Utility, ethics and behavior

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ABSTRACT

This essay has the following hypothesis as its foundation: a new function taking a more global perspective can be developed based on the analytical economic conception of utility. However, this new hypothesis/perspective considers that individuals are driven to act by economic as well as social, religious, ethical, and other reasons. Thus, the crux of this exposition is an analysis of the concept of utility and its application towards daily acts. The essay also deals with the philosophical aspects of utility and its paradoxes and analyzes utility from the perspective of a biological being. This analysis is broader and includes the simultaneous actions of an economic human and a complex human.

Keyword: Utility function, Emotional well-being, wealth, ethics, “homo economicus”, weights.

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INTRODUCTION

The study of what motivates individual acts, especially regarding economic decisions, offers an intellectual challenge for the human sciences. In economics, this matter has been studied using a methodology of normative analysis known as the utility function, in which people seek to obtain the maximum degree of satisfaction. Herein, utility is what each person obtains from a certain level of wealth or consumption. For those not instructed in economics, this idea creates distrust and is blamed for generating a society of individualistic and insatiable beings. Grounds for both supporting and distrusting this approach have been given.

The utility function is an intellectual device for explaining personal economic behavior. As a theoretical body, obviously, it is a synthetic approach to reality. The utility function is reproduced on a small scale and as a normative analytical method, it does not always coincide with reality: what can be explained by itself does not require the use of models to be understood. The utility function model does not always explain all the factors that affect economic behavior, and the application of a single theory to public policies is controversial. Therefore, it is necessary to understand the theoretical foundations of utility.

Is the utility function an irrefutable methodology for representing economic behavior? Is the search for utility the only incentive people have for their economic transactions? Does the utility theory contain any ethical concepts? Does utility completely explain human behavior? These are the questions at the heart of this essay, and the following hypothesis constitutes is foundation: a new function taking a more global perspective can be developed based on the analytical economic conception of utility but that considers individuals that are driven to act by economic as well as social, religious, ethical, and other reasons. Thus, the crux of this exposition is an analysis of the concept of utility and its application towards daily acts. The essay also deals with the philosophical aspects of utility and its paradoxes and analyzes utility from the perspective of a biological being. This analysis is broader and includes the simultaneous actions of an economic human and a complex human.

I.UTILITY AND EMOTIONAL WELL-BEING

Behind every human action is an end, conscious or unconscious, associated with emotional well-being. Normally there is some sacrifice that is directly or indirectly related to obtaining this end. Thus, the end is the result of satisfaction and emotional sacrifice. Well-being may be satisfactory or unsatisfactory depending on the expectations created in relation to the act. What is sought, then, is utility, understanding this to be a degree of emotional satisfaction that is economically associated with flows of money and the difference between incomes and costs. This last dimension of utility is the most apparent. However, it is also incomplete and so must be broadened in order to explain the nature of daily acts without annulling the economic focus.

In lay terms, the utility is associated only with the economic behavior of people. This pretext is based on reality itself and the influence of economic concepts in daily life. In certain ages, the repercussions of doctrines were passed on to society at large, and such has been the case with economic concepts and philosophical approaches. For example, the influence of Hegelian thought was important in the social and political life of the nineteenth and twentieth centuries and the impact of the Greek philosophers was

determinant in Western society. But specifically, it is economics that has incorporated, with strength, the term utility under the denomination of the utility function. This is a mathematical description of the economic behavior of people.

According to the utility function, given greater wealth, people expect to obtain greater utility. This, in the economic context, is known as "rational behavior". However, this idea does not necessarily coincide with a more general understanding of human rationality. The utility function indicates that when deciding between two investments that present equal risk, the one that offers greater utility is chosen. Given the preponderance of economics in daily life, this perspective is generally used to explain human behavior. Therefore, the conceptual construction known as the utility function is present in the interpretation of daily acts, at times, generating a rejection of the economic conceptions.

II. UTILITY AND ITS UNDERLYING PHILOSOPHY

The utility function rests on normative definitions and assumptions. Philosophically, its development is associated with schools of thought, mainly utilitarianism, from the eighteenth century. The normative focus of the utility function leads to an analysis of individual economic behavior that is, at times, simplified, omitting other aspects such as the cardinal or Aristotelian human virtues and the theological virtues that condition personal behavior in daily acts, be they economic or not. Other aspects normally left out of the utility function are the spiritual and religious motivations for daily acts and social and psychological reasons, associated with power and self-esteem.

2.1 Philosophical conception of utility

The economic utility function grew out of an analytical and reflexive process. The vast work of Joseph Schumpeter contains a refined analysis (Schumpeter, 1954) of how utilitarianism has influenced the development of economic thought. The essence of the utility function stems from the concept "useful", a matter largely ethical in its beginnings. The utilitarianism of D. Hume (1711-1776), J. Bentham (1748-1832), and J. Stuart Mill (1806-1873) was also influential; these three presented outstanding precursors of utilitarianism that influenced the theoretical bases of the utility function. The utility function also has conceptual bases in Socrates, Plato, and Aristotle: the origins of the utility function lie within the schools of utilitarianism and hedonism.

Utilitarianism seeks to maximize good acts associated with good and correct pleasure and, at the same time, it seeks to minimize pain. Pleasure is associated with happiness and the absence of pleasure with unhappiness or pain. Therefore, what is useful is that which gives the most happiness to the greatest number of people, granting the concept of useful, which is primarily individual, a greater social breadth in the explanation of daily acts.

The ethical hedonistic school has also influenced the analytical foundations of the utility function. The ethical objective of hedonism is to maximize good pleasure, rejecting malicious acts that can also generate pleasure. According to Schumpeter (pg. 103, op. cit.), this form of analysis is a mechanistic philosophy for interpreting the universe, and the social attitude of this approach is a highly sublimated egocentric hedonism or eudemonism.

This author notes the influence of J. Bentham in the development of the utility function and as a continuator of the hedonists. Therefore, hedonism and its subsequent schools constitute, along with utilitarianism, the philosophical bases of the conceptual presentation of the utility function. The other ethical schools of thought have been neutral with respect to the analysis of the utility function. The theoretical development of the utility function has followed three relevant approaches: cardinal utility, ordinal utility, and rational behavior. These three formulate a theory for explaining how people react and for determining their degree of satisfaction given one of several possible courses of action.

In cardinal utility, Alfred Marshall (1920) indicated that utility has a quantifiable psychic dimension with respect to the degree of satisfaction when adopting a decision from among several courses of action. This is a typically hedonistic approach. Unlike cardinal analysis, with the ordinal utility approach presented by John R. Hicks and R. G. Allen (1934), the utility function cannot be measured in quantities and, when adopting a decision, people order their degree of desire for a product using a scale of preferences. The third approach, rational behavior, was developed by John von Neumann and Oskar Morgenstern (1947). This perspective assumes that people make decisions considering the implicit risk of each alternative and that, when facing an economic decision, people compare the risky option with an equivalent scenario under conditions of certainty.

The conception of utility has evolved from qualitative to quantitative. D. Bernoulli, in an article written between 1730 and 1731, presented his hypothesis in which the degree of satisfaction of all society is determined by adding up the individual satisfaction of each person. Based on Bernoulli, Quesnay (1776) formulated a concept of economic utility that includes a line of autonomous thinking.

According to Schumpeter (op. cit. pg. 172), utilitarianism is a philosophy for real life, a normative system with a highly marked legal skew, and finally a social system. Thus, Schumpeter viewed utilitarianism as a working hypothesis, finding that the utilitarian hypotheses are completely unable to interpret the driving forces of economic history, noting that they are too weak to explain aspects of economic behavior and adding that, in economic theory, utilitarian hypotheses are useless but not harmful.

The utility function is represented through mathematical functions that facilitate the analysis of *homo economicus*, or the economic human, under the utilitarian conception. Nevertheless, these mathematical functions are not always able to explain completely the acts that involve economic decisions. Indeed, if individuals are considered to be more complex beings, then this approach is limited. The complex human is understood to behave like a person who acts simultaneously as a biological, social, cultural, and economic being. With the utility function, all these aspects are combined into one facet that describes and maximizes what is “useful”. Therefore, people are homologous only when they behave as maximizers in the mathematical sense, explaining their behavior when they are located geometrically over said function. Looked at thus, this intellectual concept simplifies the analysis of economic theory.

