

Modeling the Impact of Psychological Factors on the Behavior of Economic Agents in the Health System

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Abstract—

In this paper economists work with psychologists to solve social problems. Behavioral features have been introduced in many parts of macroeconomics and microeconomics. A conventional training in the field of economic leads theorists to modeling economic agents as if all are facing constraints well defined and see the functioning of the world in the same way that economists try to model their own behavior. An Economic approach to psychological factors that are manifested in the health administration are discussed in this analysis as well. Also this paper deals with psychological factors needed in decisions of economic agents and how an individual can constraint his passions, whom as other specialists says are myopic.

Keywords— Modeling Behavioral Economy, Companies' Behavior, Self-control, Anomalies, Psychological Factors, Psychological Behavior, Health Administration, Health Economics

I. INTRODUCTION. LITERATURE REVIEW

Behavioral economics is a branch of economics that has become prominent lately. One of its definitions is the "economics that is based on realistic assumption and descriptions of human behavior" ([13], pp.23). Alain Samson describes behavioral economics "as the study of cognitive, social, and emotional influences on people's observable economic behavior" ([9], pp.01).

Behavioral economics has already produced insights into consumer behavior, behavior at work, managerial behavior and business ethics, thus it is trying to use concepts and insights from other social sciences to replace, alter or enrich the current range of profit maximization and utility models used by the economy.

One of the pioneers in the area was George Katona. In 1951 he published [5], a work that invites them to apply knowledge of psychology economists in economic problems.

Another pioneer in the field was Herbert Simon who was an early critic of economic modeling, having processing capabilities with unlimited information.

Perhaps the most common is the work of psychologists Daniel Kahneman (economy¹ Nobel laureate and author of Thinking fast, slow thinking) and Amos Tversky ([3] and [4]).

An important aspect of Kahneman and Tversky studies was the discovery of how the choice was made or "framed" influenced the decision. Given the two different descriptions of the same situation, chosen subjects would make two different and incompatible options. The cases chosen were not presented different, but subjects perceived some differences depending on how the situation has been described. Thus, the perception has been shown to be a key variable which may cause the subjects, and perhaps the consumer make decisions that are not maximized.

Considered "the father of behavioral economics", Richard H. Thaler is a professor of behavioral science and economics at the Booth School of Economics, University of Chicago and president of the American Economic Association, studied throughout careers radical idea that the central agencies economics are people - individuals predictable, fallible.

In conclusion, behavioral economics suggests that businesses should identify consumer needs, including the need for novelty and control. This suggests that the consumer lifestyles should be identified and made solid foundation for the marketing effort [1].

II. IDENTIFICATION OF THE PSYCHOLOGICAL FACTORS THAT IMPACT THE BEHAVIOR OF ECONOMIC AGENTS

The following psychological factors are taken into account when discussing the behavior of economic agents:

- Incentives
- Learning
- Self-control

¹ Prize for economics is not one of the original Nobel Prizes; Alfred Nobel mentioned that in his will, although it is given with the others. Its full name is the Sveriges Riksbank Prize for Economic Sciences in Memory of Alfred Nobel.

- Anomalies
- Perception
- Attitude
- Motivation

Traders put a high value on *incentives*. The argument says that if the stakes are higher, they will be encouraged to think more, to ask for support and engage more to resolve a situation. Not supported by any evidence, that assertion was believed, contrary to the fact that nothing in economic theory and practice suggest that the economy does not only apply to high-stakes issues.

People have what is called “well-defined preferences”, which means that they know well what they like. With no stable preference, there is nothing to optimize, and economic theory should not work.

Learning, psychological factor in the “real world”, where people have the opportunity to learn. Psychologists tell us that to learn from experience takes two ingredients: exercise frequently and immediate response. When these conditions are met, such as learning to ride a bike or to drive, we can learn with small accidents on the road. The learning argument and the incentives are, to some extent, contradictory.

Learning brings relatively permanent change in human behavior that occurs as a result of experience. All complex behavior is a learned behavior. If we want to predict and explain behavior, we must understand how people learn. Learning involves change in behavior. It is continuous process, which occurs all the time. We cannot see learning but we can see changed behavior as a consequence of learning. Learning changes attitude of individuals to a large extent ([6], pp.72).

