at the laboratory for research in experimental economics LINEEX, at the University of Valencia (Spain). All experiments were run using Ztree, a standard session lasted for 60 to 90 minutes and average earnings were above €20. Our theoretical analysis shows that both the alternative network structures and the punishment institutions do not modify the unique inefficient equilibrium.

In line with previous work, our results suggest that (i) the network structure matters even in the cooperation failure condition, when no punishment is allowed, as cooperation rates are significantly different; (ii) no efficiency gains comes from the introduction of social sanctioning when the social network is not complete and symmetric; (iii) the punishing behavior heavily depends on the position in the network, and (iv) the star network outperforms other incomplete networks.

In our view, our experiment confirms that institutions matters, but they do not always matter in the same way. Subtle changes in the underlying network structure of an organization give back major differences in results. Moreover, the choice between alternative network institutions depends on behavioral principles not taken into account by standard theory. The consequences of these results both for the design of optimal monitoring systems and the social capital literature are discussed.

References

- Corbae, D. and J. Duffy (2007): "Experiments with network formation", mimeo, University of Texas at Austin.
- Fehr, E. and S. Gächter (2000): "Cooperation and Punishment in Public Goods Experiments", *American Economic Review*, 90, 4, 980-994.
- Goeree, J., A. Riedl and A. Ule (2005): "In Search of Stars: Network Formation among Heterogeneous Agents", mimeo, Caltech.
- Kosfeld, M., A. Okada and A. Riedl (2006): "Institutions formation in Public Goods Games", Discussion Paper 2288, September 2006, IZA.
- Masclot, D., C. Noussair, S. Tucker and M. C. Villeval (2003): "Monetary and Nonmonetary Punishment in the Voluntary Contribution Mechanism", *American Economic Review*, 93, 1, 366-380.
- Page, T., L. Putterman and B. Unel (2005): "Voluntary Association in Public Goods Experiments: Reciprocity, Mimicry and Efficiency", *The Economic Journal*, 115, 506, 1032-1053.