2.2 Theoretical conception of utility

The mathematical influence in the description of this phenomenon is relevant. The utility function implies that utility is a function of wealth, assuming that greater wealth leads to greater utility. Therefore, personal economic behavior is reduced to obtaining the maximum utility. Methodologically, this is obtained through the mathematical

maximization of the expected utility of an event that implies the election of just one of many alternatives. In terms of expected utility, it is understood that given two possibilities for obtaining a return on an adopted decision, the correct alternative is that which has the greater expected utility.

The above is defined as a hypothesis of the expected utility that represents the "rational behavior" of a person under uncertainty. It is assumed that the utility function should be growing and limited: growing implies a greater degree of satisfaction with greater wealth and limited implies costs that are considered to be acceptable for the level of satisfaction to be obtained.

The utility functions can be represented mathematically on the Cartesian axes, with wealth being located on the "x" axis and utility on the "y" axis. Although initially expressed in "utilitarian" units, given the theoretical development of economics, the utility functions are now expressed in monetary units. The most commonly used function is the logarithmic function or that of D. Bernoulli, this is: $U= \alpha Ln(W)$, where: W= Level of wealth; U= Utility; Ln(W)= Natural logarithm of wealth, and "α" is a parameter to be determined. This essay does not deal with the mathematical expression in detail. Rather, its intuitive interpretation is based on a curve that grows but whose growth is increasingly marginally less. Each point shows the corresponding utility for each level of wealth; the economic human only moves over these points.

Laffont (1995) made two observations with respect to this methodology: a) the definition of the utility function with these normative assumptions is a working hypothesis and, therefore, it can be used to deduce empirically verifiable implications: if this hypothesis cannot be rejected based on the empirical work, it can be concluded that people act as if they will maximize the expected utility; and b) the utility function is a normative interpretation that consists of showing that rational agents "should maximize" their expected utility.

The aforementioned postulates contain a concept of rational behavior that is defined as the consistency of choosing as if it were a lottery with various options for returns. Two options are proposed: high returns or low returns. This interpretation is a definition from economics and the concept "rational" should not be understood as a synonym for words such as: reasonable, prudent, just, impartial, or others. Rather, *homo economicus* is a rational being only if behaving according to the economic rule of the rationalist and empirical models, giving it an interpretation of universal validity based on rationalism. Thus, rational behavior is a normative approach for interpreting a reality.

Both "maximization" and "normative" are essential aspects for working out what the concept of a rational human implies under these assumptions, since people are defined as rational when they behave under these two premises; that is, as maximizers whose economic behavior is guided by this norm. A maximizer is not the same as an optimizer. Here, the difference between "optimize" and "maximize" is a mathematical matter, since to maximize indicates a solution to a mathematical problem under whose conditions there is always an outcome in which it is certain that there is a maximum solution for the proposed system. Thus, in a producer there will always be a mathematical solution that indicates the level of production in a period. However, there could be other solutions that, without being mathematical maxima, could be optimal as "second best". This mathematical clarification offers a vision of the economic human that is compatible with a broader utility function.

Further on, the case of charity organizations that are financed with donations and their impact on and contradictions regarding the economic ethic will be analyzed.

Carroll (1998) looked at this from the perspective of what Max Weber called "the spirit of capitalism", J.Robinson (1962), focusing on the search for wealth by people for their own use and possession as the main cause of the system and of individuals. Interestingly, in another philosophical discussion, the famed British economist, Joan Robinson (1962) stated: "utility maximization is a metaphysical concept of impregnable circularity". Debreu (1966) showed that there are continuous utility functions. Markowitz (1959), who was awarded the Nobel Prize in Economics for 1990, based his approach on the utility function. Pratt (1964) and Arrow (1971) established forms for measuring of the reward for risk. "Power utility functions", with complex mathematical forms, were developed under the same normative principles.

2.3 Paradoxes of the utility function

Schumpeter, (op. cit. pg. 171) asked: Why was the theory of utilitarianism so easily accepted by so many good brains? His answer was that those brains belonged to practical reformers who fought against a historically given situation that seemed to them to be "irrational" and, he added that, in such a struggle, "simplicity and even triviality are the primary virtues of argumentation". Schumpeter went on to state that those authors were not insincere; rather, he said: "we all are rapidly convinced of the "nonsense" we tend to preach". Paradoxically, given these reasonable critiques, the utility function has been altered little from its original state. Von Mises (2007) helped clarify this, sustaining that the behavior of economic humans is interesting as it is that of a person who participates in a market. He indicated that it does not matter if one is altruistic or egotistic, rational or irrational, as these data are external to the economic analysis. Thus, psychological data are a matter for psychology and social structures are problems for sociology.

As an autonomous science, economics needs its own definition of rationality for interpreting the economic subject – the maximizer. However, this is a very global perspective that attempts to include all the motivations of a person within this description; the utility function also occurs within this context. Thus, from the perspective of economic rationality and making use of the utility function, it is not easy to explain any economic situation. The following presents some economic cases for analysis in terms of the principle of economic rationality. These are also suggestive of alternative hypotheses.

2.3.1 Utility, charity, and donation

Utility functions have been used for the economic analysis of non-profit institutions and donations as a form of financing. Dixit and Stiglitz (1977) developed a utility function to explain that a donation is a good equivalent to a luxury good. It is easy to show that the economic profit from a donation, for the donor, tends to be negative, which goes against the assumption of economic rationality. On the other hand, charitable institutions that are financed with donations can charge a negative economic profit for the services that they provide, also contrary to economic rationality. It is very extreme to explain that, in terms of donations and charity, people behave exclusively within the framework of economic rationality, since here people can be seen to be complex humans.

The use of the normative principles of economic utility to explain donations is artificial and clarifies little for those donors inspired by the values of other ethical schools, whether they make donations for cultural, religious, or spiritual reasons, or are motivated by a desire to be "good Samaritans". For such people, it is difficult as well as uncomfortable to accept that their actions are motivated by the rationality of the economic utility function.

People can be simultaneously driven by genetic or biological reasons as well as by social and ethical reasons, and they may sacrifice some of these in benefit of others. That is, they may sacrifice their maximum economic utility for some emotional sentiment other than economic rationality. Thus, if a church or charitable institution receives a cash donation, it is a gift and, in keeping with economic concepts, has a negative cost. According to economic principles, the organization receiving the donation should charge for the services it provides, obtaining at least the cost of financing those services. However, since this cost, given the donation, is negative, then there is no need for the organization to charge for its services, and a negative yield is generated. That is, the organization can do charity. Thus, this gift can be donated in the form of some free service to society.

If a charitable institution does not receive cash donations and requests a bank loan, using these funds to do charity, the institution must charge for its services. If it does not, the institution will go bankrupt. In that case, it is clear that the institution should behave rationally and the utility function reflects well this situation. However, this is not the case when the organization is financed through donations.

2.3.2 Investment in ethical funds

Since 1970, funds for ethical and environmental investment have been available. These are analogous to a portfolio of mutual funds, consisting of financial intermediation in the form of a portfolio made up of stocks, bonds, or other documents emitted by companies that are sensitive to ethical aspects and the care of the environment. The financial intermediary defines criteria of ethical and environment defense that are used to evaluate the reliability of companies in these matters and, therefore, determine whether they are suitable for investment. Once the reliability of a company has been verified, the financial intermediary can buy the financial assets emitted by that organization and make investment portfolios that can be offered to investors who are also sensitive to ethical and environmental values. Obviously, these investors seek profits, but as such investors hold principles that are not necessarily economic, they are willing to sacrifice the maximum performance that could be obtained with other more profitable funds. Since both the investors and the issuers of the securities impose ethical and environmental conditions and restrictions on themselves, they may not be located at the maximum that would correspond to them if they were acting as economic humans. Given the imposed restrictions, these assets could have lower profits than those obtained with other financial assets free of limitations.

Mathematically, the maximum solution of a problem of maximization with restrictions will be lower than that obtained when maximizing without restrictions. For the utility function, the problem of maximization is simplified through the mathematical methodology of optimization with restriction; but this solution leads to another utility function since the restriction mathematically implies a sacrifice of the mathematical maximum point. Thus, there is a suboptimum that is removed from the principle of

maximization and, therefore, behaves like a rational economic human. Intellectually, the utility function can be preserved by explaining that, in this situation, the person has an economic utility function located geometrically below that which they would have if they behaved like a maximizer.