A significant part of consumer behavior is characterized by the presence of the *self-control* problems ([10], pp.02). It wouldn't be difficult to see the importance that self-control has in understanding the behavior of self-saving mode. The problems of self-control will be present to some extent in all decisions involving consumer inter-temporal trade-offs.

Self-control necessarily implies the existence of a controller and a controlled, so individuals are considered to behave as if they were the owners of two types of items. These two aspects of their personality are referred to as “the planner” and “the doer”.

Modeling the behavior in this way, it seems appropriate path was taken. Once this process is adopted, it becomes apparent that individuals share many emerging-control problems in organizations. If traders are also facing organizations control issues, then they should adopt several strategies similar to these problems. In fact it is noted that they do.

Anomalies aim to show economists or traders, that there are many aspects that do not fit traditional models. Thomas Kuhn suggests that an economic anomaly is a result that does not match the current economic paradigm. The economy is different from other social sciences by the belief that most, all behaviors can be explained by assuming that agents have stable preferences, well defined and make rational choices consistent with the preferences in the markets.

The libertarian paternalism forms can vary from minimal paternalism, the choices imposed on procedural constraints, or substantial constraints.

How to choose the official solution is depending on the problem and can go from the approach that minimizes the number of people who don't like the proposed solution, the one that forces people to make choices in a manner explicit and not implicit, in the one who would choose a majority if choices would be required explicit and shared with others.

Group decision theory suggests that these decisions would be higher under certain circumstances individual choices, especially in areas where accumulation of information is costly and difficult to deploy.

The official choice should be the best, from the perspective of maximizing individual well-being, even if it is not what he would choose in the absence of such suggestions ([12], pp.251).

Perception is the mental activity of finding, understanding, judging stimulants, achieved through the network of sensory receptors. It can be two kinds:

- (i) physical perception (physiological);
- (ii) cognitive perception (psychological).

The most important feature of perception is that it is *selective*, due to the particularities of consumers, being complementary to the need. Individual differs in the way he sees, interprets and understands a particular event. A manager may perceive nonattendance of duty by the subordinate in a different way. Individuals may also differ in their opinion though the event or situation may be the same.

For example, in an organization where lunch is served in a subsidized manner may be interpreted by the employees in a different way. An employee may perceive it as “right” to get a subsidized lunch, the other may feel that it is being given out of surplus of profits achieved by the organization while the third individual may state that it is mandatory for the management to provide lunch free of cost and that the management is not doing any favor to them by providing the lunch.

Perception is defined as “a process by which individuals organize and interpret their sensory impressions in order to give meaning to their environment (Robbins)” ([6], pp.116). Perception depends on the attitude of the individual.

According to G.W. Allport, “**Attitude** is a mental and neutral state of readiness organized through experience, exerting a directive or dynamic influence upon individual's response to all objects and situations with which it is related”.

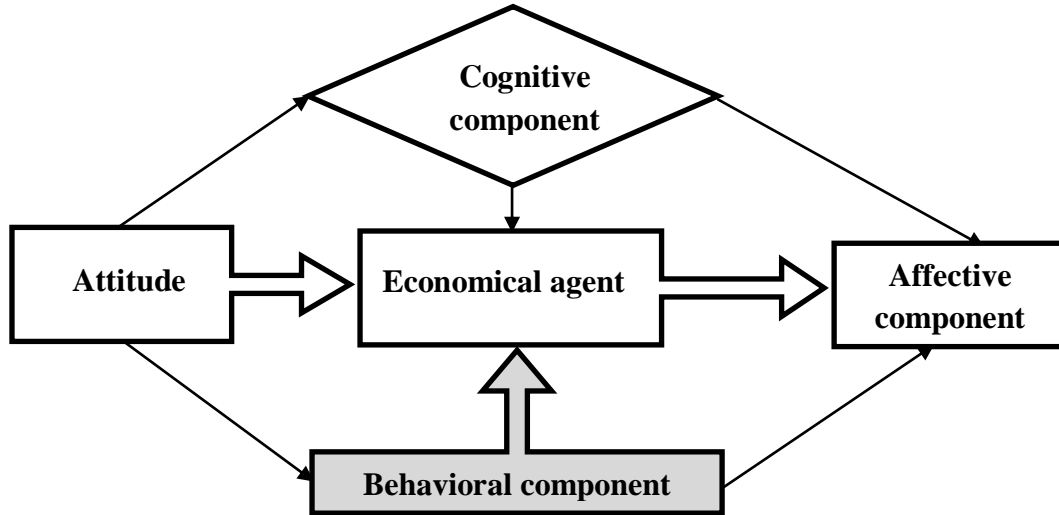
Krech and Crutchfield defined “attitude as an enduring organization of motivational, emotional, perceptual and cognitive processes with respect to some aspect of the individual's world”.

