Why Awe Makes People More Generous: Utility Theory Can Explain Recent Experiments

Joe Lorkowski and Vladik Kreinovich
Computer Science Department
University of Texas at El Paso
500 W. University Ave., El Paso, TX 79968
lorkowski@computer.org, vladik@utep.edu

Abstract

Recent psychological experiments show that the feeling of awe increases people's generosity. In this paper, we show that a usual utility-based approach to decision making explains this increase.

1 Formulation of the Problem

Recent experiment: a brief summary. A recent experiment [13] showed that the feeling of awe increases people's generosity.

Recent experiment: details. To measure a person's generosity, researchers use a so-called *Ultimatum Bargaining Game.* In this game, to test a person's generosity, this person is paired with another person in a simulated situation in which they should share a certain fixed amount of money given to them by the experimenter:

- the tested person announces which part of this amount he or she is willing to give to the second person;
- if the second person agrees, each of them gets the agreed-on amount;
- if the offered part is too small and the second person disagrees, no one gets anything.

The generosity is then measured by the amount of money that the tested person is willing to give to his/her companion.

The gist of the experiment is that this amount increases when a tested person has a feeling of awe, which is induced:

- either by requiring the persons to think about awe-inspiring natural scenes,
- or by explicitly showing such scenes prior to testing generosity.

Comment. It is worth mentioning that a similar increase in the transferred amount of money was observed in a different situation, when the tested person was injected with euphoria-inducing oxytocin [7].

How the results of this experiment are currently explained. The paper [13] provides the following qualitative explanation of this result: that the presence of awe leads to a feeling of smaller self. This, in turn, makes the person more social and thus, more generous.

It is desirable to have a more quantitative explanation. The above qualitative explanation is reasonable, but it is not necessarily fully convincing: the feeling of awe cased by a magnificent nature scene definitely decreases the feeling of importance of self – but it also decreases the feeling of importance of other people. It would make perfect sense if the feeling of awe led to more donations to nature conservation funds, but why to other people?

What we plan to do. In order to come up with a more convincing explanation of the above experiment, we analyze this experiment in quantitative terms, by using the standard utility-based approach to decision making; see, e.g., [3, 10, 12, 14]. Our analysis shows that indeed, within this approach, the presence of awe leads to an increase in generosity.

2 Let Us Describe This Setting in Terms of Utility-Based Decision Theory

The notion of utility. According to decision theory [3, 10, 12, 14], a rational person's preferences can be described by his/her *utility function*, a function that assigns, to each alternative, a real number in such a way that out of several alternatives, the person always selects the one whose utility is the largest.

How utility depends on the amount of money. Experiments have shown that for situations with monetary gain, utility u grows with the money amount m as $u \approx m^\alpha$, with $\alpha \approx 0.5$, i.e., approximately as $u \approx \sqrt{m}$; see, e.g., [6] and references therein.

So, if the given amount of money m is distributed between two participants, so that the first person gets m_1 and the second person gets $m_2 = m - m_1$, then:

- the utility of the first person is $u_1(m_1) = \sqrt{m_1}$ and
- the utility of the second person is $u_2(m_1) = \sqrt{m_2} = \sqrt{m - m_1}$.

Comment. The specific dependence $u \approx \sqrt{m}$ can itself be explained by utility-based decision theory [9].

The dependence of utility on other "units of pleasure". It is reasonable to assume that the formula $u \approx \sqrt{m}$ describes not only the dependence of utility on the amount of money, but also on the overall amount of "units of pleasure" received by a person, be it money, material good, or feeling of awe.

So, if we denote, by a, the amount of such units corresponding to the feeling of awe, then, if the first person also gets the amount of money m_1, the overall amount of such units is $a + m_1$, and thus, this persons' utility is approximately equal to $u_1(m_1) = \sqrt{a + m_1}$.

By definition, awe means that the corresponding pleasure is much larger than what one normally gets from a modest money amount, i.e., that $a \gg m_1$.

Effect of empathy. A person's preferences depend not only on what this person gets, they also depend on what others get. Normally, this dependence is positive, i.e., we feel happier if other people are happy.

The idea that a utility of a person depends on utilities of others was first described in [15, 16]. It was further developed by another future Nobelist Gary Becker; see, e.g., [1]; see also [2, 4, 5, 12, 17].

If we take empathy into account, then, instead of the original no-empathy values $\sqrt{m_1}$ and $\sqrt{m - m_1}$, we get values

$$u_1(m_1) = \sqrt{m_1} + \alpha_{12} \cdot \sqrt{m - m_1}$$

and

$$u_2(m_1) = \sqrt{m - m_1} + \alpha_{21} \cdot \sqrt{m_1},$$

where $\alpha_{ij} > 0$ are positive numbers. People participating the above experiment are strangers to each other, so their mutual empathy is not large: $\alpha_{ij} \ll 1$.

In the presence of awe, we similarly get $u_1(m_1) = \sqrt{a + m_1} + \alpha_{12} \cdot \sqrt{m - m_1}$ and $u_2(m_1) = \sqrt{m - m_1} + \alpha_{21} \cdot \sqrt{a + m_1}$.