2.3.3 Other cases

Altruism leads some business people to invest in sectors that are less economically profitable than others. Should these people behave as strictly economic humans, according to the utility function theory, they would probably make other investments. However, motivations of another type, for example, being "good Samaritans", can lead them to make suboptimal economic decisions.

Some business people whose businesses are located geographically in areas dominated by "economies of illegal drugs" choose not to go into this business, which might be more profitable, because of the ethical values that they hold. That is, these people refrain from participating in illegal activities for a good purpose and not in order to avoid a risk, which would be the explanation offered by the utility function. The sale of illegal drugs is usually highly profitable. However, when this business is avoided because of the bad that it brings, the matter at hand is not one of economic risk but of the different values that inspire people.

The field of medicine offers possibilities for performing interventions (e.g., abortions) that are economically profitable. Nonetheless, some doctors are driven by ethical or religious reasons and prefer not to maximize their incomes thus. Once again, the utility function, understood exclusively as an economic matter, cannot explain these cases and can only obstinately interpret the actors as economic humans. Finally, sponsors who could obtain greater profits but prefer to finance youth, music, art, or other such centers with reduced profits act in contradiction to the normative assumption of the utility function.

The people in the above cases clearly obtain lower economic profits than the maximum indicated by economic theory. Thus, there could be other functions that represent economic behavior, such that the traditional utility function would be just one of a set of functions. Normally, it is assumed that, for cases such as those cited, people who move away from the maximum benefit have a lower utility function, but within the same conceptual and normative context of economic rationality.

What differentiates the economic utility function from other functions of human behavior? This can be seen in terms of the cardinal or Aristotelian human virtues, Domenec and Vázques-Dorero (1993). Variables such as emotion lead to the proposal of a hypothesis that the economic utility function is a mathematical envelope of another function of behavior that explains the paradox of acting on the descending part of the utility curve. W. Sharpe (1970), recipient of the Nobel Prize in Economics for 1990, indicated that beyond point r* of the squared utility function, where this reaches its maximum, utility actually declines as the rate of profitability increases. According to that author, this is clearly unacceptable and the declining part of the curve should never be used for decisions with incomes over r*. This explanation is completely valid within the context of a normative assumption of an economic human, that is, of a maximizer. However, it loses its explanatory value for actions in the real world, such as those presented above, since some people sacrifice economic utility for other causes that also provide emotional satisfaction.

From a perspective of positive – as opposed to normative – economics, it is a great simplification to say that personal economic behavior, even when motivated by economic utility, cannot be explained when it occurs on the descending part of the curve. It seems implausible to state that behavior that does not comply with the norm of a rational economic human cannot be understood. This reduces the matter too much. Thus, the hypothesis presented here is that of another function that includes economic rationality and behavior as well as that of a more complex human for whom economic rationality is only one aspect of their behavior.

III. UTILITY AND ETHICS

The utility function has an implicit ethical focus that is the same as that of the economic sciences. Therefore, the underlying bases of this function consist of contributions made by philosophers from the schools of hedonism and, obviously, utilitarianism. Utilitarianism is a pillar of the utility function that leads implicitly to obtaining greater good pleasure and, at the same time, to decreasing pain. That people try to increase pleasure and diminish pain, and anything they do to obtain this end is ethical, is implicit in the utility function. The modern version of this function attempts to calculate levels of pleasure and pain, resulting in a mathematical interpretation of the current utility function. However, some pleasures and pains are not easy to measure objectively.

The search to maximize pleasure and diminish pain implies that the utility functions should be geometrically growing: as wealth increases, so should satisfaction. In marginal terms, this is equivalent to the idea that each increment in wealth leads to a smaller marginal increment in pleasure; this is known as diminishing marginal returns. Therefore, all activity that is carried out to augment pleasure is ethical and any decision that delivers greater pleasure given the same level of pain is rational. Thus, given two daily acts, both with the same level of pain, a person should choose the one that gives the maximum pleasure, which is ethical from the utilitarianism and hedonistic perspectives.

Applying the above to economic transactions leads to the following question: Given the possibility to earn a certain amount of money, would the individual prefer the option that gives them greater profitability? In the ethos of the "rational economic human", the answer is yes, but here is necessary to make note of the difference between this type of rationality and that of a complex human.

Despite the autonomy of economic science and, therefore, of the utility function, certain ethical concepts from other schools of thought must be included to help clarify these situations. Although these were initially incorporated into economics, over time, they have lost strength. Adam Smith, in the "The Wealth of Nations" (1776, Pg. 736), indicated: "Nothing but the most exemplary morals can give dignity to a man of small fortune. The vices of levity and vanity necessarily render him ridiculous, and are, besides, almost as ruinous to him as they are to the common people." Thus, incipient theoretical economics were concerned with ethics. Indeed, in 1759, Smith wrote another work entitled "The Theory of Moral Sentiments".

Some businesses, although not justified from the perspective of the ethics of the utility function, are still carried out based on other ethical values that are not necessarily compatible with the search for maximum profitability. There are other aspects implicit in economic acts that escape the ethics of the utility function but are related to human nature, with both the cardinal (prudence, justice, strength, temperance) and theological virtues

(faith, charity, hope) acquiring greater relevance. Let's look at how these are related to the utility function.

Prudence is an intellectual habit that implies acting with realism and doing good. Prudence is not considered explicitly in the utility function, whether due to an intellectual incapacity to generate an alternative analytical model that includes prudence or because, at times, being prudent can go against the dreams of those who believe that anything in this world is possible. For example, it is prudent not carry out a sexual business with children, no matter how profitable it might be. Prudence is a qualitative concept that is difficult to place within a parameter.

The virtue of ethical justice means qualitatively "to give to each their due". As a qualitative concept, it is not considered explicitly in the utility function. Ethical justice implies three dimensions of justice: general or legal justice, distributive justice, and commutative justice. All three are relevant and should be considered.

The virtue of strength is related to actions that help balance fear or cowardliness with a degree of audacity or temerity, placing them equidistant, albeit not in a mathematical sense, from one another. That is, a person faced with any decision should always be alert to the difference between cowardliness and daring, and the utility function should reflect this. In utility function theory, this has been introduced implicitly through the use of risk indicators, principally with mathematical-statistical-type definitions. What in economics typically has been used as a measure of risk is associated with the cardinal virtue of strength.

The virtue of temperance implies acting with moderation to avoid the tendency of excesses. This is neutral in the utility function; that is, economically, whether the person is honest and sincere is not of interest. Normatively, this topic is assumed to belong to other areas, not economics. The inclusion of temperance in the utility function offers an intellectual challenge. The theological virtues (faith, charity, hope) also influence both the daily and economic acts of believers, thereby falling into a special dimension for analysis.

A person's ends and the means used to obtain them constitute another relevant ethical aspect. Everyday actions have an ethical dimension when the end that is sought is good, noble, and obtained by following the "straight and narrow". This is also neutral in the utility function. Let's suppose that a company makes a new investment that increases its wealth and is, therefore, economically justifiable. However, this investment is located in a geographic zone with a culture of generalized corruption. Although the objective may be good, the manner of obtaining it may be inadequate. For example, a bribe may be necessary to obtain approval for the investment. Clearly, despite complying with the ethics of the economic human – that is, of generating greater wealth – given such a scenario, the decision to set up a business at that location would be restricted if a bribe is required to obtain the objective. In simplistic terms, when considering the sacrifices or costs, an allowance must be incorporated to pay the required bribe. If the investment project is still profitable, it should be carried out. This is debatable and, therefore, requires a broader analysis and invites reflection as to the utility function.

IV. UTILITY AND GENETICS

4.1 Economics and genetics

Experimental sciences such as biology and, specifically, genetics have indagated into human behavior, especially the study of the emotions. Although still incipient, the contributions of these sciences should not be ignored since they can influence the utility function. However, at present, it is too early to make any prognoses.

In the 1980s, research was done on the role of genetics in decision-making. In Bishop and Waldholz (1994, Pg. 379, 380), the authors refer to features such as vitality, cleverness, efficiency, and ease for decision-making. Moreover, injuries in early infancy can lead to the development of amoral behavior, even when other intellectual functions remain intact. The region of the brain in which people learn to distinguish notions of good and bad has been identified. Furthermore, the genetic base of the tendency towards extreme timidity has been studied.

