Advances in Social Sciences Research Journal – Vol.3, No.12
Publication Date: Dec. 25, 2016
DoI:10.14738/assrj.312.2414
Aityan, S.K., Ivanov-Schitz, A.K. & Thapa, S. (2016). Measuring the Nonmonetary Component of General Value of Jobs. *Advances in Social Sciences Research Journal,* 3*(12)* 1-33.

Measuring the Nonmonetary Component of General Value of Jobs

Sergey K. Aityan
Lincoln University, Oakland, CA, USA

Alexey K. Ivanov-Schitz
Moscow Institute of International Relations, Moscow, Russia

Shankar Thapa
Lincoln University, Oakland, CA, USA

Abstract

The concept of value has been a central concern of economics since its inception as a discipline. The labor theory of value in classical economics was followed by the neoclassical perceptional theory of utility, and behavioral economics introduced a psychological track in it. The recently introduced theory of general value makes the next step by introducing two distinct components of value: monetary and nonmonetary. The introduction of the nonmonetary component of value helps explain many types of decisions and choices, which were not clearly understood before, and helps with the strategic planning and actions. This paper introduces a methodology of measuring nonmonetary value of jobs in the perception of people. The indifference point between two choices is used to measure the difference if nonmonetary components in terms of the difference of the monetary components with the opposite sign. This method was used to measure relative nonmonetary values (the difference of the monetary components) of various jobs in the perception of different social groups.

Keywords: value, nonmonetary, utility, preference, behavioral economics, decision-making, assessment, personal choice

1-INTRODUCTION

People constantly make decisions in their personal, social, economic, political, and other activities. In economic activities, correct and balanced decision-making is the key to success in trading, planning, controlling, and choosing the best out of available options. Humans make decisions by assessing values and choosing scenarios that offer the best value.

Money is an important factor in the decision-making process. However it is well known that most decisions are made with some additional considerations in mind that bring value assessment beyond just the assessment of amounts of money. For instance, monetary compensation is an important but not the exclusive factor in the decision on choosing a job. Such nonmonetary factors include but not limited to personal interest in the job, work environment, the company size and prestige, and many other factors. On the other hand, more employers get clear understanding that company success depends on employee loyalty and employee loyalty is not directly related to the employee monetary compensation.

The concept of value has always been one of the major concerns of economic theories since the inception of economics as a discipline. Value relates to such categories as price, demand, utility, usability, assessment, choice, decision-making, and many others. It is important to distinguish value form price. The same price for a certain good or service may be charged to different people but they may see quite different value in the good or service. Price and value are quite different things. For example, air to breath is normally available free of charge but its value for everybody is extremely high. This controversy is known as paradox of value.

The notion of value has been evolving over time, engaging different approaches beginning from the labor theory of value in classical economics through the utility theory in neoclassical economics to a mostly psychological approach in behavioral economics.

The variety of the theories of value can be divided into two major categories:

- Intrinsic or objective theories
- Subjective theories

1.2-Objective Theories: Classical Economics

Intrinsic theories attempt to define value objectively with human perception taken out of picture. These theories are based on the classical economics that describes value as labor involved in the production of goods or rendering services (Adam Smith [31]; David Ricardo [22]; Karl Marx [18]). Value is divided into three categories: labor value, use value, and exchange value. Labor value measures the quantity of labor put in the product. Use value represents the utility of a product or a service or the need in the product or service. Exchange value measures the ability of products or services to exchange in certain proportions and hence represents price. According to the precepts of classical economics, use value is impossible to measure and therefore the only measurable is exchange value that is measured by the labor involved in the production of a good of rendering a service. Adam Smith [31] wrote, - "It was not by gold or by silver, but by labor, that all the wealth of the world was originally purchased; and its value, to those who possess it, and who want to exchange it for some new productions, is precisely equal to the quantity of labor which it can enable them to purchase or command." Thus, classical economics did not address the relationship between use value and exchange value and stayed on the purely objective grounds of labor theory of value.

1.3-Subjective Theories: Neoclassical Economics

Marginalism laid foundations for neoclassical economics in the second part of nineteenth century. Hermann Gossen [8], a Prussian economist, was the first who introduced the general approach to marginal utility though many other economists by that time had already elaborated on various special aspects of value in terms of human perception.

Subjective theories were originated from marginalism and independently developed in the second part of nineteenth century by Hermann Gossen [8], William Jevons [11], Carl Menger [20], and Leon Walras [32]. Subjective theories define value in terms of human perception of the satisfaction with goods or services and limitations in their supply. Menger [20] argued that value is essentially subjective. The concept of utility as a measure of satisfaction was introduced in neoclassical economics to measure value, thus replacing the objective approach to value in classical economics with the purely subjective approach. It is important to emphasize that by replacing the labor approach to the definition of value in classical economics

with the perceptional approach in neoclassical economics has denoted a fundamental shift in the view on value from producers to consumers.

Marginalism suggests that value of an additional unit of a good or service is determined by an additional satisfaction (marginal utility) from the most recently added unit of the good or service. The greater quantity of something you have, the more of it you would be willing to give up for one unit of something else, what you need. This law is referred to as the law of diminishing marginal utility. Thus, according to marginalism, value represents the most recent rate of exchange. The concept of marginal utility and the law of diminishing marginal utility can be easily illustrated with a diamond-water paradox which was first introduced in 1880s. In normal conditions, water has a much higher practical utility for a human than diamonds, but diamonds have a higher value, because marginal utility of diamonds is much higher than marginal utility of water [23]. However, the value of water in case of water shortage may significantly exceed the value of diamonds in terms of marginal utility because humans cannot survive without water.

The principles of neoclassical economics have become the major platform for the majority of economic theories of the twentieth century. The major criticism of neoclassical approach in economics relates to the presumption of the exclusively rational behavior of market participants. A comprehensive review of neoclassical economics and its view on the concept of value is provided in many publications [12, 19, 21].