According to Katz and Scotland, “Attitude is a tendency or predisposition to evaluate an object or symbol of that object in a certain way”. In effect attitude is used in a generic sense, as to what people perceive, feel and express their views about a situation, object or other people. Attitude cannot be seen, but the behavior can be seen as an expression of attitude.

The components of attitude are classified as follows:

- (a) *Cognitive component*: Cognitive component of attitude is related to value statement. It consists of belief, ideas, values and other information that an individual may possess or has faith in. Quality of working hard is a value statement or faith that a manager may have.
- (b) *Affective component*: Affective component of attitude is related to person’s feelings about another person, which may be positive, negative or neutral.
- (c) *Behavioral component*: Behavioral component of attitude is related to impact of various situations or objects that lead to individual’s behavior based on cognitive and affective components ([6], pp.87).

All these components are explained in Fig. 1 presented below:



Source: Based upon [6], pp. 87

Fig. 1 Components of attitude

Motivation is defined as “inner burning passion caused by need, wants and desire which propels an individual to exert his physical and mental energy to achieve desired objectives”. Efficiency of a person depends upon performance, where performance can be expressed as under:

$$\text{Performance} = \text{Ability} \times \text{Motivation}$$

The Encyclopedia of Management: Motivation refers to degree of readiness or an organism to pursue some designated goals and implies the determination of the nature and locus of the forces, including the degree of readiness ([3], pp.99).

III. ECONOMIC APPROACH TO PSYCHOLOGICAL FACTORS

A. Economic Approach to Psychological Factors that Manifest among Traders

Each trader act in the principle of economic rationality that seeks maximum effect with minimum effort, because of the unlimited nature of the needs in correlation with limited resources.

Acting in accordance with the principle of economic rationality, each agent will seek to satisfy a large amount of needs with just a few resources.

Because individual behaviors are formed under the influence of a variety of factors, among which the subjective and psychological factors are predominate, the trader’s expectations are characterized by relativity and a high degree of uncertainty.

On the other hand, economic predictions have some degree of certainty and stability. This stability is characterized by a certain regularity determined by the existence and action of domain-specific economic principles ([11], pp.17).

B. Economic Approach to Psychological Factors that are Manifested in the Health Administration

As the socio-economic development and medical sciences has increased, more diversified forms of healthcare organization have appeared, assigning means ever-growing of defense and care for the sick persons.

In recent decades, we witness the amazing performance of surgical treatment, involving increasingly investments that are more and more difficult to sustain. On the other hand, are more promoted the preventive principles and the medicine of healthy human habits, and beliefs with inculcation of useful management for own health by each person ([8], pp.05).

Health services are nowadays major utility activities for the society, that have as objectives the safeguarding and promotion of the general human health, both individually and in communities.

Generally, and particularly for the active population, health services are seen as investments in human factors, investment indispensable, since they contribute, through the work they carry out, to strengthen the working capacity of people, to grow the labor productivity of individual work and for the society, to increase production and increase national income.

For these reasons, the World Health Organization ranks first the health, among the 12 indicators that characterize the life of people ([7], pp.5). The object of research in public health is the group or groups of people and not the person (individual). It aims the role of social factors that influence health and has a preventive tint.

Thus, the main objectives of public health are:

- (i) Defining health and factors for conditioning it;
- (ii) Measuring health status with regular health indicators;
- (iii) Appreciation of the importance of health and associated factors;
- (iv) Understanding the content of public health.