The above is related to the utility function through risk. Economic theory does not concern itself with how this phenomenon is produced; rather, this is studied through models. The utility function could be explained by a genetic factor since the study of genetics has concluded that the reaction of the nervous system that produces anxiety and fear acts according to an individual's degree of introversion and extroversion. Biologically, the circuits that lead to the danger of fear and fright and to risk-taking attitudes given an event were first studied in the 1990s; now there is a better understanding of where the emotions are centered. This is not considered explicitly in the utility function and, as already indicated, this matter is not important for economic analyses.

Genetics have made inroads into the study of illnesses such as bipolar depression. Mental illnesses are neutral in the utility function and in the actions of the economic human. So why establish a relationship between bipolar depression and the utility function? It is known that one characteristic of bipolar depression is that those who do not have it and are in a state of bipolar euphoria carry out acts that other individuals would not. For example, euphoric people engage in senseless purchasing and the need to buy large amounts of products and, although they may not have the resources for this, they still manage to procure them. In the utility function theory, this pathology is neutral and this act would be considered to be that of a risk-lover. This explanation is valid even when it is not known that the person has a psychiatric disorder and, given the advances in modern pharmacology, can return to having normal behavior. Thus, it is necessary to ask which utility function represents this scenario: that of the unmedicated person or that of the medicated person?

With respect to risk, people who have damaged amygdalas have different attitudes regarding risk than those free of such damage. The same is true of individuals who have defects in their ventromedial prefrontal cortex. According to the utility function theory, this situation would be theoretically represented by the level of risk of each person. However, given the appropriate medication, their behavior will be normal and so they should have two utility functions.

Towards the end of the 1990s, genetics and neuroscience focused on the study of how people behave according to their genetic code. This has led to the challenge of analyzing the economic behavior of individuals through direct observation of the brain when they are faced with economic decisions. Although incipient, this new "neuroeconomy", stemming from the neuroscience available in the USA, offers a challenge to researchers working on classical economic analysis. Aldo Rustichini, professor of the University of Minnesota, was reported in *The New York Times* as saying: "This new approach, which I consider a revolution, should provide a theory of how people decide in

economic and strategic situations. So far, the decision process has been for economists a black box." In another newspaper, he indicated that although economists have always assumed people behave rationally, measuring costs and benefits, scientists have failed to explain how such behavior is produced, and this is precisely the contribution of neuroscience: it helps explain why people make the decisions they do. Jonathan D. Cohen, professor of cognitive neuroscience at Princeton University, told *The New York Times*: "Most economists don't base their theories on people's actual behavior. They study idealized versions of human behavior, which they assume is optimal in achieving gains."

Neuroeconomy relies on mathematical models, electroencephalograms, magnetic transcranial stimulation machines, and blood analyses. According to its authors, neuroeconomy will allow us to discover how these biological facts influence the behavior of economic agents. For example, certain acts that are categorized as irrational in economic language could be explained by the presence of certain hormones in the cerebral cortex. This new form of analysis leads to the following reflections:

a) The utility function, as an idealistic and empirical model, is valid within its normative postulates and is not necessarily invalidated by this new proposal (i.e., neuroeconomy). Methodologically, it can only be considered that this new approach could refute the utility function. The proposal of neuroscience is based on Game Theory, which uses a brain scanner of individuals participating in what is known as the "ultimatum game" to generate some polemic and not always novel conclusions.

b) Neuroeconomy is incipient. Observations of economic behavior remain valid after centuries of analysis. This does not mean that the studies done using observation and induction are not fully valid. Observations of economic behavior have been obtained through the direct study of the brain without the need for scanner technology for some time, using observations of personal behavior for this.

4.2 Utility and animal behavior

In the case of the animal kingdom, there are indications that the behavior of some species can also be understood, analytically, through utility. Thus, it is possible to explain animal survival when faced with predators or simple subsistence. R. Dawkins (1976), professor of ethology at Oxford University, has presented cases of egotistical animal behavior using acts that were normally considered to be cooperative or altruistic. However, Dawkins has shown that these acts are guided more by individual subsistence than by the desire to aid their congenerics.

For example, gazelles make large leaps when there is a predator nearby. These jumps seem to be provocative, like the gazelles are deliberately calling for attention. According to Dawkins, rather than signaling their companions of the presence of a predator, as it may seem at a first glance, the gazelles are really sending a message to the predator: Look how high I can jump! Trying to catch me will be hard work! Thus, clearly, this animal has an individual and egoistic utility.

Dawkins also reports other cases in which egotistical animal behavior can be deduced. This analysis is done from a perspective of group strategy in which incautious and tricky individuals must deal with one another. Game Theory explains the strategies used by species to maintain a balanced situation among them. The author is careful about extrapolating this analysis to human behavior, although he does make some insinuations.

V. DETERMINATION OF A GENERAL UTILITY FUNTION

Empirically, not all personal acts are well represented by the utility function. In some cases, the use of economic behavior as an explanation is forced or, rather, it is only valid under the assumption that, normatively, people are expected to act thus. A new form of analysis is developed here based on the current utility function and that which is shown by the evidence (the existence of other motivators).

Mathematically, the economic utility function is a geometric set of maximum points, but in reality, people can move within a broader range and are not necessarily located over a single combination of wealth-utility. Mathematical rationalism shows that the logarithmic function that represents utility is a greater envelope curve of another curve. This paper opts for a more explanatory and intuitive approach, rather than the use of excessive mathematical language. Earlier works by Parada (2004, 2009) present a mathematical development of the proposal made herein, and Appendix No. 1 contains a summary of the same. This new function is called the emotional satisfaction function. This is more general than purely economic behavior, and behavior driven by non-economic factors can be separated from economic behavior by assigning a respective weight to each of these facets.

There are mathematical methodologies for evaluating this type of function, such as assigning weight to the economic and non-economic factors. A person can move between two limits: a required minimum that could even be equal to zero and a maximum given by the interpretation of the economic human. Thus, people can be seen to act in a wider range and are not limited to the geometric space of the maximizing economic human.

Mathematically, with the Envelope Theorem, enveloping functions of the logarithmic function of Real Utility can be calculated. The envelopers: emotional satisfaction= economic satisfaction + non-economic satisfaction. In this case, "economic satisfaction" is expressed by $A_1Ln(W)$ and "non-economic satisfaction" by $A_2Sin(\pi W)$; where A_1 and A_2 are the weights that each person give each facet, the sum of both being equal to one or 100%. These are calculated with mathematical methods. W= wealth; Ln(W)= logarithm of wealth; Sin= sine function, and π= 3.1416.

For example, a person can place great importance on behaving like an economic human, weighting this, say, at 55%, whereas the rest of their actions (45%) may be influenced by other, non-economic factors. An extreme interpretation of this is the person who is motivated exclusively as an economic human, weighting this factor at 100%; in other words, the person has no motivations that are not economic. On the other hand, another person could care very little about acting as an economic human, basing their decisions exclusively on non-economic factors (e.g., ethical, religious, political, or other reasons).

According to the above, a new interpretation is generated that considers the rationalist, intellectualist, and empirical influences of the current utility function. The aforementioned concepts can be used to create an analytical framework that allows, within a single function, an explicit separation of the purely economic factor from the other factors that define a person as a complex human. In turn, a person's behavior can be explained not as a geometric place of maximum but by assuming that each individual acts within a range

of minima and maxima. This implies that the Bernoulli utility function is a particular case, only when A_1=0.

The above is an intuitive approach for explaining human behavior, which is somewhat *a priori* since it is a mixture of rationalism and empiricism. This analytical framework resolves a topic of common sense, as what it describes is that a person can adopt an economic decision observing what would they would cease to gain by behaving fully and exclusively as an economic human, comparing this loss with what would be gained over a required minimum and what, for them, is emotionally comfortable. That is, one does not always earn the economic maximum; rather, there is also the possibility for sacrifice, as in real life. Here, this lower economic utility is thought to have an emotional compensation and, therefore, it is adopted.

Thus, even though a person may know they can obtain greater utility, for example, selling illegal drugs, they do not do so for ethical reasons. In fact, human beings acquire the dimension of an ethical human when they choose not to carry out an act that they know will do bad. This last dimension can cause such a degree of emotional satisfaction that it fully compensates that which is not gained economically. Therefore, under an approach of emotional satisfaction, the critique of seeing the economic human as an insatiable being gains another dimension. Such behavior would constitute a particular case given a null coefficient A_1 and a coefficient A_2 that is equal to one; this is a borderline situation.