The next step in the development of neoclassical concepts in economics was related to Alfred Marshall [17], a British economist, who developed the well-known supply and demand graph that forms market equilibrium and establishes the relationship between quantity and price in regards to supply and demand. However, Marshall did not distinguish between price and value and presumed that all participants of market relationship possess full information about the related market conditions.

The nature of neoclassical concept of utility has had various interpretations from pure psychological through availability of resources. Samuelson and Nordhaus [26] wrote, - "… but you should definitively resist the idea that utility is a psychological function or feeling that can be observed or measured. Rather, utility is a scientific construct that economists use to understand how rational consumers divide their limited resources among commodities that provide them with satisfaction."

Let's try to apply the neoclassical concept of value to employment, compensation, and the impact of non-financial factors on job selection decisions. There are many other factors beyond financial compensation that impact the job selection decisions such as job prestige, professional challenges, work environment, proximity to the residence, and many other factors. These factors contribute to the value of the job in the perception of an employee or a job candidate. It is evident, that less prestigious jobs should offer a higher financial compensation to equalize the value of the job in the perception of employees or job candidates. This issue was addressed in the theory of equalizing differences [5, 25]. The theory attempted to explain why employees in similar positions receive different compensations in different geographic locations. The results of that analysis showed that employees receive additional compensation for adverse work conditions. However Rosen made a simplifying assumption about the uniformity of individual preferences that ignores the fact that employees may prefer different activities under all equal conditions. Challenges of heterogeneous models of human

capital have been recently addressed in the literature [4, 9]. However, despite multiple attempts, no general and comprehensive theory of employment decisions has been suggested.

Gary Becker [3] tried to apply the neoclassical utility approach to the analysis of criminal behavior. However, the model assumed rational behavior of criminals, though most of the time rational factors do not actually play a decisive role.

1.4-Subjective Theories: Behavioral Economics

Neoclassical economics have built the major foundation for economic theories for twentieth century and helped better understand economic processes and relationships. However the neoclassical approach presumed all participants of the market to be perfectly rational and analytic. Such a quite strong presumption does not actually reflect the way how humans actually act. Humans, in their decision-making, mostly rely on habits, customs, beliefs, advices, or even on mimicking or imitating others rather than on shear rationality. This issue has been brought up for discussion by many authors for many years. Simon [28, 29] addressed the concept of bounded rationality of market participants. Kahneman & Tversky [13] have analyzed human decision-making under risk and showed that the decisions were different from rationally induced. Finally, a new direction in the economics has been formed by closely tying up economics with human psychology and behavioral patterns [13-15, 29]. This direction in economics is referred to as behavioral economics. According to this approach, human psychology and behavioral patterns play the major role in making judgments, choices, and decisions.

2-A MISSING LINK TO THE NONMONETARY COMPONENT OF VALUE

Typically, fiat money has none or a very low commodity value. Nevertheless, money is commonly accepted only because of the explicit or implicit common perception as value. However, there are other aspects of value beyond money. These aspects are of the nonmonetary nature and represent individual perception, joint perception by the people in a community, a country, a culture, or by entire mankind. The nonmonetary values are completely subjective and given consideration in addition to the monetary values, contributing by such to the general assessment of a situation, action, good, or a service.

Though the neoclassical concept of utility was introduced to present the subjective perception of satisfaction, utility does not differentiate the monetary and nonmonetary parts of value, presenting these two parts combined, and, therefore, basically focuses on the perception of money and price. Thus, the utility in neoclassical economics actually accounts for the perception of money but falls short of identifying distinct perception of nonmonetary values [7, 27, 30].

The approach of compensating variations was introduced by Hicks [10] as a measure of utility change in terms of additional money, which an individual needs to compensate for a change in price or product quality, to keep the same level of satisfaction. With this approach consumer's surplus can be used as a welfare measure [6]. The theory of hedonic prices [24] addresses the spatial equilibrium for differentiated products, in which the entire set of implicit prices guides both consumers and producers locational decisions in characteristics space. This theory utilizes the hedonic hypothesis, that goods are valued for their utility-bearing attributes or characteristics on the bases of the theory of equalizing differences. The theory of compensating differences has addressed the changes in utility with price, but still was confined within the concept of monetary utility.

The theory of equalizing differences [5, 25] made a step towards a separation of monetary and nonmonetary perception in labor market stated that "workers receive compensating wage premiums when they accept jobs with undesirable nonwage characteristics, holding the worker's characteristics constant" [5]. Despite its attempt to separate monetary and nonmonetary perception, the theory of equalizing differences could not go beyond the labor market due to its conceptual limitations.

The principles of behavioral economics are based on human "bounded rationality" [13-16, 28-29]. Behavioral economics has implicitly addressed nonmonetary values by engaging subjective rules of thumb, beliefs, and hopes as major driving forces in economic decisions, but still kept it closely tied up with monetary values.

Thus, the mainstream directions of the economic ideas related to the concept of value have shown a clear trend towards incorporating subjective and nonmonetary aspects in the definition of value separately from the monetary aspects. However, all economic theories up to quite recent time were unclear about the relationship between the monetary and nonmonetary aspects of value. A new approach in the concept of value was recently proposed by Aityan [2]. This theory, which is referred to as the theory of general value, explicitly distinguishes monetary and nonmonetary components of value. This approach is capable of resolving many challenges related to the concept of value by explicitly separating and analyzing monetary and nonmonetary components.

The purpose of this paper is to develop a practical methodology of measuring the nonmonetary component of general value for the purpose of applying it to the assessment of decision-making processes in economics.