The health system consists in a set of independent components, but profiled and specialized, which are interrelated and help ensure minimum health in the family, population groups, human communities or in society. In a health system there are 5 subsystems:

- (1) The resources: human, material, financial;
- (2) The health management include: planning, organization, evaluation;
- (3) The economic support (financing system);
- (4) Provision of medical services;
- (5) Organized health programs.

Amos Tversky presented a study that he wrote with Daniel Kahneman in 1981 and who later became famous as Asian disease problem. This study treated certain violations of economic principles, the so-called *economic anomaly* that does not fit the paradigm. This is set out as follows: take two groups of subjects and are told that 600 people suffering from an Asian disease and that must choose between two policies. The first group has to choose between the following:

- A policy will certainly save 200 people.
- Applying policy *B*, there is one chance in three that everyone is saved, but two of three in all 600 patients to die.

When they are presented with these options, most people choose the safe route, *A*.

In alternative version the subjects have also two options:

- If you choose option *C*, 400 people will die for sure.
- If you choose option *D*, there is a chance of three not to die and two of the three that everyone dies.

In this case, most preferred the risky option *D*.

Nothing seems to be especially for those choices, but applying the rules of arithmetic, this shows that the police is the same policy *C*, and policy *B*, the same as *D*, so it is not logical that subjects to prefer *A* instead of *B*, but *D* instead of *C*. And for all that, this is how it was, and the same results were obtained when a similar problem has been made to a group of physicians ([12], pp. 238).

IV. MODELING THE IMPACT OF PSYCHOLOGICAL FACTORS OVER THE TREADERS BEHAVIOR

Most decisions have future consequences, effects which are delayed in time relative to when the choice is made. The decision to make a major purchase or the decision to make a small adjustment to the pension contribution may affect consumption patterns months or years in the future.

Choices about diet, exercise and smoking have consequential effects on long-term health. Ability to assess the future consequences is therefore a fundamental aspect of decision making. There will be considerations in the theoretical findings, behavioral and neurobiological in this field [2].

Why do people impose constraints on their future behavior? For example, cigarette smokers pay more per pack than buying them in the cartridge. Dieters do not have ice cream in the freezer. These examples have in common the existence of self-control problems.

Robert H. Strotz's answer depends on the observation that most people inclinations change over time in a systematic way. While Strotz's demonstration contains more useful information on this issue, he fails to treat directly self-control, and this makes his model inadequate. We begin by summarizing his argument.

Strotz believes an individual with a certain income, marked $K(0)$, of an exhaustible resource at time 0. The individual must decide on a plan of consumption, noted $c(\cdot)$ which will deplete the resource in a time interval $[0, T]$. Then, the mathematical formula will be:

$$\int_0^T \lambda(t, \tau) U(c(t), t) dt \quad (1)$$

Subject to:

$$\int_0^T c(t)dt \leq K(0) \tag{2}$$

In following a plan $c(\cdot)$, the amount of resource used up between times 0 and τ is just:

$$\int_0^\tau c(t)dt \tag{3}$$

Consequently, the amount of the resources remaining at time τ is simply:

$$K(\tau) = K(0) - \int_0^\tau c(t)dt \tag{4}$$

Where:

- $c^*(\cdot)$ represents the original plan and maximizes this problem;
- $\lambda(t, 0)$ represents the depreciation rate applied to $U[c(t)t]$ his determination $c^*(\cdot)$.

Of course, the inclinations of the individual may have changed at the time τ because it depreciates at a rate of $\lambda(t, \tau)$ and not $\lambda(t, 0)$ (provided that $\lambda(t, \tau)$ depends on τ). Does he want individuals to change their original plan when his tastes changes? One of Strotz conclusions is that the individual will not want to alter the original plan if $\lambda(t, \tau)$ is exponentially, otherwise his plan will become hyperbolic. If the original plan will be altered when the individual is said to show “dynamic inconsistency” ([10], pp.04-05).

The following example will show through a model presented by Strotz.