5. Utility, daily acts, and their analysis

5.1 Religious and charitable institutions

At the end of 2001, a public scandal known as the “Gescartera Case” occurred. Gescartera was a securities intermediary entrusted by investors with funds to be administered and invested for the purpose of yielding benefits. However, there was fraud. The matter of interest here is that the investors included congregations and entities of the Spanish Catholic Church. This led to a discussion as to whether the church should invest resources in the stock market. According to the Spanish bishops, ecclesiastic organizations have the duty and the right to invest conveniently the goods they receive from the faithful, procuring that these goods do not lose value. The bishops stated that there was nothing illicit about investing in assets with variable returns (stocks), although most of the church’s investments were in fixed return assets (bonds). One bishop said that this did not constitute a double standard and that he saw no incongruence between the vow of poverty taken by some religious congregations and investments in the stock market. Another representative of the church declared to the press that the investments were made in good faith. He indicated that people should administer their resources as best as possible and, when feasible, seek profitability.

Despite these opinions expressed by the church representatives, the situation did not generate widespread consensus because the utility of the church is not determined only by economic yields but also by the transmission of a religious message. The Gescartera case revealed a conflict between the religious objective of the church and its other objectives. What is the utility of the church? Is it the transmission of a religious message to a greater number of faithful? Is it the search for investments that obtain the maximum utility with the minimum risk? Are the two complementary? At first glance, there is a mixture of both objectives: economic and religious. Are, then, investments made by church institutions on

the financial market purely economic or are there parallel aspects behind these that should be analyzed? Herein, this will be consider from two perspectives, one exclusively economic and the other global, considering a complex human.

5.1.1 Conceptual economic analysis

Economically, scholastic arguments, Chaufan (1991) compiled by the founders of the economic sciences show no objection to investments made by a church on the financial market. There is no ethical questioning of the church behaving like an economic human and professional administrators of religious organizations should have no qualms about doing so. According to the ethical definition of economic humans that underlies the utility function, the church accepts that it can behave as persons that seek to maximize their utility. It is valid, normatively, to separate the manner in which the church obtained these resources – normally through donations – from the way in which they have been invested. Nevertheless, from this same perspective, the matter is not so obvious when the church receives cash donations since it is not exempt from ethical misgivings, even under the ethics of the economic human.

To illustrate, let's suppose that a church or charity institution requests a loan from a bank for $100, for one year, at 5% interest; thus, the institution must return $105. If the bank donates the 5% interest, then the cost of the loan for the church is 0%. However, if the bank is a better Samaritan and decides, along with not charging interest, to donate 60% of the loan, then the church only has to return $40 of the original $100 given by the bank. Thus, for the church, the cost of this donation is negative (-60%). Current values, assuming that the bank earns the cost of the recipient of the loan. Here the bank earns "i" for loaning $100 and at the end of the year receives only $40, complying with the following equation: $100 = 40/(1 + i)$; that is, $i = -0.60$ or rather -60%. Does this mean that the institution that receives this donation, if it is to charge something for its religious work, should only charge $40? Indeed, and the higher the donation, the more negative the cost, or the greater the earnings for the church.

Therefore, the organization that receives a donation has an economic utility and is not justified in acting as an economic human who must necessarily invest in more profitable but riskier stocks. On the other hand, an institution – be it charitable or otherwise – that obtains funding through loans with a financial cost greater than zero cannot cease to be an economic human and must seek the best alternative for investment to comply with its financial commitments.

A critical opinion of the Gescartera case published in a newspaper stated that if the church has 800 kilograms, it will reinvest them over and over until reaching 1100 kilograms and as much as it can because each time the investment will be more attractive; however, it would be better to spend the original 800 on the poor than to have any left over. This refers implicitly to a utility function that is growing, continuous, and has decreasing marginal gains. This affirmation is valid within the normative conception of the utility function. Nevertheless, the opinion that the limit of the function should be 800 kilograms touches on the dilemma of the level of utility at which each person or company should be located. It is here where the individual expressed a judgment and, therefore, implicitly indicated other ethical and religious values that condition the faithful interpretation of the utility function as a purely economic phenomenon.

Thus, from the perspective of the ethics implicit in the economic utility function, charitable or religious organizations that receive funding through donations have a greater margin of maneuvering than those organizations that do not receive such funds, regardless of the labors that they perform, be these charitable, religious, or spiritual. The greater margin of maneuvering allows these organizations to invest money in the stock market but in fixed returns; to invest in variable returns would exceed the behavior of an economic human, since the utility, upon receiving a donation, would be elevated.

5.1.2 Ethics of the original act and the following economic act

Charitable, religious, or spiritual institutions normally have good objectives and, therefore, the community justifies their functioning. Thus, every act that is derived from a preceding act that is well inspired – and so judged by the community – is also perceived to contribute to this good objective. On the other hand, any derived act (in this case, economic) that is removed from the primary objective of doing good will also be criticized by the community.

The bishop that avowed a lack of double standards in the Gescartera case and stated that he did not see any incongruence between the vow of poverty taken by some religious congregations and their investments in the stock market expressed the contradiction between the actions of a human with economic ethics and the ethics of a human motivated by other purposes. Here, it can be seen that attempting to explain the behavior of people based exclusively on one perspective, be it economic or global, can be a simplified vision.

According to the scholars, Chaufan (1991, Pg.141), the immorality of the actions of a prostitute does not invalidate the economic vision that a salary is charged for their services. This money originated in a morally dubious act, and the justification of the following economic act only has conceptual validity within the normative ethics of economic theory. Therefore, it is indecorous money in terms of an ethical analysis, but according to the ethics of the economic human, this is not of interest since the service of the prostitute – but not the economic act itself – is an ethical and moral problem. Therefore, there is no objection to payments made for sexual services. This is analogous to investments in the stock market made by charitable institutions. The good objective of the initial act (giving charity) does not justify the use of the probable economic excesses obtained through this activity for purposes that are not morally presentable to society. It is not that investments in variable returns are unseemly, but that such investments, in this case, are not prudent or fair since there is an implicit benefit and it seems more convenient to invest those surplus funds in something less risky (e.g., with fixed returns). Therefore, explaining the actions of a charitable or religious institution that receives donations with the utility function can only be justified using economic ethics.

By virtue of prudence, it is not realistic to invest money in risky investments when the objective of this money is for charitable or religious purposes since there is already utility when the money is received as a donation. By virtue of ethical justice, it is not highly advisable to invest in risky assets, since it is intended to give each their due. It is necessary to be careful with the monies donated by the community and not betray the trust that is bestowed on the organization. The third human virtue that should be analyzed here is strength, which is equivalent to bravery for moderating the impetus of taking risks beyond what is appropriate. Is it necessary to take a risk when there is already utility due to the

donation of the money received? Finally, as a human virtue, temperance should be analyzed, which is moderating the tendency to go towards very risky actions.

When dealing with religious institutions, it is also valid to analyze the theological virtues of faith, charity, and hope, furthering the notion that the analysis extends beyond that indicated by the concept of the economic human. This leads to the definition of emotional satisfaction expressed in the previous point. In fact, here, there are two functions**,** a maximum and a minimum economic function. Variable return assets generate greater yields than those of fixed return assets. This is known and is the maximum possible utility obtained on the stock market. That is, a church or charitable institution has two utility functions in spite of being able to be emotionally satisfied with a lower economic utility, thanks to its ethical and religious beliefs, if the institution becomes distanced from behaving exclusively as if it were an economic human. Does this imply that not acting as an economic human is inadequate? Not necessarily. Given the concept of emotional satisfaction, the definition of this act can be understood as something that is not exclusively economic but as something broader.

Whatever be the origin of the source of the funds that are invested – licit or illicit, ethical or not ethical –the likely maximum utility that can be obtained is known and can be projected, although not with total certainty. Furthermore, it is a known fact that some fixed return assets have lower but more certain returns. The professional administrators of religious and charitable organizations should also know this. If these administrators behave as economic humans, then the maximum utility function will guide their actions. If they do not desire risks, they will have minimum returns given by the minimum utility function. The administrators of these organizations can move within a range according to the cardinal virtues that guide their organizations, and their actions will depend on the importance that is given each of the two facets: that of an economic and a complex human.