3-THE THEORY OF GENERAL VALUE

3.1-Definition of General Value

The recently introduced notion of general value [2] presents value as a linear composition of the monetary and nonmonetary components of value, i.e.

$$V = V^M + V^N \tag{1}$$

where V is general value, V^M and V^N are the monetary and nonmonetary components of value, respectively. These components depend on the subjective perception of an individual or a group of individuals. The nonmonetary component represents level of satisfaction unrelated to money that strongly depends on an individual or a group of individuals while the monetary component represents the perception of a given amount of money also specific to an individual, to a group of individuals, and/or to a specific situation of the individual or the group.

For the sake of simplicity, we will often refer to general value simply as value, to the monetary component of value as monetary value, and to the nonmonetary component of value as nonmonetary value.

Monetary value can be measured in units of perception of money, e.g. in neoclassical terms of utility of money, or in terms of value function in behavioral economics, or in a simple case of neutral utility of money, just in the amount of money. It is important to note, that due to the additive linear relationship between monetary and nonmonetary components of value

presented in Eq.(1), these two components should be measured in the same units. However this fact does not mean that these two components are identical by their nature.

3.2-Principle of Increasing General Value

An individual decides to pursue with an action if the action leads to the increase of the general value, i.e. the general value after the action, V_{After}, will be greater than the general value before the action, V_{Before}, which can be expressed as

$$V_{After} > V_{Before} \tag{2}$$

or

$$\Delta V = V_{After} - V_{Before} > 0 \tag{3}$$

Similarly, in a comparison of two jobs, goods, or services, the preference is given to one with the higher general value. For example, job A is preferred to job B if

$$V_A > V_B \tag{4}$$

or

$$\Delta V_{AB} = V_A - V_B > 0 \tag{5}$$

We will refer to possible choices as scenarios. A decision on an action as shown in Eq.(2) can be interpreted as a choice between two scenarios: one to take the action and the second one not to take the action. Thus, any decision is a choice between scenarios, at least between two scenarios and, possibly, among many scenarios.

It is important to point out, that decisions are normally made by assessing the difference of general values of two scenarios rather than calculating absolute values of general values in each scenario. This is similar to the ordinal approach in utility.

In any decision on a choice between two scenarios, the preference is given to a scenario that results in a positive increment of general value. An increase of general value does not compulsory implies an increase in the monetary component. In some cases an increase of the general value may be accompanied by a reduction of the monetary component, if the nonmonetary component increases more to offset the reduction in the monetary component. For example, if a choice is made in favor of scenario A against scenario B, then according to Eqs.(1) and (4), it means that

$$\Delta V_{AB} = \Delta V_{AB}^M + \Delta V_{AB}^M > 0 \tag{6}$$

where $\Delta V_{AB}^M = V_A^M - V_B^M$ and $\Delta V_{AB}^N = V_A^N - V_B^N$ are the differences of the monetary and nonmonetary values of scenarios A and B, respectively. is referred to as the relative monetary value and is referred to as the relative nonmonetary value

3.3-The Indifference Point

The monetary component of general value can be measured in terms of perception of the amount of money. Such perception could be expressed in terms of utility of money as in neoclassical economics [20] or in terms of value function in behavioral economics [13]. In case of the neutral perception of money, monetary value can be measured as amount of money.

Nonmonetary value should be measured in the same units as the monetary value though the nonmonetary value is not money at all. A difference of nonmonetary values (a relative nonmonetary value) can be conveniently measured at the point of indifference, i.e. in the condition, when the difference of general values of two scenarios is equal to zero. The point of indifference means that a given individual does not have any preference in choosing between two scenarios, A and B, i.e.

$$V_A^M + V_A^N = V_B^M + V_B^N \tag{7}$$

where V_A^M and V_A^N are the monetary and nonmonetary components of general value for scenario A and V_B^M and V_B^N are monetary and nonmonetary components of general value for scenario B in the perception of the individual.

According to Eq.(7), the difference of general values of the scenarios at the point of indifference equals zero, i.e.

$$\Delta V_{AB} = \Delta V_{AB}^M + \Delta V_{AB}^N = 0 \tag{8}$$

We will refer to the difference of monetary and nonmonetary values as the relative monetary and nonmonetary value, respectively. Then the relative nonmonetary value of scenarios A and B can be calculated as a relative monetary value with the opposite sign as

$$\Delta V_{AB}^N = -\Delta V_{AB}^M \tag{9}$$

where ΔV_{AB}^M and ΔV_{AB}^N are the relative monetary and nonmonetary values (differences of monetary and nonmonetary components of general values) for two scenarios A and B, i.e.

$$\Delta V_{AB}^M = \Delta V_A^M - \Delta V_B^M \quad \text{and} \quad \Delta V_{AB}^N = \Delta V_A^N - \Delta V_B^N \tag{10}$$

Eq.(9) implies that the individual is indifferent in a choice of gaining an increment of the nonmonetary value for giving up the same increment of monetary value or vice versa.

3.4-General Value vs. Utility

The concepts of general value and the neoclassical concept of utility both address human perception of value. However there is a fundamental difference between these two concepts.

The concept of utility represents satisfaction from the usage, possession, or exchange of money, goods, or services. Both, satisfaction from money as well as satisfaction from the nonmonetary aspects of goods, services, and other entities are inseparably combined in the concept of neoclassical utility. Such an approach can easily lead to confusion between the internal nonmonetary satisfaction related to the human perception of a good, a service, or any other entity and its exchangeability in the market related to the monetary aspects. The confusion with neoclassical utility may grow further in an attempt to understand the impact of monetary and nonmonetary factors on a decision and the relationship between these factors.

The concept of general value specifically and distinctly differentiates the perception of internal nonmonetary satisfaction with goods, services, or other entities from the satisfaction with the amount of money associated with the goods, services, or other entities. Such a separation provides a solid and unambiguous ground for the assessment of value. The explicit distinction between monetary and nonmonetary components of value provides a clear separation of the monetary perception related to a transaction or exchange from the nonmonetary perception of value which might be unrelated to any transaction or any exchange. The nonmonetary

component of value reflects a purely subjective perception of value independent of its monetary part. Thus, the concept of general value provides a more explicit and a less speculative approach for the assessment of subjective perception in a broad variety of entities in economics [2].

