Economics Letters 67 (2000) 147–152

economics letters

www.elsevier.com/locate/econbase

Why do you hate me? On the survival of spite

Martin Dufwenberg[a], Werner Güth[b,*]

[a]Department of Economics, Stockholm University, S-10691 Stockholm, Sweden
[b]Department of Economics, Humboldt University of Berlin, Institute for Economic Theory III, Spandauer Str. 1, D-10178 Berlin, Germany

Received 30 December 1998; accepted 23 September 1999

Abstract

Spite involves harming others without good reasons. It may survive in small populations or on markets with strategic substitutes. We consider situations where selfishness helps efficiency. Here spite endangers efficiency, but is wiped out by evolutionary forces.

Keywords: Efficiency; Spite; (Indirect) evolution; Endogenous preferences; Game theory

JEL classification: C72; D63

1. Introduction

It often occurs that people hurt others. And they may be justified in doing so: a responder, who receives only a meager offer in ultimatum bargaining (Güth et al., 1982), can have many good reasons for rejecting the offer and thus causing conflict (one may simply enjoy punishing a greedy proposer, try to preserve a certain self-image, or be programmed to reciprocate (Young, 1986)).

Spite is something different. Here others are harmed without an obvious reason. Consider, for instance, a variant of the ultimatum game where P can propose how to share the pie with R, the responder, and where a third party T decides whether or not the proposal is accepted. Assume that T earns a fixed fee regardless of what happens. When P proposes to split the pie evenly and T nevertheless does not accept, letting P and R earn nothing, there seems to be no good reason for such a spiteful behavior by T.

Harming others may, of course, improve one's own relative standing. In a small group one might

*Corresponding author. Tel.: +49-30-2093-5731; fax: +49-30-2093-5704.
E-mail address: gueth@wiwi.hu-berlin.de (W. Güth)

0165-1765/00/$ – see front matter
PII: S0165-1765(99)00261-X

gain a higher reputation or a better relative income position by harming others. This might suggest that spite, which at first sight appears weird and detrimental, is a personality trait with good survival prospects.

The argument is, however, not so simple. Even when people live in small groups, e.g., as tribes or in villages, the species as the entity for studying evolution will be nevertheless quite large (a small population endangers the survival of a species since it needs a minimal size to survive rare catastrophic events and to provide enough genetic variety, see Aumann and Güth, 1998). Modelling group selection (see the recent attempt by Sober and Wilson, 1998) would have to capture not only how the type composition of the small groups change over time, but also how the small groups of the same species interact, especially how individual members can migrate from one group to another.

On the other hand a small group is by no means necessary for the survival of spite. Actually the model by Bester and Güth (1998), who analyse for duopoly markets which concerns about the competitor's profit will finally evolve, would predict evolutionarily stable spite for the case of strategic substitutes (this possibility has been simply excluded by assuming an appropriately restricted mutant space (see Bolle, 1998, and Possajennikov, 1998)).

Non-competitive markets are usually rather inefficient when everybody cares only for his own material well-being, i.e., is neither altruistic nor spiteful. Another situation would prevail when universal selfishness implies efficiency — one such example would be competitive markets. Can spite survive even when efficiency requires that everybody cares for himself? Here we want to illustrate first by an example, which we then try to generalize,

- that spite can result in inefficiency, i.e., the interaction of spiteful individuals qualifies as a dilemma, and
- that spite can be driven out due to its poor survival prospects.

2. An example of detrimental spite

Consider the following game in material payoffs (Table 1) whose solution $s^2 = (s_1^2, s_2^2)$ in strictly dominating strategies is efficient. Introducing spite would mean to rely on utilities such that a positive material success of the other is detrimental for one's own utility. If π_i, respectively, u_i for $i = 1,2$ denotes player i's material payoff, respectively, utility, a simple formulation would be

$$u_i = \pi_i - m_i \pi_j \quad \text{with} \quad m_i \geq 0 \text{ for } i,j = 1,2 \quad \text{and} \quad i \neq j.$$