In short, to explain this case, two aspects of behavior can be distinguish: one purely economic and the other more complex. These two aspects can be weighted differently by each person or institution. In the analysis of emotional satisfaction, these weights are represented by the coefficients "A_1" or "A_2". If choosing not to behave as a total maximizer, then the economic actions can be weighted at a level lower than one and, therefore, the complex human will be weighted as greater than zero. How much each is weighted is a personal and institutional matter.

5.2 Scientific researchers and writers

In the book, "The Picture of Dorian Gray", Oscar Wilde states:

> "What nonsense people talk about happy marriages!" exclaimed Lord Henry. "A man can be happy with any woman, as long as he does not love her."

This statement of Wilde can be interpreted from the point of view of utility and implicit risk. In fact, the utility in this case can be associated with "being happy", which Lord Henry intends to obtain with the least possible risk, interpreting this as the equivalent of "loving", since loving too much can cause emotional conflict. Clearly, this is an intricate and provocative interpretation for the reader, but it is proposed herein to motivate reflection and introduce the concept of utility and the implicit risk inherent in every daily act.

A man who seeks happiness (utility) without limits or restrictions cannot be interpreted using the tale of Wilde. This is because of the danger that loving a woman may also cause suffering, which, according to the quote above, will be avoided. It is the same as

saying: “I am happy, but by not making a commitment”, since doing so might result in falling in love and this could lead to suffering if your love is not returned with the same intensity. This can also be interpreted as the more you love a woman, the happier you will be. According to this interpretation, with greater risk (loving more) comes greater utility (greater happiness). That is, there is a positive relationship between utility and risk, an aspect on which economic theory is based. Why does the former interpretation indicate that it is risky to love? Perhaps because such silly things have been done in the name of love that it is also risky. So as not to overextend this interpretation of Wilde’s statement, it should be noted that love has also inspired very good acts. Nonetheless, being happy because of love is risky, both for men and women.

Utility and its interpretation can also be illustrated by the case of the Chilean writer, Antonio Skarmeta, winner of the 2003 Premio Planeta, awarded by the Spanish Editorial, Planeta, to novelists and writers of any nationality for new works. When receiving the award, Skármeta said he did not write to win prizes and that the winning work had not been written to be submitted to a contest. Rather, he said, he wrote the book with emotion and joy: writing is the vehicle of happiness and the author wanted to give the reader the energy of creation. Although Skarmeta has published other books of international importance, he noted that the Premio Planeta is tied to hundreds of thousands of readers, thereby multiplying his possibility of contacting them, El Mercurio (16.10.2003). The prize earned him €601,000 – an interesting amount of money! In 2011, another work by Skarmeta won the Premio Planeta-Casa de las America, with a prize of $200,000 dollars This is notable!

What motivates an author to write? On what does their utility depend? Although Skarmeta said he did not write the book to present it for a prize, in fact, it was so presented. The amount of the prize is a known fact that is stated in the contest guidelines. Many writers have never won an award, and others are unable to find a publishing house that will publish their work. Therefore, writing is clearly motivated by a mixture of utility and “emotion and joy”, as indicated by this author. This happiness reaches “hundreds of thousands” of readers, who can contribute marginally, as indicated in the contest guidelines. In this case, the amount of the prize (€601,000) is given as an advance that covers between 5% and 10% of the earnings from the book sales after and before selling the first 425,000 books. Clearly, the publishing house must sell these books to earn money, which is its goal. That is, the writer and the publisher have complementary utility functions. However, since no one guarantees the publisher that it will earn money with this book, the relationship between utility and risk appears. With respect to the writer, the question is what really motivates authors to write, and whether this can be analyzed through the economic utility function. This case is somewhat analogous to that of the motivations that guide researchers in different sciences.

Contributions have been made by researchers driven by the spirit of searching for the truth. Their discoveries form the bases of scientific and technological developments. However, other fraudulent researchers plagiarize, invent data, steal ideas, etc. This could be interpreted by forcing the analysis exclusively through the utility function and considering the researchers to have been motivated by obtaining economic funds to carry out their research, since new discoveries augment their curriculum and offer new possibilities for obtaining financing for investigations.

In this case, people are motivated simultaneously by economic, psychological, and social as well as ethical reasons. In fact, research requires economic funding to be carried out. Normally, this funding comes from the State or private parties. Whatever the

motivation of the scientists, they need to show results and build a good curriculum vitae to support their work, guarantee its quality, and assure that it will lead to some expected result. That is, every researcher must show results in order to continue their task and have the money necessary to carry it out. Thus, scientists have a clear economic motivation.

A researcher who obtains a novel result is also rewarded with fame and prestige. This psychological motivation is difficult to evaluate monetarily, since obtaining fame is one of the needs of self-esteem. An exclusively economic approach might attempt to evaluate this prestige through the different monetary incomes obtained before and after fame is obtained. However, this is a difficult interpretation to evaluate since other variables affect its valuation and the research may even be the product of the work of other researchers or of a work team. Research is also motivated by social, State, and military reasons.

In short, a variety of reasons drive researchers to make new inquiries. Of these reasons, the economic one is important, but how much more so than the others? This depends on the weight afforded each dimension and each scientist must assign this weight. The economic utility function would only be valid if, normatively, is assumed that only the economic motivation is relevant. However, given the perspective of a more complex human motivated by multiple purposes, it is necessary to determine the weight that each researcher gives their motivations. The researchers may not be strictly maximizers of their economic incomes. The weights afforded the coefficients ("A_1" or "A_2") allow us to determine that the behavior is motivated by the two types of reasons.

The above analysis can also be applied to writers. As an individual task, writing involves self-esteem, recognition, and obviously economic reasons. Some authors and writers finance their own works, knowing that they will not recover their investment. That is, they can economically lose money, which goes against the normative principle of the utility function. What could explain a writer self-financing their publication, even knowing that they will not recover their economic investment? One response could also be economic: writers do this in order to become known and to reach publishers that will publish future works. Some writers do this and their behavior is explained by utility and risk, but other writers receive satisfaction from seeing their books on display, in which case, the economic utility function is not a referential explanatory framework for their pleasure.

Thus, the works of writers and researchers contain a purely economic dimension as well as one of a complex human. The economic dimension allows them to analyze the problem exclusively from the maximum utility function. On the other hand, psychological (self-esteem), ethical, or other motivations may cause them to not act as exclusively economic humans, with the appearance of other factors compensate this distancing from the economic function.

5.3 Marriage and children

Jellal and Wolf (2002) carried out an economic analysis of how parents postpone having children. They reported that in developing countries, children are seen as potential sources of resources and support for old age, adding that investments in children are, nevertheless, risky. Let's assume that the parents maximize a utility function that depends on their level of consumption, and that this function is three times derivable and quasiconcave, as well as having other mathematical conditions that allow calculating an

optimum. This article, looked at by a non-economist, may seem to offer a somewhat cold, questionable, and pedantic explanation that could be nullified by following another line of thought such as a biological view of reproduction, a psychological perspective of love, or a religious point of view. However, this case offers abundant applications of economic concepts and of the utility function for explaining real life phenomena. This tendency is given mainly by the work of the 1992 Nobel Prize-winning economist, Gary Becker.

5.4 Public and private education

What motivates a person or community to create a new school or university? In order to explain this motivation from a strictly economic perspective, the utility function must be considered. In the history of economic thought, this case has been proposed for centuries, and the expositions of it do not escape the normative framework of the utility function.

George Stigler (1985), winner of the Nobel Prize in Economics for 1982, indicated that the work of Adam Smith (1776) made little of inept government behavior, finding that Smith believed clearly that, in terms of efficiency, stock companies and even universities committed more offenses than the State. More than two centuries later, this idea is still being discussed and, given the large number of private universities in many countries, remains relevant. According to Smith, discipline in colleges and universities was, in general, intended more to benefit the teachers than the students or for the convenience of those who teach. Indeed, Smith noted that those branches of education not taught in public school were generally taught better. This was what Smith observed in his day.