The concept of utility is synonymous to the concept of value in neoclassical economics. On the other hand, the concept of general value separates monetary and nonmonetary components of value and may use the neoclassical utility of money to express the perception of the monetary component of general value. Such a separation explains the difference between price, perception of money, and value.

Finally, the concept of general value is a good match for the explanation of perceived value in terms of behavioral economics.

3.5-General Value in a Choice of Job

To clarify the theory of general value, let's discuss some examples related to a choice of job. Suppose an individual is choosing between two jobs, A and B, with the monetary compensations, S_A and S_B, correspondently. The general values of the jobs in the perception of the individual can be presented as

$$\begin{aligned} V_A &= V_A^M + V_A^N = U(S_A) + V_A^N \\ V_B &= V_B^M + V_B^N = U(S_B) + V_B^N \end{aligned} \tag{11}$$

where $U(S_A)$ and $U(S_A)$ are the monetary values of the jobs, which reflect the monetary compensations in the terms of perception of money and V_A^N and V_B^N are the nonmonetary values of the jobs in the perception of the individual. Both components are taken with the positive sign because they both adding up the value of the job. The nonmonetary value of a job reflects the individual preferences related to the interest in the job, job prestige, working environment, commuting convenience, and many other nonmonetary factors. The monetary value in Eq.(11) is represented with the utility of money rather than with the amount of money due to a possibility of non-neutral (nonlinear) perception of different amounts of money by the individual and/or of the perception of the same amount of compensation by different individuals, or by the same individual due to different circumstances. The perception of the same amount could vary if, for example, the individual desperately needs money or the offered compensation does not cover the individual's required budget, or for many other reasons.

For the sake of generality, please note that in case of buying a good or a service, the monetary value, which reflects the perception of the price paid for a good or service, is included in general value with the negative sign because the price paid for the good or service reduces its general value; the higher price the lower is the general value.

3.1.1-Comparing Two Jobs

When comparing jobs A and B, the difference of general values of these two jobs can be expressed as the difference of the monetary and nonmonetary values of these jobs for a given individual as

$$\Delta V_{AB} = V_A - V_B = \Delta V_{AB}^M + \Delta V_{AB}^N \tag{12}$$

where

$$\begin{aligned} \Delta V_{AB}^{M} &= V_{A}^{M} - V_{B}^{M} = U(S_A) - U(S_B) \\ \Delta V_{AB}^{N} &= V_{A}^{N} - V_{B}^{N} \end{aligned} \tag{13}$$

An individual chooses a job that offers a higher general value rather than a higher monetary compensation alone as shown in Eq.(14).

$$\begin{aligned} \Delta V_{AB} > 0 \quad &\rightarrow \quad \Delta V_{AB}^{N} > -\left(U(S_A) - U(S_B)\right) \quad \rightarrow \quad \text{Preference of job A} \\ \Delta V_{AB} < 0 \quad &\rightarrow \quad \Delta V_{AB}^{N} < -\left(U(S_A) - U(S_B)\right) \quad \rightarrow \quad \text{Preference of job B} \\ \Delta V_{AB} = 0 \quad &\rightarrow \quad \Delta V_{AB}^{N} = -\left(U(S_A) - U(S_B)\right) \quad \rightarrow \quad \text{No preference} \end{aligned} \tag{14}$$

Figure 1 shows an example when an individual chooses job A over job B despite the lower monetary compensation offered for job A. The choice is caused by the higher general value due the higher nonmonetary value of job B for the individual

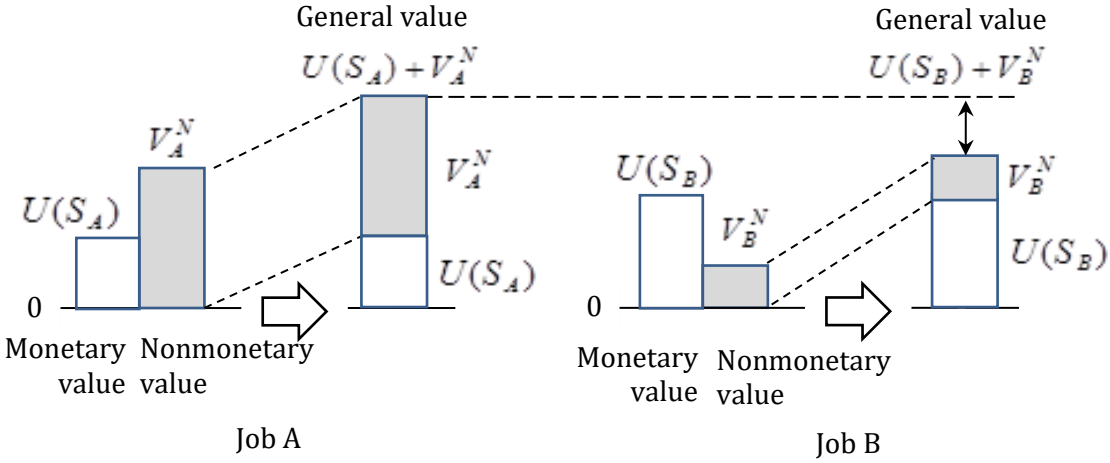

Figure 1: An example of choosing jobs A over job B, by an individual despite a lower compensation offered for job A due to a higher nonmonetary value of job A

As is evident from Figure 1, the individual chooses job A over job B because the general value of job A is higher than the general value of job B for this particular individual. The choice was made in favor of job A despite the lower monetary compensation for job A than for job B.

