

Arousal, rank and utility

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Abstract.

We apply Maslow's hierarchy of needs to the concept of utility and then go on to a new model where individual's behavior is aimed at reaching optimal level of arousal of neural system and optimal level of domination in social ranking.

Keywords: utility, motivation, altruism, demonstration of wealth, novelty, comfort, rank, arousal.

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Most economists agree that economic behavior can be well explained, if we assume that en masse this behavior is aimed at maximization of utility or profit. However, if we ask an economist himself, why he does science, he will admit that his own behavior is not profit-maximizing. Scientist could use his intelligence and skills to make millions as entrepreneur, but instead he simply wastes much effort to earn just a modest salary. Why, in terms of economic theory, would he behave in that way, and why wasn't he outlived by more practical fellows?

Imagine a man, who watches a fly on a wall. This might seem not the case of economic behavior, but suddenly you notice a smart guy who has offered that man the right to watch that particular fly on that particular wall for, say, 2 bucks a minute. Wise people and marketologists would argue, that this situation is possible, just because "it is generally possible to sell anything". Someone has paid for this "service" and now enjoys watching the fly. The reasons of consumer's behavior might be: boredom, stupidity, desire to be original, some associations with that fly recalling pleasant moments in life, or many other things. Definitely, if this transaction takes place, we should assume, as economists, that the person has got (or at least was expecting to get) some positive utility, otherwise, the money would not be paid¹. Where does the utility come from, if nothing was consumed and nothing produced, and there was no "goods" at all, just the fly, which did not notice itself, that it was sold?

Another picture is a rich man, who buys a car for 50 million dollars. If he paid that much, he must have expected to get some significant amount of utility, but it is definitely not the car itself or its features, color, shape, engine, maneuvering characteristics that provide the utility. It is the price itself. So (and this explanation dates back to Veblen), the action of spending such a large sum of money on a thing that is really worth much less, gives extremely high utility to a rich person – a nonsense form the point of mainstream economics. This man could become even happier, if he threw that millions out in the sea before the whole nation. Unfortunately, the guy

¹ One could argue that it was a mistake of the customer that made the transaction possible, but imagine that many people get interested and now we have a large, 5 billion market of the flies. Do you still think it is just a mistake with no particular reason inside the customer himself?

didn't have enough imagination and he might envy another guy who would buy the same car, but for 60 million. Both would envy the third guy, who pays 70 million.

One more example is a man who buys a computer-magazine and reads about some new headphones or video-cards but very rarely buys them. It is not the information he wants to get from that magazine, but the pleasure of thinking about the goods he is interested in but can't afford to buy at the moment. He just likes to mentally interact with those hi-tech things. We have to admit, that he gets utility from the goods without owning them and without using them. He looks at the photo in the magazine, that's all, so where does the utility come from?

Those and many other examples in our lives show that utility may come virtually from nothing: from ideas or from how we think of something which would never seem a case for economic behavior in another setting. But there is something to note here: *anything* can't give utility, but just the things that satisfy this or that need, thus being rewarding. Otherwise, it would be unlikely that these behaviors would appear so frequently. In the case of a fly we have to say, that the fly did satisfy some need of the buyer. What need was that? Modern economists would readdress this question to psychologists, but psychology wouldn't give much help. The issue of human needs remains largely unexplored, although attempts to make classifications of needs are made quite often.

Economists are used to understanding the term "needs" as some aggregate for a number of products. For instance, there can be a need for clothes, need for food, need for TV-sets, cars, houses. The list is endless, and many new needs appear each month while technology develops. If we understand the term "needs" in that way, utility could be thought of as depending on satisfaction of needs. We could write that in the way like $U = \sum a_i N_i$, where U – utility, N_i – levels of satisfaction of needs, a_i – weights. Weights would then show the difference in consumption patterns of different individuals or groups of customers. For example, if someone's utility depends more on the cars than on TV-sets, we should expect that this person will *ceteris paribus* spend more on cars, while another person with different weights would spend more on TV-sets. This is another way to represent preferences.