Assuming such utilities the game of Table 1 would be transformed into the game of Table 2. If $m_i < 1/2$ for $i = 1,2$, the solution (in strictly dominant strategies) would be still s^2. But if $m_i > 1/2$ for

Table 1

s_1	s_2	s_2^1	s_2^2
s_1^1		1,1	3,2
s_1^2		2,3	4,4

Table 2

s_1	s_2	s_2^1	s_2^2
s_1^1		$1-m_1$, $1-m_2$	$3-2m_1$, $2-3m_2$
s_1^2		$2-3m_1$, $3-2m_2$	$4-4m_1$, $4-4m_2$

$i=1{,}2$, the unambiguous solution (in strictly dominating strategies) is $s^1=(s_1^1,s_2^1)$ which is inefficient in material payoffs and for $1/2<m_i<1$ for $i=1$ also in utilities. Finally, for $i,j=1{,}2$ with $i\neq j$ and $m_i<1/2<m_j$ the solution in strictly dominant strategies prescribes s_i^2 and s_j^1.

The example thus illustrates that (sufficient) spite on both sides may render a situation problematic (Table 2 with $m_1,m_2>1/2$) which without spite (Table 1) or with minor spite (Table 2 with $m_1,m_2<1/2$) would yield the optimal material success for both parties.

The example is also analyzed by Wallace (1996) who shows that learning might lead to playing s^1 when players are spiteful (see also the related study of Palomino (1995); less related studies of spiteful motivation are Hansen and Samuelson (1988), Schaeffer (1989) and Vega-Redondo (1997), who all study oligopoly markets, and Palomino (1996), who analyses financial markets). In our analysis we assume common knowledge of rationality, i.e., there is no need for behavioral adaptation. However, unlike in the previous studies we do not consider spite as given, but rather analyse whether spiteful motivations are evolutionarily stable. Thus, we study behavioral adaptation only indirectly, namely by the dynamics of motivation on which (rational) behavior depends.

3. Will spite survive?

Assuming spite in the sense of $m_i>1/2$ for $i=1{,}2$ transforms the problem of explaining nasty behavior in to the problem of explaining why such spite exists. One way to induce spite is by taking appropriate prior decisions. Assume, for instance, that player 1 and 2 are firms operating on different markets. If firm $i(\neq j)$ now buys shares of firm j's competitors, a higher profit π_j of firm j will often decrease the profits of j's competitors and thus reduce firm i's utility (and actually firm i's monetary payoff consisting of own profit and dividends).

Another possibility (for a comparison of both approaches see Dufwenberg and Güth (1999)) is to analyse the evolution of spite. Sufficient spite can only survive when its (reproductive) success is relatively high. For the example at hand (Tables 1 and 2) one can, for instance, analyse whether non-spiteful types ($m=0$) or spiteful types with $\overline{m}>1/2$ will survive when (reproductive) success is measured by the material payoffs as described in Table 1.

In view of the solution derived above the (symmetric) evolutionary game is one with the type set $\{m=0,\overline{m}\}$, where $\overline{m}>1/2$, as strategy sets for both players and with the success function shown in Table 3.

Table 3

m_1	m_2	$m_1=0$	$\overline{m}_2$
$m_1=0$		4,4	2,3
$\overline{m}_1$		3,2	1,1

Regardless of the other's type $m_j = 0$ or $\overline{m}_j$, the success of the $m_i = 0$-type player $i(\neq j)$ exceeds the one of the $\overline{m}_i$-type player $i(\neq j)$ with $\overline{m}_i > 1/2$, i.e., $m_i = 0$ strictly dominates $\overline{m}_i$ for $i = 1,2$. Thus, all success/fitness monotonic concepts of evolutionary stability, static or dynamic ones (see Weibull, 1995, for a survey) imply that spite in the sense of $\overline{m}_i > 1/2$ and spiteful behavior in the form of s_i^1 for $i = 1,2$ will finally disappear.