3.1.2-Assessment of the Same Jobs by Different Individuals

Different people may differently assess general value of the same job. Suppose two individuals, *k* and *m*, are offered the same job with the same monetary compensation, *S*, and the same work conditions. Assume that both job candidates are neutral in their perception of money, so

$$U_k(S) = U_m(S) = S \tag{15}$$

where $U_k(S)$ and $U_m(S)$ are utilities of money for individuals *k* and *m*.

Both candidates are equally qualified for the job. However the job responsibilities imply working in shifts. Job candidate *k* likes working in shifts because he studies at university while candidate *m* prefers working regular hours because he is married with children. For this reason, the nonmonetary value of the job is different for these job candidates, i.e.

$$V_k^N > V_m^N \tag{16}$$

Due to different nonmonetary values and equal monetary values of the job for these individuals, the general value of the job for candidate k is greater than one for candidate m, i.e.

$$V_k > V_m \tag{17}$$

In result, candidate *k* will be more incline to accept the job offer than candidate m as shown in Figure 2

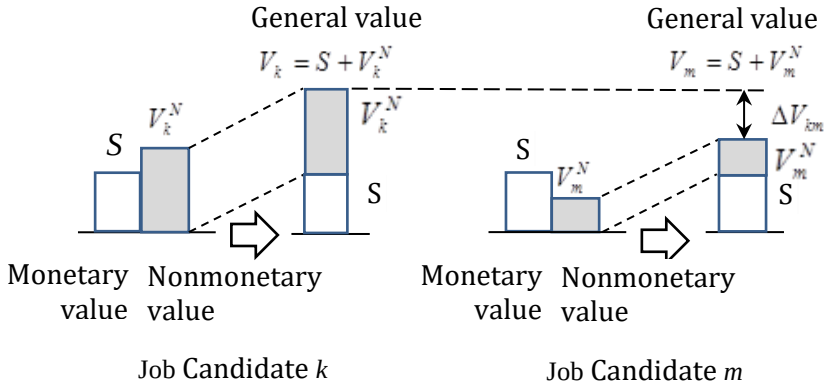

Figure 2: An example of the same job assessment by two different individuals, *k* and *m*

The difference of general values of the job between job candidates k and m, shown in Figure 2, is

$$\Delta V_{km} = V_k - V_m = V_k^M + V_k^N - V_m^M - V_m^N = \Delta V_k^M - \Delta V_k^N = -\Delta V_{km}^N \tag{18}$$

where

$$\begin{aligned} \Delta V_{km}^M &= V_k^M - V_m^M = S - S = 0 \\ \Delta V_{km}^N &= V_k^N - V_m^N \end{aligned} \tag{19}$$

Let's note that in case of a job, the monetary component is included in general value with the positive sign as shown in Eq.(11) because the higher monetary compensation, the higher general value of the job. On the other hand, the monetary component (the perception of price) is included in general value of a good or a service for consumers with the negative sign, because the higher price, the less general value the appropriate good or service has in the perception of the consumer.

4-METHODOLOGY OF MEASURING NONMONETARY VALUES

4.1-The Indifference Point

An individual, when given a choice, prefers a scenario that results with a higher general value. However, if the individual is indifferent in his choice between scenarios A and B, it means that both scenarios end up with the same level of general value, i.e.

$$\Delta V_{AB} = V_A - V_B = \Delta V_{AB}^M + \Delta V_{AB}^N = 0 \tag{20}$$

or

$$\Delta V_{AB}^N = -\Delta V_{AB}^M \tag{21}$$

Thus, the difference of the nonmonetary values of two scenarios A and B at the indifference point, ΔV_{AB}^N, can be measured according to Eq.(21) as a difference of the monetary values of these scenarios with an opposite sign, $-\Delta V_{AB}^M$.

4.2-Measuring the Difference of Nonmonetary Values of Jobs

The difference of the general values of two jobs, A and B, in the perception of an individual equals zero at the indifference point as expressed in Eq.(20), hence the difference of the nonmonetary values of jobs A and B in the perception of that individual can be measured as the negative difference of the monetary values of these jobs, i.e. according to Eqs.(14) and (21) as

$$\Delta V_{AB}^{N} = -\big(U(S_A) - U(S_B)\big) \tag{22}$$

where S_A and S_B are the monetary compensations for jobs A and B, accordingly. The utility of the monetary compensation $U(S)$ reflects the perception of amount S by the given individual. Such perception may depend on many factors such as general circumstances, lack of savings, certain commitments or obligations, and many other factors.

Let's use for simplicity the neutral utility, i.e. neutral perception of money where the utility of money equals the amount as defined in Eq.(15). With the neutral perception of money, the difference of nonmonetary values of jobs can be measured simply as a difference of monetary compensations with the opposite sign, i.e.

$$\Delta V_{AB}^{N} = -\big(S_A - S_B\big) = -\Delta S_{AB} \tag{23}$$

where ΔS_{AB} is the difference of the monetary values of jobs A and B. It is evident that the relative general value (the difference of the general values) of any two jobs, including its components, relative monetary and nonmonetary values, obeys the anticommutativity rule, i.e. relative general value of A and B, including its relative monetary and nonmonetary components, is equal to the relative nonmonetary value of B and A with the opposite sign as shown below

$$\Delta V_{BA}^{N} = -\Delta V_{AB}^{N} \quad \text{and} \quad \Delta S_{\mathrm{BA}} = -\Delta S_{\mathrm{AB}} \tag{24}$$

The major point of the methodology is that the difference of the nonmonetary values (relative nonmonetary value) of any two jobs for a given individual can be measured by the difference of the monetary values (relative monetary value) of these jobs at the indifference point for this individual. It is expected that specific social groups may share similar nonmonetary values of jobs. These common nonmonetary values within a social group can be found from a survey conducted in the group.

4.3-Questionnaires

In order to identify the indifference point between two jobs we developed a series of questionnaires for the survey. A sample questionnaire is illustrated in Figure 3. Respondents were offered to choose between two well-known jobs. One of two jobs in the questionnaire was offered with a fixed monetary compensation while the second job was offered at a variety of compensations. The respondents were asked to indicate their preference between two jobs at each pair of compensations—the fixed compensation for the first job and each compensation option of the second job.