A nice question to come here is where we should put a fly in this scheme. There must be some special "need for watching flies when they rest on walls". Such strange need could boil down to a more general need "to watch things which no one watches" or "pay for something no one would pay for" or something else depending on how we classify. Even if we find a place for the fly, it will be harder to solve the problem with the rich guy, who wants to pay as much as possible for a car or a guy who wants to simply throw his money out in the sea (is there a need for throwing money into the sea?). Another problem is that the products, groups of products and the corresponding needs exist in a complex symbolic world or human culture. What is considered to be a sellable product in one culture may simply not exist even as an object in another culture.

Imagine that some group of people is put in a virtual reality, and all signals coming into the brain are emulated by a computer program, which also sustains the body in a state of sleep. In virtual reality people can buy cars, houses, food, earn money, even produce new goods from raw resources, all of which is just program code. The brain is tricked and interprets variables in the computer memory as symbols. Say, the program generates a virtual banana, and the person "buys" it. Banana becomes a product, and when it is "consumed", some positive utility is gained (the program falsifies the signals from the stomach). Should we then consider transactions in this artificial society "economic" ones? Should we look at "needs" appearing in the virtual world as real "needs"? What should we do, if the virtual world becomes populated not only by human minds, but also by AIs: were is a transaction a proper case of economic behavior and were isn't?

Intuitively it is clear that in any cultural context, even in a weird virtual world, needs will appear and behaviors will be shaped according to some basic principles which lie in a much lower layer, than the culture. For example, boredom and lack of activity will be the same negative, but in different cultures individuals will get rid of it in different ways. These basic principles might even be common not only between cultures, but also between species. If we agree with this, it becomes easier to find a place for the fly on the wall, for the act of throwing money into the sea or comparing prices on two motherboards when the person is not going to buy any motherboards at all. All of these and many other actions can be considered economic ones, but we should look beyond the culture to see that.

A possible way to look beyond culture is to classify needs in such a way, that the groups of needs we define were found in behavior of any species and in the society of any complexity. What we do not like about classifications psychologists offer is that in most of them some needs are understood as “higher” and some as “lower”. With such an approach we would have to add new levels or groups for each level of complexity of a species’ behavior, so the model would never be universal. In terms of our approach the motives are the same, and complexity only changes the way these motives materialize in behavior or institutions². The question is what these motives are.

We will take Maslow’s (1954) hierarchy of needs as the starting point. It defines 5 groups of needs and puts them in a hierarchy: physiological level, security, affiliation, esteem, self-actualization. However, this model is obviously not perfect. It is easy to see, that there is no hierarchy already on the first two levels: danger is actually more important to any organism than food, thirst, or bodily comforts. To test it, scare a dog while it eats: it will stop eating when scared and defend itself. Then, if we go on to the third level, we see, that what Maslow calls “belonging to a group” or “acceptance” is nothing else but the same “avoiding danger”, but in a more complex social environment. Social animals can’t survive without a group, because they provide defense for one another. Outcasts are attacked, so they should seek acceptance. On this reason we will combine the second and the third levels of Maslow’s hierarchy into one group of needs and label it “security”.

Now consider Maslow’s fourth level, which is esteem. An expert putting an endless list of his publications into his resume, a millionaire counting his money, a woman posing for an artist or a buck fighting for a cow are all doing that to satisfy needs, which fit into this group. If we neglect the factor of culture, we will see, that the guy, who threw out millions into the sea and a smart businessman behaving rationally and maximizing profit are standing very closely in their final goals: both won’t esteem, but use different tools. So, there is no surprise, if we see the same businessman first bargaining for pennies and then dipping that money in a casino.

Now we come to the higher levels in Maslow’s model, which represent self-actualization. Such group of needs obviously can’t be found in animals, and if we want to have a universal classification, we should drop it. However, if we take a closer look, it is easy to see that self-actualization is only a mixture of desire for esteem and another motive, which can be labeled as “need for activity” or “fighting boredom”. With such an approach, we will have to admit, that people, which were standing on highest levels of development according to Maslow, were actually not much different in their motivations from some collector of beer-cans, who also strives to be the best beer-cans collector and enjoys the process of emptying that cans. As we

² For instance, there is very little difference in why a cat plays with a clew, a computer-games fan plays an ego-shooter, a scientist runs experiments, or a poet writes a poem. All of those behaviors have the main goal of fighting boredom. Put more neutrally: scientist just need more stimulation, more information inflow to be happy, than an average person. So, a scientist will feel bored without experiments like cat without a clew.

said, it is not the level of complexity that matters but the basic motivation. Nicely, the group of needs labeled “activity” is a good slot for the man, who watches the fly, if he watches it just for fun.