How joint decisions are made. In the Ultimatum Bargaining Game, two participants need to cooperate to get money. For such cooperative situations, an optimal solution has been discovered by the Nobelist John Nash [10, 11, 12]: a group should select the alternative x for which the following product attains its largest possible value:

$$(u_1(x) - u_1(0)) \cdot (u_2(x) - u_2(0)),$$

where $u_i(x)$ is the i-th person utility corresponding to the alternative x and $u_i(0)$ is this person's utility in the original (*status quo*) situation.

The fact that Nash's bargaining solution can be used to describe such games is emphasized, e.g., in [8]. In our case, the status quo situation is when neither the first not the second participant get any money, i.e., when $m_1 = 0$ and $m_2 = 0$. In the absence of a, this means $u_1(0) = u_2(0) = 0$. In the presence of awe, this means that:

- in the first approximation, when we ignore empathy, we get $u_1(0) = \sqrt{a}$ and $u_2(0) = 0$;
- when we take empathy into account, we get $u_1(0) = \sqrt{a}$ and $u_2(0) = \alpha_{21} \cdot \sqrt{a}$.

Resulting formulation of the problem. Now, we are ready to formulate the situation in precise terms. We compare the optimal amounts $m_2 = m - m_1$ corresponding to two different situations.

In the first situation, there is no awe, so we select the value m_1 for which the following product attains the largest possible value:

$$\left(\sqrt{m_1} + \alpha_{12} \cdot \sqrt{m - m_1}\right) \cdot \left(\sqrt{m - m_1} + \alpha_{21} \cdot \sqrt{m_1}\right). \quad (1)$$

In the second situation, there is an awe $a \gg m_1$, so we select the value a for which the following product attains the largest possible value:

$$\left(\sqrt{a + m_1} - \sqrt{a} + \alpha_{12} \cdot \sqrt{m - m_1}\right) \cdot \left(\sqrt{m - m_1} + \alpha_{21} \cdot \left(\sqrt{a + m_1} - \sqrt{a}\right)\right). \quad (2)$$

Let us estimate and compare these optimal values.

3 Analysis of the Resulting Problem Explains Why Awe Increases Empathy

Analysis of the first (no-awe) situation. Let us start with analyzing the first situation. Since the values α_{ij} are small, in the first approximation, we can safely ignore the corresponding terms and instead maximize the simplified product $\sqrt{m_1} \cdot \sqrt{m - m_1}$.

Maximizing this product is equivalent to maximizing its square, i.e., the value $m_1 \cdot (m - m_1)$. Differentiating this expression and equating the derivative to 0, we conclude that the maximum is attained when $m_1 = 0.5 \cdot m$ and $m_2 = m - m_1 = 0.5 \cdot m$. This is indeed close to the observed division in the Ultimatum Bargaining Game [8, 13].

Analysis of the second (awe) situation. In the second situation, we can use another simplifying approximation: namely, since $a \gg x_1$, we can use the fact that in general, for a differentiable function $f(x) = \sqrt{x}$, we have $\dfrac{df}{dx} = \lim\limits_{h \to 0} \dfrac{f(x+h) - f(x)}{h}$. Thus, for small h, we have $\dfrac{df}{dx} \approx \dfrac{f(x+h) - f(x)}{h}$, hence $f(x+h) - f(x) \approx \dfrac{df}{dx} \cdot h$.

In particular, for $f(x) = \sqrt{x}$, we get $\sqrt{a + m_1} - \sqrt{a} \approx \dfrac{1}{2\sqrt{a}} \cdot m_1$. Since the value a is huge, the ratio $\dfrac{1}{2\sqrt{a}}$ is very small, so, in the first approximation, we can safely ignore this ratio in comparison with the term $\alpha_{12} \cdot \sqrt{m - m_1}$. Similarly, in the second factor, we can safely ignore the term $\alpha_{21} \cdot \left(\sqrt{a + m_1} - \sqrt{a}\right)$ which is proportional to this ratio. Thus, in this first approximation, maximization of the product (2) can be reduced to maximizing the following simplified product:

$$\alpha_{12} \cdot \sqrt{m - m_1} \cdot \sqrt{m - m_1} = \alpha_{12} \cdot (m - m_1).$$

Among all possible values m_1 from the interval $[0, m]$, the largest value of this expression is attained when $m_1 = 0$ and $m_2 = m - m_1 = m$, i.e., which indeed corresponds to the maximum generosity.

Conclusion: awe does increase generosity. As we have mentioned earlier, generosity is hereby measured by the amount of money $m_2 = m - m_1$ given to the second person.

We have shown that in the first approximation:

- in the first (no-awe) situation, the amount m_2 given to the second person is $m_2 = 0.5 \cdot m$, while

- in the second (awe) situation, the amount m_2 given to the second person is $m_2 = m$,

In this first approximation, since $m > 0.5 \cdot m$, the presence of awe does increase generosity.

Of course, there are solutions to the approximate problems, and thus, approximations to the solutions to the actual optimization problems. For the actual optimal solutions, we will have $m_2 \approx 0.5 \cdot m$ in the no-awe case and $m_2 \approx m$ in the awe case. Thus, still, the generosity in the awe case is larger. So, the utility-based decision theory indeed explains why awe increases generosity.

Comment. Since oxytocin also brings a large amount a of positive emotions, this model can also explain the above-mentioned results from [7].

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