For example, the questionnaire in Figure 3 offers two jobs, A and B. Job A was offered with a fixed compensation S_{A} while job B was offered with various compensations, S_{B1}, ... , S_{B6}. A respondent has to indicate his personal preference by choosing between jobs A and B for each option of the compensation for job B from the list of possible compensations presented in the right column in the questionnaire (Figure 3). The choice has to be indicated by a checkmark placed in the appropriate column "Prefer job A", "No preferences" or "Prefer job B". The sample answers shown in Figure 3 indicate that the respondent prefers job A (with a fixed

compensation S_A) over job B with compensations S_{B1} or S_{B2} for job B. On the other hand, the respondent prefers job B over job A with compensations S_{B4} and higher for job B. However the respondent has no preference between jobs A or B with compensations S_{B3} for job B. Let's refer this choice to as the indifference point. At the indifference point, the difference of the difference of the nonmonetary values of jobs A and B is balanced by the difference of the monetary compensations according to Eq.(24).

To avoid confusion of the respondents on how to fill up the questionnaire, each actual questionnaire contained an example of an answer similar to one shown in Figure 3.

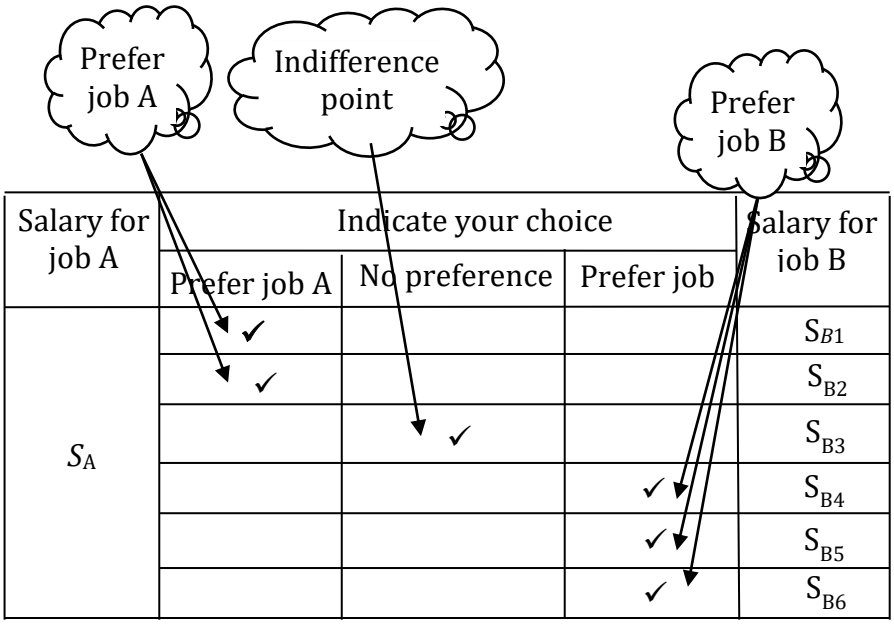

Figure 3: A sample questionnaire

Figure 4 illustrates the logic of the questionnaire shown in Figure 3. In Figure 4, the respondent chooses compensation S_{B3} for job B as the indifference point in comparison to job A with compensation S_A. The indifference point means that the difference in compensations, S_A. - S_{B3}, offsets the difference in nonmonetary values of these two jobs. Then at the indifference point and according to Eq.(23), the difference of the nonmonetary values of jobs A and B is equal to the difference of the monetary values of these jobs, i.e. $\Delta V_{AB}^N = -(S_A - S_{B3})$.

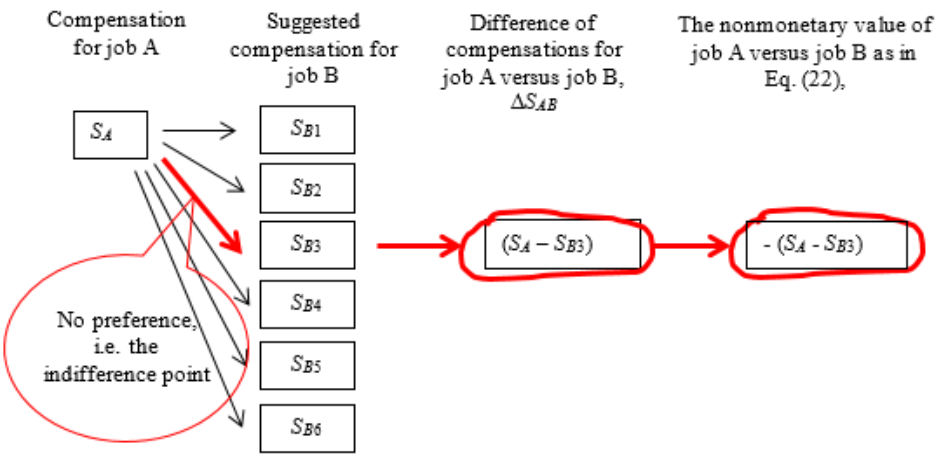

Figure 4: The logical schema of the sample questionnaire shown in Figure 3

4.4-Survey Processing Methodology

All respondents participated in the survey had to fill up the questionnaire. All incomplete or wrongly filled questionnaires, which did not clearly and unambiguously indicate indifference points, were marked as invalid responses and discarded from the further processing. Suppose there are N valid questionnaires left for the processing after discarding the invalid ones. It is natural to expect that different people might have different opinions about the jobs and chose different compensations for job B in the questionnaire as the point of indifference relative to job A. Thus n_1 respondents chose compensation S_{B1} as the point of indifference between jobs A and B in the questionnaire in Figure 3, n_2 respondents chose compensation S_{B2}, n_3 respondents chose S_{B3}, n_4 respondents chose S_{B4}, n_5 respondents chose S_{B5}, n_6 and respondents chose S_{B6}. The total number of valid responses N is equal to the sum of the numbers of the specific responses n_k as

$$\sum_{k=1}^{6} n_k = N \tag{25}$$

The distribution of the respondents by indifference points chosen by them and the respective differences of the monetary and nonmonetary values of the jobs obtained from N valid questionnaires in the sample survey shown in Figure 3 are illustrated in Table 1.

