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How to Encourage Imperfect Individuals to Care More about Society in General: a Utility-Theory Approach

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Abstract

For a society to function efficiently, it is desirable that all members of this society care no only about themselves, but also about the society as a whole, i.e., about all the other individuals from the society. In practice, most people are only capable of caring about a few other individuals. We analyze this problem from the viewpoint of decision theory and show that even with such imperfect individuals, it is possible to make sure that everyone's decisions are affected by the society as a whole: namely, it is sufficient to make sure that people have emotional attachment to those few individuals who are capable of caring about the society as a whole.

As a side effect, our result provides a possible explanation of why the Biblical commandment to love your God encourages ethical behavior.

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1 Formulation of the Problem

Ideally, it is desirable that everyone should make decisions taking into account not only his or her own interest, but also the interest of the society as a whole, the interests of *all* the people from the society.

The problem is that most individuals are only capable of caring about a few other people. In the society consisting of such imperfect individuals, what can we do to enhance their caring about the society as a whole?

2 Towards Formalizing the Problem

The notion of utility: reminder. How can we describe this desired situation in precise terms? Decision theory has shown (see, e.g., [8]) that rational individuals select a decision that maximizes the expected value of their *utility* u.

Just like many physical quantities, utility is determined modulo an arbitrary linear transformation $u \to u' = a \cdot u + b$, depending on selecting the measuring unit and the starting point.

What determined utility: case of a fully self-interested individual. In other to formalize our problem, we need to recall what determines the individual's utility. Let us start with the simplest case when an individual's decisions are determined only by his or own interests and are not effect on what happens to the others.

How can we formalize this situation? Let u_i denote the utility of the i-th person. The above self-interest assumption means that this utility u_i depends only on the benefit b_i (amount of different goods) obtained by this individual: $u_i = f_i(b_i)$.

The benefits b_i are usually small. When the inputs b_i are small, we can expand the dependence $f_i(b_i)$ in Taylor series and safely ignore quadratic and higher order terms in this extension, resulting in $f_i(b_i) = a_i + c_i \cdot b_i$ for some coefficients a_i and c_i. Since, as we have mentioned, utility is defined modulo a linear transformation anyway, we can select the utility scale for the i-th individual in such a way that $u_i = f_i(b_i)$ is simply equal to the i-th benefit, i.e., to

$$u_i = b_i.$$

Types of care about others. Situations in which the person's utility is determined only by his or her own benefits and do not depend on the benefits or utilities of others are rare. Most people do care about others, either rationally or emotionally. How can we describe this care?

Rational care. Rational care means, in these terms, that the utility u_i of the i-th person is determined not only by the benefits u_j obtained by this person, but also by In this case, the utility u_i of the i-th person depends not only on the benefit b_i of this same person, but also on the benefits b_j of other individuals.

Similar to the above case, we can expand this dependence in Taylor series, keep only linear terms in this expansion. In this case, we have $u_i = a_i + c_i \cdot b_i + \sum\limits_{j \neq i} c_{ij} \cdot b_j$, where c_{ij} is the degree to which the utility of the i-th person

depends on the benefits of the j-th individual. Similarly to the self-interest case, we can then re-scale the utility so that we get $a_i = 0$, $c_i = 1$, and thus,

$$u_i = b_i + \sum_{j \neq i} c_{ij} \cdot b_j.$$

Emotional care (aka love). Emotional care means that we care not only whether the others are well-fed, well-clothed, etc., we also – and mostly – care about whether they are happy. In this case, the utility of the i-th individual depends on the utilities u_j of one or several other folks. Similarly to the above case, we can approximate this dependence by an appropriate linear formula:

$$u_i = b_i + \sum_{j \neq i} d_{ij} \cdot u_j,$$

for some coefficients d_{ij}; see, e.g., [1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12].

General case. In general, our decisions are influenced both by the rational care (i.e., by the others' benefits b_j) and by the emotional care (i.e., by the others' utilities u_j). In this case, the utility u_i of the i-th person is determined *both* by the values b_j and u_j. In the linear approximation, this general case can be described as follows:

$$u_i = b_i + \sum_{j \neq i} c_{ij} \cdot b_j + \sum_{j \neq i} d_{ij} \cdot u_j.$$

What we have and what we would like to have. As we have mentioned, most people are only capable of caring about a few others. For such people, most values c_{ij} and d_{ij} are 0s, the sums only contain a few terms.