One more group Maslow did not mention is altruism, which exists in animals, even much less developed than humans. This group is hard to attach to either esteem (since moral imperatives of Christianity, which connect altruism with self-esteem and purpose of life are too young to be a basic motive), so we mark it as a special group of needs³. Finally, we get the following 5 groups of needs: physiological needs, security, activity, esteem, altruism.

In a new model utility transforms to $U = \sum a_i U_i$, where U_i – levels of satisfaction of each group of needs (or amount of utility, provided by a group of needs at their current level of satisfaction), a_i – weights. Thus, we get an elegant model of decision making. Consider ΔU_i expected increase of the level of satisfaction of the group i , and the rational choice of an individual is then selecting the alternative with highest $\Delta U = \sum a_i \Delta U_i$. The man who paid for watching the fly can fit into this model in the following way:

$$\Delta U_{\text{physiological needs}} = 0;$$

$$\Delta U_{\text{security}} = -20 \text{ (the man felt sorry for the 2 bucks paid)}$$

$$\Delta U_{\text{activity}} = +15 \text{ (the man had fun while watching)}$$

$$\Delta U_{\text{esteem}} = +10 \text{ (the man felt himself original)}$$

$$\Delta U_{\text{altruism}} = 0;$$

Suppose, weights $a_i = (0.1, 0.2, 0.5, 0.1, 0.1)$;

$$\text{Then } \Delta U = 0*0 + (-20)*0.2 + 15*0.5 + 10*0.1 + 0*0 = +4.5;$$

If the value +4.5 is higher than the corresponding value for all other alternatives, we should consider this action rational choice. The bad side of such a model is that it remains unclear, where the values U_i and a_i come from. Such an approach also demands converting prices into decision utilities, which is much dependent on perception of numbers, cognitive maps etc. The good side is that it operates beyond cultural and institutional context.

No matter how bad the model is, the concepts are not completely worthless. A closer look at groups we labeled “security” and “activity” will bring us to Scitovsky’s insights about comfort and interest: higher feeling of comfort and security corresponds to lower arousal and feeling of excitement and vice versa. In his “Joyless economy”(1976) Scitovsky showed that man is not only motivated by drives, but also by desire for novelty and excitement (which is the group of needs we labeled “activity” in the model above). Scitovski came to the conclusion, that maximal utility is received when the excitement is moderate: this notion is based on the “inverted U”-form of Wundt curve, which showed pleasantness of a stimulus depending on its intensity⁴.

Thinking of altruism and esteem as groups of needs will bring us to the term “rank” in sociobiology. Maslow’s “desire to be respected” is nothing else but striving for high rank inside the population, which is to have more offspring. In human societies the ways of ranking may be very diverse: we have rankings of football teams, hierarchy in firms, rankings of ego-shooter

³ Obviously, including this motive as basic into the set of motives of economic behavior is another representation of a well-known concept of “social preferences” (Camerer & Fehr, 2003).

⁴ Neurobiologists of early 70s explained the curve’s configuration in the following way: when intensity rises from low to moderate, only centers of positive reinforcement get activated, but at a certain threshold centers of negative reinforcement come into play, push pleasantness down and finally (when stimulus is too intensive), make the stimulus unpleasant. Berlyne (1971) offered a model where pleasantness came not only from absolute level of intensity or excitement, but also from *shifts* of these levels towards the optimum.

fans in the Internet, beauty contests etc. If esteem is just rank, than altruism is also rank, because altruist decreases his fitness and number of offspring for the sake of another individual of the same species⁵. We can put here as a hypothesis, that altruism and desire for respect are mutually excluding, however this must yet be tested.