Table 1: Processing of results of a survey conducted with the questionnaire in Figure 3

Salary *of Job A*	Salary *of Job B*	Number of respondents by indifference points	$\Delta V_{AB}^{M} = S_A - S_B$	$\Delta V_{AB}^{N} = -(S_A - S_B)$
S_A	S_{B1}	n_1	$S_A - S_{B1}$	$-(S_A - S_{B1})$
	S_{B2}	n_2	$S_A - S_{B2}$	$-(S_A - S_{B2})$
	S_{B3}	n_3	$S_A - S_{B3}$	$-(S_A - S_{B3})$
	S_{B4}	n_4	$S_A - S_{B4}$	$-(S_A - S_{B4})$
	S_{B5}	n_5	$S_A - S_{B5}$	$-(S_A - S_{B5})$
	S_{B6}	n_6	$S_A - S_{B6}$	$-(S_A - S_{B6})$

The first column in Table 1 shows the fixed salary offered with job A and the second column in the table shows a variety of salaries offered with job B. The third column in the table shows the number of respondents, who chose the respective salary of job B as the indifference point. The fourth column shows the relative monetary values (difference of monetary values of the jobs) as the difference of the salaries, and the fifth column shows the calculated relative nonmonetary values (the difference of the nonmonetary values) of the jobs as the opposite of the difference of the monetary values.

According to Table 1, the mean difference of the nonmonetary values of jobs A and B on the sample of N respondents can be calculated as

$$\overline{\Delta V_{AB}} = -\frac{1}{N}\sum_{k=1}^{6}\left(n_k (S_A - S_{Bk})\right) \tag{26}$$

with the standard deviation of the relative nonmonetary value (actually, the difference of nonmonetary values) which can be calculated as

$$\sigma = \frac{1}{N-1}\sum_{k=1}^{6}\left(n_k(S_A - S_{Bk}) - \overline{\Delta V_{AB}}\right)^2 \quad (27)$$

5-SURVEY DOMAIN AND SAMPLING

In this research, we measured and analyzed the difference of nonmonetary values (relative nonmonetary values) of jobs in terms of employment decision.

The surveys were conducted in four different social groups including

- graduate students of the School of Business at Lincoln University, Oakland, CA,
- taxi drivers,
- construction workers, and
- restaurant waiters
- in Oakland, Berkeley, and San Francisco, California.

The surveys were conducted separately in four above mentioned social groups. We used various social groups in our research to find out there is a difference in the perception and preferences in the assessment of nonmonetary values of the jobs among these groups.

In the surveys, we included jobs of Chief Executive Officer (CEO), financial clerk (FC), and garbage collector (GC). In the survey the respondents were to choose between the CEO and FC jobs, between the CF and GC jobs, as well as between the CEO and GC jobs. To find the indifference points between the jobs, the survey questionnaires offered unrealistically high salaries for the less attractive jobs to offset their nonmonetary value. For example, a FC job was offered at unrealistically high salaries to find an indifference point with a CEO job; a GC job was offered with unrealistically high salary to offset its low nonmonetary value relative to a FC job. A choice between CEO versus GC jobs was added to the survey for consistency to analyze a possible triangular arbitrage for each individual and for the mean assessment in each social group.

All incomplete and wrongly filled questionnaires were disqualified as invalid and removed from the survey. The portion of invalid responses varied from 20% through 40% per each survey. In result, the sample sizes of the valid responses for different surveys varied from 130 through 170 as of the number of valid questionnaires per survey.

All valid results were collected and statistically processed with the confidence level of 90% (sampling error 10%).

6-CHOICE OF JOBS: THE SURVEY RESULTS

6.1-The Survey among Business Students of Lincoln University, Oakland, CA

The first survey was conducted among students of Business School at Lincoln University in Oakland, California.

6.1.1-Chief Executive Officer (CEO) vs. Financial Clerk (FC) by Business Students

The first survey was dedicated to a choice between two business positions, Chief Executive Officer (CEO) and Financial Clerk (FC). In the CEO-FC pair, a CEO position was offered in the questionnaire with the annual compensation of $140K while a financial clerk (FC) position was offered with various compensations as $145K, $155K, $170K, $185K, $195K, and $210K. The respondents have to identify their indifference points by choosing one of the jobs depending on the offered compensations.

The total number of valid responses, i.e. correctly filled and hence qualified questionnaires was 124. The results of the survey on the choice between a CEO and FC positions conducted among business students of Lincoln University are shown in Table 2.

Table 2: Results of the survey on CEO vs. FC jobs conducted among business students

Nonmonetary Value of CEO vs. FC jobs (among business students)				
Salary of CEO	Salary of FC	Number of respondents	ΔV^{M}_{CEO-FC}	ΔV^{N}_{CEO-FC}
$140 K	$145 K	6	-$5 K	$5 K
	$155 K	12	-$15 K	$15 K
	$170 K	40	-$30 K	$30 K
	$185 K	32	-$45 K	$45 K
	$195 K	24	-$55 K	$55 K
	$210 K	10	-$70 K	$70 K

Number of valid responses:	124
Mean on sample $\overline{\Delta V^{N}_{CEO-FC}}$:	$39 K
Standard deviation:	$17 K

Confidence level:	90%
Confidence interval:	±$2K
Mean on population:	$39±2K

The middle column "Number of respondents" shows the number of respondents who chose the appropriate salary of FC for the indifference point against the CEO job. For example, the first data row of the table shows that 6 respondents chose $145 K as a salary for FC at which they have no preference between that job and a job of CEO with the salary of $140 K.