Ideally, we would like to have, for each i, all the coefficients c_{ij} positive, and ideally, all equal – or at least close to each other – to make sure that we care equally about all the others, about the society as a whole, and not mostly about one small group within this society. How can we achieve that?

3 Natural Solution

Natural solution. A natural solution to the above problem comes from the fact that some people *are* capable of caring about the society as a whole. In other words, we have an individual i_0 for whom $u_{i_0} = b_{i_0} + c_0 \cdot \sum\limits_j b_j$ for some c_0.

In the ideal case, this individual cares about others exactly as much as he or she cares about him/herself. In this case, $c_0 = 1$ and

$$u_{i_0} = \sum_j b_j.$$

Then, all we need to do is make sure that everyone loves this ideal person, i.e., that the expression for the utility u_i of every person contains a terms proportional to u_{i_0}:

$$u_i = b_i + c_{ii_0} \cdot u_{i_0} + \ldots$$

Since this ideal person's utility is proportional to the sum of benefits of the people in the society, this means that the utility u_i contains a term proportional to this sum, i.e., that

$$u_i = b_i + c_{ii_0} \cdot \sum_j b_j + \ldots$$

This is – almost – exactly what we wanted. Almost because while we achieved the person's care of the society as a whole, a person may still care about his or her own small group even more. So, we need to make sure that this "love of the ideal person" is strong enough – ideally, stronger than this person's love for others $j \neq i_0$.

This idea is not as revolutionary as it may seem. At first glance, the above idea may seem non-standard and revolutionary, but this is actually how societies are run – hero worship, veneration of living saints, love of the leaders, these are all examples of exactly the above phenomenon.

Why need to love God: a speculative discussion. Instead of the actual ideal person i_0, we consider God or saints who, according to the religious teachings, care about the society as a whole. This may be of the possible explanations why in the Bible, an important commandment is that You shall love the Lord your God. At first glance, it may sound strange: if God wants us to behave better, why not say so explicitly as in other commandments. One of the main objectives of religion is to make us ethically better, they prefer an ethical person who may not be following all the requirements to the one who follows the rules but who is ethically deficient. At first glance, the fact that the commandment to love your God is first and ethical commandments are next seems to indicate the opposite preference: that it is more important how you pray that how you behave.

The above discussion shows that loving the ideal God is exactly the best way to make us behave ethically better, to care about society as a whole – this implies other ethical commandments and is, thus, rightfully the first of them.

Similarly, one can explain the second part of the first commandment: not to have other gods, because, depending on what other gods care about, this will change our relative care of others and thus, decrease the positive ethical effect of caring about the ideal person i_0.

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References

[1] G. S. Becker, *A Treatise on the Family*, Harvard University Press, Cambridge, Massachusetts, 1991.

[2] T. Bergstrom, "Love and spaghetti, the opportunity cost of virtue", *Journal of Economic Perspectives*, 1989, Vol. 3, No., pp. 165–173.

[3] T. Bergstron, *Systems of benevolent utility interdependence*, University of Michigan, Technical Report, 1991.

[4] B. D. Bernheim and O. Stark, "Altruism within the family reconsidered: do nice guys finish last?", *American Economic Review*, 1988, Vol. 78, No. 5, pp. 1034–1045.

[5] D. D. Friedman, *Price Theory*, South-Western Publ., Cincinnati, Ohio, 1986.

[6] H. Hori and S. Kanaya, "Utility functionals with nonpaternalistic intergerenational altruism", *Journal of Economic Theory*, 1989, Vol. 49, pp. 241–265.

[7] V. Kreinovich, *Paradoxes of Love: Game-Theoretic Explanation*, University of Texas at El Paso, Department of Computer Science, Technical Report UTEP-CS-90-16, July 1990.

[8] D. R. Luce and H. Raiffa, *Games and Decisions, Introduction and critical survey*, Dover, New York, 1989.

[9] H. T. Nguyen, O. Kosheleva, and V. Kreinovich, "Decision Making Beyond Arrow's 'Impossibility Theorem', With the Analysis of Effects of Collusion and Mutual Attraction", *International Journal of Intelligent Systems*, 2009, Vol. 24, No. 1, pp. 27–47.

[10] A. Rapoport, "Some game theoretic aspects of parasitism and symbiosis", *Bull. Math. Biophysics*, 1956, Vol. 18.

[11] A. Rapoport, *Strategy and Conscience*, New York, 1964.

[12] F. J. Tipler, *The Physics of Immortality*, Doubleday, New York, 1994.