Imitation (see, for instance, Vega-Redondo, 1997; Wallace, 1996) may, however, imply a different result. If one imitates the other whenever the other is more successful, a situation with $m_i = \overline{m}_i$ and $m_j = 0$ will induce j to switch to $m_j = \overline{m}_j$ showing that $(\overline{m}_1, \overline{m}_2)$ is stable under imitation dynamics. Without mutation also $(m_1 = 0,\ m_2 = 0)$ would be (imitation) stable. Rare mutations would, however, destabilize $(m_1 = 0,\ m_2 = 0)$ since any deviation from $(m_1 = 0,\ m_2 = 0)$ by mutation would lead to $(\overline{m}_1, \overline{m}_2)$. In the following such non-success/fitness monotonic adaptation dynamics will be neglected.

4. Generalizing the message

In which respects is the example above special? To simplify matters the example has been structured so that all games can be solved by requiring that only strictly dominating strategies are used, i.e., by the most undebatable solution concept. Clearly, one could extend the analysis to other examples, which cannot be solved in this way, if one is willing to accept weaker solution requirements, e.g., strict equilibria from which no single player wants to deviate. Notice, however, that solutions in strictly dominating strategies require less information – a player does not have to know whether others are rational or not, their payoffs, or even whether others exist at all. Another special aspect of our example is that its solution is efficient. In the following we want to show that for any game with this property our message that spite will not survive applies.

Since in our evolutionary analysis the success of player i's type $m_i = 0$ or $m_i = \overline{m}_i$ is measured by the (material) profit which this type earns, survival of the fittest is equivalent to survival of the profit maximizing type with $m_i = 0$. Güth and Peleg (1997) have shown (for continuous games, but the result can be obviously translated to discrete ones) that two requirements can guarantee the survival of the fittest, namely: For $i,j = 1,2$ and $i \neq j$, *either* player i's profit π_i does not depend on s_j *or* the solution strategy s_i^* in case of $(m_1 = 0,\ m_2 = 0)$ does not depend on m_j. The first condition is violated by our example. Thus, we have to rely on the latter condition for the survival of the fittest, namely that for $i \neq j$ the solution strategies s_i^* do not depend on m_j, i.e., on the other's type.

What can guarantee that player i's solution behavior s_i^* in case of $(m_1 = 0,\ m_2 = 0)$ does not depend on m_j with $j \neq i$? One simple, but nevertheless important condition would be that individual spite is private information, i.e., for $j = 1,2$ only player j knows whether $m_j = 0$ or $\overline{m}_j$ applies. Clearly, player i will not change s_i^* when m_j changes since player i would not notice it (Güth and Peleg, 1997, prove this intuitive and obvious result in detail by actually deriving (Bayesian) equilibria when types are private information).

Let us now consider the opposite extreme case that the types m_i for $i = 1,2$ are commonly known. That is, in the case of $(m_1 = 0,\ m_2 = 0)$ when player j changes m_j, this is observed by player $i(\neq j)$ before i chooses s_i. When would player i stick to his strategy s_i^* for $(m_1 = 0,\ m_2 = 0)$ even after observing $m_j \neq 0$? One such situation would be where many individuals interact and where nobody cares what just one other individual does and of which type (s)he is. In this connection it is natural to think of competitive markets for which the survival of the fittest — and thus the non-existence of spite — is often conjectured.

There exist other special cases where players $i = 1,2$ would stick to s_i^* for $(m_1 = 0, m_2 = 0)$ even when m_j changes from $m_j = 0$ to $\overline{m}_j$ for $j \neq i$. One is our example above where player i chooses s_i^2 as long as $m_i = 0$ for $i = 1,2$. A very special case is also the model, analysed by Bester and Güth (1998), with $k = 0$ (whenever $k \leq 0$ no spite survives, for $k < 0$ a positive degree of altruism would prevail).

5. Conclusion

Survival of spite can typically be expected in small populations where harming others might promote the diffusion of one's own type. Spite might, however, also survive in large populations given the appropriate environment, e.g., strategic complementarity on duopoly markets (see Bester and Güth, 1998).

Whereas markets are typically inefficient when everybody is selfish, this note focuses on situations where universal selfishness implies efficiency. After illustrating the detrimental effects of spite we show that spite will eventually die out which in turn, improves efficiency.