What has changed since 1776, when A. Smith wrote this? G. Stigler says that, for two hundred years, the system for analyzing economics has become more precise, clear, and general, although not always more lucid. In this sense, a university, whether State or private, offers society tangible and intangible goods. Some goods are strictly private since they generate direct benefits for those who possess them. Others are public goods that provide services to the entire community and that cannot be appropriated by a private person. Finally, there is an intermediate, semipublic category. Universities offer several public goods: cultural activities, symphonic orchestras, parks, cultural and scientific congresses, basic scientific research, art exhibits, and many works that benefit society. Despite being interested in and needing these good, people are not generally willing to pay a price for them. Thus, such goods must be financed by the State and many universities offer them on their own.

A private good is the property of who acquires it, and any benefit or return on its use goes to that person, such that economic gain for the rest of the community is only possible if the community pays for the use of the good. For example, applied research, the production of books, and the liberal professions not only allow greater returns but also generate social mobility. Thus, doctors, being useful and necessary for society, obtain greater pecuniary benefits than other workers due to their university studies. In this case, the State should finance part of the university costs to cover the proportion that corresponds to all society. Imagine a society without doctors or engineers. In such a situation, the State should promote these professions through scholarships for those who cannot finance their own studies.

The difference between these two concepts is essential for the analysis of which type of utility function best represents the behavior of a university. This is usually

presented as if universities only offer public goods and, therefore, it is the State who should contribute the resources. If a university offers private goods, it must charge for these; otherwise it is inefficient in the designation of its internal resources. In the case of public goods, is necessary to go to the State and convince the political authorities of the effectiveness of maintaining certain tasks that should necessarily be funded. It is essential to recognize these conceptual contributions, as not doing so would lead to severe economic imbalances that would leave the universities, be they private or State, at subsistence levels and offering products of poor quality.

The distinction between public and private goods is essential for understanding the meaning of the economic utility function. Therefore, the Bernoulli-type maximizing function can be adapted for the case of private goods offered by educational organizations. Nonetheless, the other facets of human behavior must be also analyzed. In fact, some universities have other parallel ends along with the professional majors they offer. If their users do not have the resources to pay for a product, then the university can charge a lower enrolment fee than what would be paid if the university were to behave as an economic maximizer, thereby sacrificing its economic income for other university objectives.

The importance of behaving as an economic or complex human is defined by each college or university. If it behaves as a total economic human, it would identify with the utility function. However, an implicit conception of the minimum utility function, moving between both ranges, can be explained through the function of emotional satisfaction. Some colleges and universities have high enrolment fees, whereas others are oriented towards satisfying a demand in sectors with lower incomes. These latter are motivated by reasons that are not exclusively economic, so if such universities are analyzed using only the economic perspective, they are not rational since they are removed from the normative objective of maximizing their incomes.

5.5 Human genome, research, and economics

In the year 2000, Bill Clinton, President of the USA, and Tony Blair, Prime Minister of England, together presented the draft of the human genome. The French geneticist, Arnold Munich, stated that false expectations were generated, selling excitement regarding the genome so that stock values would go up on Wall Street. Let's leave the genetics to the experts in that field and see how economics influenced this.

The Human Genome Project had been made official 10 years earlier. In total, 18 countries participated in it, led by the USA, England, Japan, France, and Germany. The project brought together 1,100 experts and was financed by the governments, costing around US $2,700 million. Two years prior to this announcement, the scientist, Craig Venter, who began with the original public project, had founded the company, PE Celera Genomics, whose stocks are traded on the market, with his wife and another scientist. In two years and with an investment of US $200 million, they were able to decipher 98% of the human genome. In the same period, the public project deciphered 85%. Economically, this is impressive, although it should be noted that Venter benefitted from the initial information of the public project. The first director of the public project was James Watson, the 1962 winner of the Nobel Prize for Medicine, who renounced the project as he opposed the patenting of discoveries, arguing that genetic information is a patrimony of humanity. This is contrary to the stance of a scientific-businessperson since, for the latter, basic

research should culminate in products, and it is the business people, not the scientists, who earn money. The public project will not patent discoveries, that is, they are a public good.

Craig Venter is a 53-year-old scientist-businessman who pushed the public project to accelerate its work and was more efficient with less economic resources. This unites two aspects: being the first to arrive and garnering recognition, a strong motivation in research, with the possibility that a discovery may generate end products and money.

The results of research in the basic sciences are public goods, that is, they are available to society for free. Those performing this work carry out research using exogenous funding. It is difficult to explain the behavior of these researchers using only the economic utility function. Although this function must be included in the explanation of the scientist's behavior, this can best be clarified by the emotional satisfaction function. The researcher-businessperson takes a risk and should generate an income, allowing them to return their funding. Therefore, they should patent their findings as private goods. Craig Venter acted as an economic man and as a pure scientist; if his actions are analyzed using only the economic point of view, they can only be partially explained.

5.6 Conceptual observations

The cases described show that each person has a utility function and that there may be more than one utility function for each person. At times, therefore, it is strange to explain an act from just the economic point of view. The interpretation of an act could only be well represented by the utility function if this captured all the distinct facets of human behavior. But things are not so simple when dealing with human behavior. As it is strange, it must be assumed, as did Ortega and Gasset: " before a thing is converted into an object of cognition, it must have been a problem; and before becoming a problem, we must have found it strange".

Economic theory has resolved this problem. Nonetheless, its application to real life daily acts is not always, for all cases, clearly explanatory. This leads to the analysis of the problem using concepts of Knowledge Theory Hessen (1993), such as rationalism and empiricism, with the variants of apriorism and intellectualism, aspects implicit in the utility function theory.

The Theory of Knowledge retains the currents of the generation of knowledge with respect to their influence on the utility function theory through dogmatism and its opposite, skepticism; of these, criticism is seen to be a generator of knowledge. The conviction that the utility theory should have a reflexive and critical process for better understanding daily acts has influenced the reflection of this essay. A total trust and an apparent lack of doubt in rationalism is observed. Moreover, the subject of the study (i.e., the person) is ignored and it is the object of study that becomes relevant.

Also skepticism is observed, understanding this to be distrust of the object under study, in this case the utility function. Given this distrust, the subject under study acquires greater relevance. Thus, people are the center of the study. With respect to the Gescartera case, Bishop José Sánchez, then the President of the Episcopal Commission on Social Communications and Mass Media, said that the fact affected the image of the church, among other things, because "we are neither saints nor angels". In this case, the utility function, as the object of study, is substituted by the characteristics of the people that make up the institution. That is, the subject of study is the person and the emphasis should be on whether they are "saints or angels".

On the other hand, unique aspects of rationalism and of its opposite, empiricism are also manifested in daily acts. In fact, rationalism proposes that all real knowledge originates in thought, such as mathematics. Therefore, the mathematical approach is present in the very definition of the utility function and in the interpretation of the economic human as analogous to the rational human, which is the definition of the economic subject. The case of the aforementioned prize-winning writer is an example: if the author sustains that he enjoyed writing the winning book, this apparently is not "rational economic" behavior, at least not as analyzed from the rationalism implicit in the utility function.

Empiricism can also be seen, since given real deeds – as opposed to ideas, as found in rationalism – people justify the investment of the church in the stock market or the action of Lord Henry in Oscar Wilde's novel. It is the observation of the fact that justifies the utility function adopted by each one. This aspect leaves room to reinterpret the utility function, which is also influenced by the current of intellectualism that allows establishing, for this case, modifications of the utility function based on its actual development. That is, the real behavior of people can be explained by the combination of a rational current based on ideal objectives and the proposal of real objects, which are the basis of empiricism.

CONCLUSIONS

Herein, the evidence shows that utility is based on utilitarianism and hedonism and is influenced by rationalism in the mathematical concepts of utility. Rationalism is an idealistic form of seeing reality. Empiricism also has an influence since utility is an empirical observation.

A fundamental aspect is how the evolution experienced by ethics has affected social behavior. It seems that economics have stealthily moved away from the initial ethics and this should be reconsidered since, without ethics, explanations of economic behavior are incomplete. The evolution of these norms has lagged behind in the analytical construction of economics, whether considering this to be a neutral variable or *ceteris paribus*. This relevant variable defines human beings as complex humans and is considered here in the new proposed function. The normative economic human only assumes the ethical and moral bases from the two ethical schools.