Table I Model of Inter-temporal Choice

| Time (t) | Income (y) | Consumption (c) | Discount Rate* ($\lambda(t,0)$) | | The amount of resource used up between times 0 and τ | The utility accruing at time t | The discount rate applied to the utility accruing at time t |
|-------------|---------------|--------------------|--------------------------------------|--------------------|--|--------------------------------------|---|
| | | | Exponential Case | Hyperbolic Case | | | |
| 0 | 3723 | 3240 | 1.00000 | 1.00000 | 3,240.00000 | 1,620.00000 | 1,620.00000 |
| 1 | 3723 | 3240 | 0.76923 | 0.66667 | 2,492.30769 | 1,620.00000 | 1,246.15385 |
| 2 | 3921 | 3240 | 0.59172 | 0.50000 | 1,917.15976 | 1,620.00000 | 958.57988 |
| 3 | 3711 | 3054 | 0.45517 | 0.40000 | 1,390.07738 | 1,527.00000 | 695.03869 |
| 4 | 3824 | 3253 | 0.35013 | 0.33333 | 1,138.96572 | 1,626.50000 | 569.48286 |
| 5 | 3826 | 3602 | 0.26933 | 0.28571 | 970.12333 | 1,801.00000 | 485.06166 |
| 6 | 3832 | 3052 | 0.20718 | 0.25000 | 632.30180 | 1,526.00000 | 316.15090 |
| 7 | 3629 | 3415 | 0.15937 | 0.22222 | 544.23597 | 1,707.50000 | 272.11798 |
| 8 | 3915 | 3321 | 0.12259 | 0.20000 | 407.11964 | 1,660.50000 | 203.55982 |
| 9 | 3724 | 3191 | 0.09430 | 0.18182 | 300.91001 | 1,595.50000 | 150.45500 |
| 10 | 3791 | 3575 | 0.07254 | 0.16667 | 259.32389 | 1,787.50000 | 129.66194 |
| 11 | 3725 | 3597 | 0.05580 | 0.15385 | 200.70748 | 1,798.50000 | 100.35374 |
| 12 | 3644 | 3039 | 0.04292 | 0.14286 | 130.43990 | 1,519.50000 | 65.21995 |
| 13 | 3750 | 3476 | 0.03302 | 0.13333 | 114.76678 | 1,738.00000 | 57.38339 |
| 14 | 3995 | 3965 | 0.02540 | 0.12500 | 100.70157 | 1,982.50000 | 50.35079 |
| 15 | 3865 | 3788 | 0.01954 | 0.11765 | 74.00477 | 1,894.00000 | 37.00238 |
| 16 | 3919 | 3222 | 0.01503 | 0.11111 | 48.42079 | 1,611.00000 | 24.21040 |
| 17 | 3906 | 3447 | 0.01156 | 0.10526 | 39.84779 | 1,723.50000 | 19.92390 |
| 18 | 3764 | 3596 | 0.00889 | 0.10000 | 31.97712 | 1,798.00000 | 15.98856 |
| | 72,187 | 64,313 | | | 14,033.39140 | | 7,016.69570 |

Source: Author's computations

*) where rate of discount is 30% when is exponential, and 50% when is hyperbolic.