These are definitely good news. Unfortunately, they apply only to special classes of games as discussed above. If the spite of others is unobservable, it cannot survive. If spite is commonly known, the own choice should not depend on others' spite.

It would be interesting to investigate experimentally whether spite can be observed only when such conditions prevail. This, however, presupposes that people are in fact spiteful. The few confirming experimental results are rather weak and scattered, e.g., Güth and Huck (1997) who report rare rejections of fair proposals in semi-ultimatum games where the responder can only veto the proposer's, but not his own share.

Like gender effects which are often checked, but usually only reported when they show up (see Bolton and Katok, 1995; Andreoni and Vesterlund, 1997; Eckel and Grossman, 1998) it may be that evidence of spite is reported only when it shows up. In this sense spite might be only a rare phenomenon after all. So, are people really spiteful or do we only observe effects resulting from variety seeking, misunderstandings (Güth and Huck (1997), rely on highschool participants who may more likely have misunderstood or misperceived the instructions), highly competitive frames, or other aspects? We leave this question for future empirical, most likely experimental, research.

Acknowledgements

We gratefully acknowledge helpful comments by Jörg Oechssler.

References

Andreoni, J., Vesterlund, L., 1997. Which is the Fair Sex? Gender Differences in Altruism. University of Wisconsin, Madison. Mimeo.

Aumann, R., Güth, W., 1998. Species Survival and Evolutionary Stability in Sustainable Habitats — The Concept of Ecological Stability. Discussion Paper 122, Humboldt University of Berlin.

Bester, H., Güth, W., 1998. Is altruism evolutionarily stable? Journal of Economic Behavior and Organization 34 (2), 193–209.

Bolle, F., 1998. Is Altruism Evolutionary Stable? And Envy and Malevolence? Remarks on Bester and Güth. Europe, University Viadrina Frankfurt (Oder). Mimeo.

Bolton, G.E., Katok, E., 1995. An experimental test for gender differences in beneficent behavior. Economics Letters 48, 287–292.

Dufwenberg, M., Güth, W., 1999. Indirect evolution versus strategic delegation: a comparison of two approaches to explaining economic institutions. European Journal of Political Economy 15, 281–295.

Eckel, C.C., Grossman, P.J., 1998. Are women less selfish than men: evidence from dictator experiments. Economic Journal 108/448, 726–735.

Güth, W., Schmittberger, R., Schwarze, B., 1982. An experimental analysis of ultimatum bargaining. Journal of Economic Behavior and Organization 3, 367–388.

Güth, W., Huck, S., 1997. A new justification of monopolistic competition. Economics Letters 57, 177–182.

Güth, W., Peleg, B., 1997. When Will the Fittest Survive? An Indirect Evolutionary Analysis. Discussion Paper 96, Humboldt University of Berlin.

Hansen, R., Samuelson, W., 1988. Evolution in economic games. Journal of Economic Behavior and Organization 10, 315–338.

Palomino, F., 1995. On the Survival of Strictly Dominated Strategies in Large Populations. Working Paper 308.95, Department of Economics, Universitat Autonoma de Barcelona.

Palomino, F., 1996. Noise trading in financial markets. Journal of Finance 51 (4), 1537–1550.

Possajennikov, A., 1998. A Note on Indirect Evolution: When are Spiteful Preferences Evolutionarily Stable? CentER, Tilburg-University. Mimeo.

Schaeffer, M., 1989. Are profit-maximizers best survivors? Journal of Economic Behavior and Organization 12, 29–45.

Sober, E., Wilson, D.S., 1998. In: Unto Others, Harvard University Press, Cambridge, MA.

Vega-Redondo, F., 1997. The evolution of Walrasian behavior. Econometrica 65 (2), 375–384.

Wallace, C., 1996. A Note on the Evolutionary Dynamics of Jealousy. Nuffield College, Oxford University. Mimeo.

Weibull, J.W., 1995. In: Evolutionary Game Theory, MIT Press, Cambridge, MA.

Young, Jr. G.A., 1986. Patterns of threat and punishment reciprocity in a conflict setting. Journal for Personality of Social Psychology 51, 541–546.