Some people consider actions guided by obtaining individual utility to be socially good in and of themselves, whereas others consider them to be bad. Halfway between rationalism and empiricism and taking a broader view, a global view of an infinity of acts can be obtained if the contents intuited by the conscience, which is the base of ethics, are added to both. This is what is proposed here as a function of emotional satisfaction, which emphasizes the idea of considering factors that are neutral in the utility analysis since all economic acts include simultaneous motivations, only one of which is economic. Equally important is the analysis from within the human being and here it is necessary to be alert to the challenge of neuroeconomy.

Not all the evils of humanity can be caused by the economic actions of egotistical persons. The exalted interpretation of this approach has led to inadequate deductions since not all persons behave as normatively defined by the economic perspective. From a global point of view, it is negative when a person assumes a behavior lacking in ethical values that could affect the emotional satisfaction of another person. Pure egotism – when a person with an exaggerated attachment to themself does not respect the interests of others – is

negative for social development and separates the human being from egotistical biological beings of other species.

Appendix No. 1

Emotional Well-being Function

a) Definition of a new function

A utility function is sought that is more global than the classical economic utility function. According to Parada (2004, 2009), a broader function can explain the behavior of people and companies by simultaneously incorporating the economic rationality of humans with a vision of people and companies that behave simultaneously motivated by other values. A summarized theoretical exposition of that approach is presented herein. The article in question shows, mathematically, that the logarithmic utility function of the type U(w)=Ln(w), which is commonly used in economics and finance, is an envelope of another family of curves of the type:

$$BE(w) = A_1 \sin(\pi w) + A_2 \ln(w) + c, \quad (1)$$

with: $0 \leq A_1 \leq 1$; $0 \leq A_2 \leq 1$ and $0 \leq c \leq 1$.

Where: w= wealth; BE(w)= emotional well-being in function of wealth; ln(w)= natural logarithm of wealth; sin(πw)= sine of wealth; the coefficients A_1, A_2 are used to weight sensitivity; c is a constant and independent of wealth, and π= 3.1416.

The function BE(w) has two envelopes: one superior, $U_1(w)$, that is united to this by the tangential relative maxima, and another inferior envelope, $U_2(w)$, whose points are tangential relative minima considering the function BE(w). Between these two are the functions $U_3(w)$, which are distinct only in their coefficient of position c. Graph No. 1 shows this new function with a red line, where the function BE(w) is growing at some points and later declines. At the same time, this function has two envelopes, both logarithmic functions: the superior and the inferior. This is a continuous function.

b) Interpretation of the Emotional Well-being Function, BE(w)

The model BE(w) is a rationalist vision and, therefore, makes no more sense than being a typically mathematical deduction of the logarithmic function. Nevertheless, to give an interpretation that agrees better with the Theory of Knowledge, it is necessary to adjust towards empiricism to give this greater validity. Thus, between the two approaches of rationalism and empiricism, an explanatory model is generated that lays the theoretical foundations for the behavior of people and companies as beings whose every action is motivated simultaneously by a behavior of "homo economicus" as well as by ethical and socially responsible behavior.

To comply with the above and give an interpretation to the mathematical function BE(w), the following conditions are assumed:

- Economically, all the normative aspects of the utility function theory are met.
- The behavior of people is represented by the function BE(w) and the envelopes $U_1(w)$ and $U_2(w)$. It is assumed that individual behavior is explained by the space between the two U(w); with $U_2(w)$ being the minimum that is required as emotional economic compensation for any decision and $U_1(w)$ being the maximum that can be taken as emotional compensation.
- Other utility curves, shown as $U_3(w)$, may exist between the maximum and minimum utility curves.
- Emotional well-being is understood to be the degree of satisfaction obtained from an act, whether this is motivated purely by the ethics of economic rationality or by a mixture of this rationality and another that is not economic (herein, this is interpreted as social responsibility). That is, a more global approach is considered, including different personal values, which are captured by BE(w).
- It is assumed that emotional well-being, BE(w), can be represented by:

$$BE(w) = A_1 \sin(\pi w) + A_2 \ln(w) + c$$

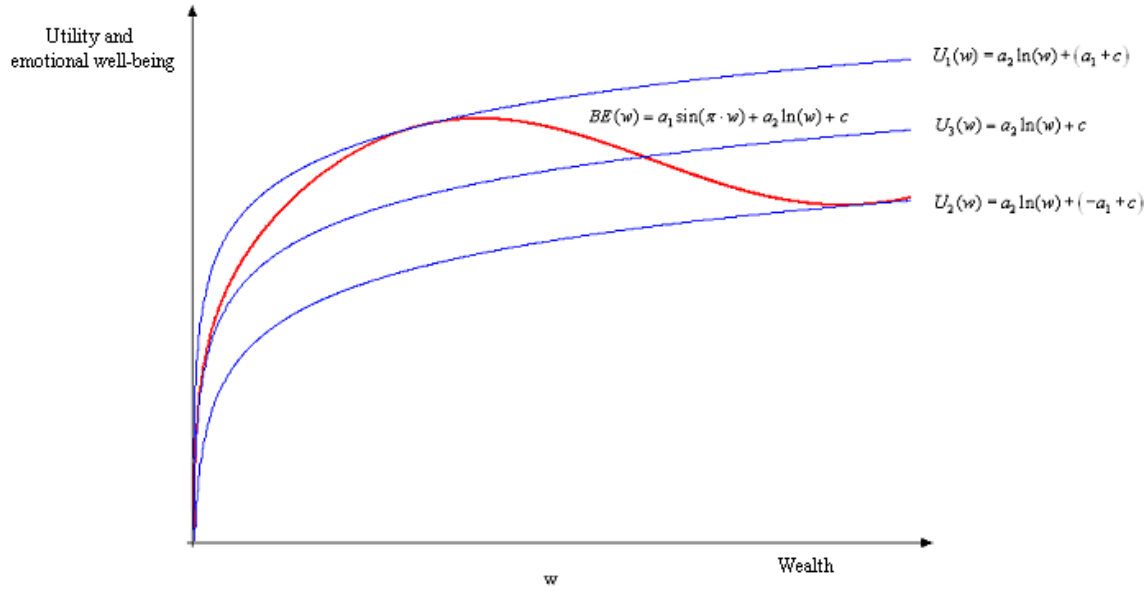
The coefficients A_1 and A_2 represent the relative weights that companies and their owners give to global behavior (ethical and social responsibility) and economic ethics, respectively. As there are only two components, it is assumed that: $A_1 + A_2 = 1$. In the original article, two ethics are considered: the global ethic, represented by $a_1 \sin(\pi w)$, and the economic ethic, represented by $A_2 \ln(w)$. In this work, the concept of a global ethic is broadened to include the concept of corporate social responsibility (CSR).

If $A_1 + A_2 = 1$, and $A_2 = 1$, then $U_1(w) = BE(w) = Ln(w)$. That is, the behavior can be explained exclusively based on the ethics of economic rationality, since emotional well-being is totally explained by the traditional utility logarithmic function of Bernoulli. On the contrary, if: $A_1 = 1$, the person would not give relevance to the economic ethic. Rather, that person would behave as a primarily complex human, motivated by ethical reasons and social responsibility. In real life, it is seen that people can act simultaneously with both motivations and that when it is shown that: $A_1 = 1$ or $A_2 = 1$, they are extreme analytical cases. Therefore, the utility theory function, $U(w) = Ln(w)$, is a particular case of the emotional well-being function and valid only when $A_2 = 1$.

The term "c" represents a minimum satisfaction, independent of the wealth of each person or company. If it is zero, this means that its emotional well-being depends only on

wealth. The coefficient "c" is interpreted as the "enjoyment of belonging" for the case of persons that are an integral part of a company that gives them an emotional satisfaction of belonging to this organization, regardless of their wealth. This enjoyment can include factors such as: business prestige, business tradition and history, business culture, and other factors unique to and characteristic of each company or of the society in which this person is inserted. It is assumed that: a) there is an emotional sacrifice due to distancing oneself from the economic ethic that is covered by an emotional compensation and that b) the emotional well-being depends on the level of wealth "w" and other factors captured by the coefficient of position "c".

Graph N°1.



In summary, emotional well-being includes the following effects: BE(w)= Global Ethical Effect + Economic Effect + Enjoyment of Belonging, where:
Global Ethical Effect = $A_1 \sin(\pi w)$, Economic Effect = $A_2 \ln(w)$ and Enjoyment of Belonging= c

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