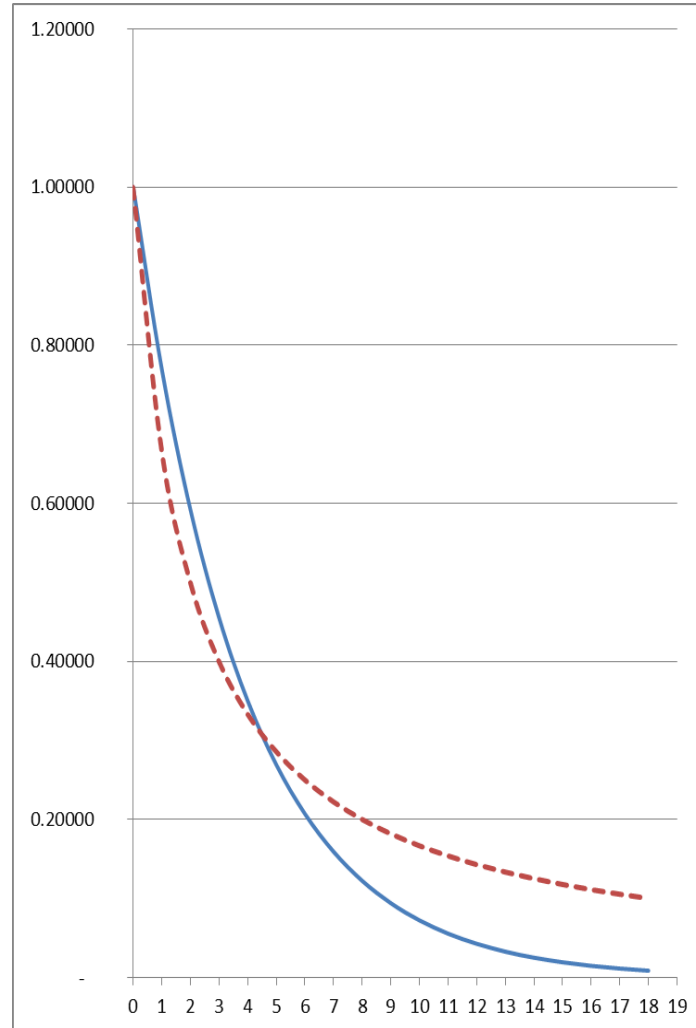
The exponential discount rate has the following form:

$$\frac{1}{(1 + 0.3)^t} \quad (5)$$

While the hyperbolic discount rate is given by:

$$\frac{1}{1 + 0.5 * t} \quad (6)$$

The graphical representation of the computations above is shown in Fig. 2, as follows:



Source: Author's computations
 Fig. 2 Dynamic Inconsistency and Self-Control

V. CONCLUSIONS

Individual will not alter the original plan if $\lambda(t, \tau)$ is exponential; otherwise he will. If the original plan is altered, then the individual is said to display dynamic inconsistency.

A person tends to maximize satisfaction in the short term rather than long term, irrespective of the long-term consequences.

If we have to choose between going to an extraordinary meeting this week or later on in a year, likely that most of us would prefer earlier.

The consumption is worth more now than later.

REFERENCES

- [1] R. E. Hattwick. Behavioral economics: An overview, *Journal of Business and Psychology*, vol. 4, issue 2, pp. 141-154, December 1989.
- [2] J. W. Kable, *Valuation, Intertemporal Choice, and Self-Control*, Elsevier Inc., 2014.
- [3] D. Kahneman and A. Tversky, "Prospect theory: An analysis of decision under risk", *Econometrica*, vol. 47, pp. 263-291, 1979.
- [4] D. Kahneman and A. Tversky, "The psychology of preferences", *Scientific American*, vol. 246, pp. 160-173, 1982.

- [5] G. Katona, *Psychological Analysis of Economic Behavior*, New-York: Mc Graw-Hill, 1951.
- [6] V. G. Kondalkar, *Organizational Behaviour*, New Age International (P) Ltd., Publishers, 2007. [Online], Available:
<https://docs.google.com/viewer?a=v&pid=sites&srcid=ZGVmYXVsdGRvbWFpbXjaXRlb2J8Z3g6MjA5YjY1OTZjZmY0ZjgzZA>.
- [7] T. S. Malacopol, *Issues of health economics*, Bucharest: Medical Publishing House, 1985.
- [8] Al. Popescu, *Health Economics and Management*, Bucharest: Medical Publishing House, 1988.
- [9] A. Samson, *The Behavioral Economics Guide 2015*, Samson, A. (Ed.), 2015.
- [10] H. M. Shefrin and T. Richard, *An economic theory of self—control*, National Bureau of Economic Research, Inc., 1978.
- [11] S. Stancu, *Microeconomics - behavior of economic agents in conditions of certainty, uncertainty and risk - Theory and Applications*, Bucharest: ASE Publishing House, 2012.
- [12] R. Thaler, *Misbehaving: The Making of Behavioral Economics*, Publica Publisher, 2015.
- [13] R. Thaler, *The Behavioral Economics Guide 2016*, Samson, A. (Ed.), 2016.