So, the model of weighted sum of different components of utility will transform into another model, where security and activity become poles, as well as esteem and altruism. The man who was willing to pay for watching the fly actually wanted to increase his rank in the society and raise his level of excitement, and this explanation is most general and culture-independent. This action is rational, if individual's current rank (balance between esteem and altruism) was low (closer to altruism) and his arousal was lower than optimal (he felt too much comfort and security and too little excitement). There is no surprise in seeing that maximal utility is gained when a factor is at its optimum, not growing unlimitedly high, as economists usually picture consumers' utility. Individuals are most happy and have highest level of utility, when they eat moderate amounts of food, not overeat, when the temperature in the room is average, not too high. We would even hypothesize that individuals are most happy when their level of consumption and their wealth are at optimum, not over some (maybe very high) absolute level⁶. The happiest individuals must be those standing close to their own optimum in ranking, arousal and physiological needs. The model may be like:

$$U = U(D, A, R) = 1 - (a_1 * (D) + a_2 * |A - A_0| + a_3 * |R - R_0|);$$

$$U, a_i, D, A, A_0, R, R_0 \in [0;1] ; \sum a_i = 1;$$

Where D – drives (physiological needs), A – current level of arousal, A_0 – optimal arousal, R – rank, R_0 – optimal rank, a_i – weights.

Good questions to come here are: where do the optimum values come from? are optimums stable at least in short term view? is the dependence really linear (shouldn't we use something else instead of weights a_i)? are A and R are independent? If we remember, that perception of stimuli is proportionate to logarithms of intensity (one of the basic notions in modern neurobiology), we have to specify that A and D are actually represented in the brain as logarithms of some stimuli, and R is logarithm of social rank of the individual (his wealth, ranking in sports or anything else, in which he compares himself with others).

The position of the optimal arousal level and optimal rank defines the prevalent behaviors the individual will chose. For instance, people with higher optimal arousal (extroverts) and higher optimal rank (strong, healthy and sexually attractive persons) will *ceteris paribus* more likely start new businesses, make risky investments and become entrepreneurs. On the contrary, people with lower arousal (striving more for comfort and stability) and lower egoism would sooner work for someone and get stable income, even if they have the opportunity to initiate a profitable venture. Such a model could well be used for prediction purposes (e.g. if we find the optimal values of arousal and rank for a given person and estimate their current states by some variables in the brain, it would be possible to predict the most likely behavior: it should be directed to

⁵ Examples of altruism are very often in animals (see, e.g. Brosnan & de Waal, 2001). A puzzling example of altruism is the society of *bonobo* – a type of chimps, whose DNA is 98% like human (see de Waal, 1995). In any situation where rivalry can appear (sharing food etc.) bonobos do not compete, but masturbate each other (notwithstanding the age or gender) to decrease arousal and then share on egalitarian principle.

⁶ This notion obviously contradicts the basic axiom of economic theory, that there is no limit for human needs. We suggest to you the following mental experiment: imagine you are in a virtual reality, where any need of yours is satisfied immediately. Goods, pleasures, anything – appears as soon as you begin thinking of it. How much happy would you be in this paradise, if it never ends? Will you be so imaginative to avoid boredom when nothing lacks? Put broader: would you, as scientist, be happy, if any question of yours was answered by some deity, and that was the final truth each time, meaning complete knowledge of everything?

optimal point and demonstrate a kind of “mental homeostasis”). However, there are many questions to clear out, like influence of personal traits or cultural contexts.

The approach to utility becomes more scientific if shifts of utility are directly measured by levels of dopamine in the brain (see, e.g. Shizgal, 1997). The new science of neuroeconomics⁷ emerged after the discovery of reward-centers in the brain which activate when people are going to receive pleasurable stimulations like tasty food, sex, amphetamines injection, or money. However, it is unclear how different motives (some of them pushing utility up and some down) combine in the brain. To test our model one could try to compare average arousal levels and signs of high rank (like testosterone levels or number of sexual partners⁸) within groups of self-employed and employed people, and between people of different professions. In any case, finding basic individual differences could explain much phenomena we observe in the economy. It is just important to look in the right direction.

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⁷ See Camerer, Loewenstein & Prelec (2003) for a review.

⁸ I am thankful to Prof. Paul Zak for telling me the ways ranks are measured and advising the relevant literature.