According to the results of the survey, the mean relative nonmonetary value of a CEO job versus a FC job on the sample is $39 K with the standard deviation of $17 K. The confidence interval with the confidence level of 90% is $2K that results in the mean relative nonmonetary value of a CEO job versus a FC job on the population as $39K±2K.

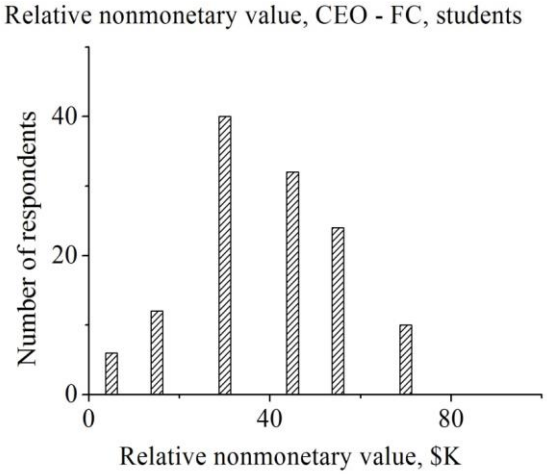

Figure 5: The distribution of the relative nonmonetary value of CEO vs. FC jobs among business students

6.1.2-Financial Clerk (FC) vs. Garbage Collector (GC) by Business Students

In the same survey among business students of Lincoln University, the respondents were to choose between a financial clerk (FC) and a garbage collector (GC) jobs. In the FC-GC pair, the financial clerk (FC) job was offered in the questionnaire with the annual salary of $50K while a garbage collector (GC) job was offered with a variety of salaries mostly exceeding the compensation for FC to offset the lower nonmonetary value of a GC job against a FC job. The offered salaries for a GC job were $60K, $75K, $80K, $90, $95K, $110, and $115K. The respondents were to indicate their preference depending on the offered compensations.

Table 3: Results of the survey on FC vs. GC jobs conducted among business students

Nonmonetary Value of FC vs. GC jobs (among business students)				
Salary of CF	Salary of GC	Number of respondents	ΔV^{M}_{FC-GC}	ΔV^{N}_{FC-GC}
$50 K	$60 K	2	-$10 K	$10 K
	$75 K	27	-$25 K	$25 K
	$80 K	50	-$30 K	$30 K
	$90 K	22	-$40 K	$40 K
	$95 K	15	-$45 K	$45 K
	$110 K	7	-$60 K	$60 K
	$115 K	1	-$65 K	$65 K

Number of valid responses:	124
Mean on sample $\overline{\Delta V^{N}_{CEO-FC}}$:	$34 K
Standard deviation:	$10 K

Confidence level:	90%
Confidence interval:	±$1K
Mean on population:	$34±1K

The total number of valid responses in the survey was 124. The results of the survey on the comparison of FC and GC jobs conducted among business students of Lincoln University are shown in Table 3.

The middle column "Number of respondents" in the table shows the number of respondents who chose the appropriate salary of GC as the indifference point against the FC job. For example, the first data row of the table shows that 2 respondents chose $60K as a salary for GC at which they have no preference between that job and a job of FC with the annual salary of $50K.

Figure 6 shows the distribution of the relative nonmonetary value of a financial clerk (FC) job versus a garbage collector (GC) job among business students.

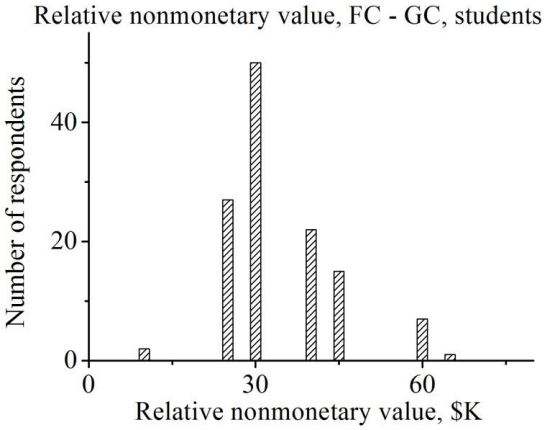

Figure 6: Distribution of the relative nonmonetary value of FC vs. GC jobs among business students

6.1.3-Chief Executive Officer (CEO) vs. Garbage Collector (GC) by Business Students

Finally, the students were given the choice between two jobs, CEO and GC. The position of CEO was offered at annual salary of $140K while the job of garbage collector (GC) was offered at $155K, $180K, $185K, $195K, $200K, $210K, and $215K which was unrealistically high to offset the nonmonetary status of the CEO job.

The results of the business student choices are shown in Table 4. The mean value of the relative nonmonetary value of a CEO job versus a GC job is $73K±3K assessed with the 90% confidence.

Table 4: Results of the survey on CEO vs. GC jobs conducted among business students

Nonmonetary Value of CEO vs. GC jobs (among business students)				
Salary of CEO	Salary of GC	Number of respondents	ΔV^{M}_{CEO-GC}	ΔV^{N}_{CEO-GC}
$140 K	$155 K	2	-$15 K	$15 K
	$180 K	3	-$40 K	$40 K
	$185 K	10	-$45 K	$45 K
	$195 K	13	-$55 K	$55 K
	$200 K	17	-$60 K	$60 K
	$210 K	23	-$70 K	$70 K
	$215 K	19	-$75 K	$75 K

Number of valid responses:	124
Mean on sample $\overline{\Delta V^{N}_{CEO-FC}}$:	$73 K
Standard deviation:	$23 K

Confidence level:	90%
Confidence interval:	±$3K
Mean on population:	$73±3K

Figure 7 shows the distribution of the relative nonmonetary value of a CEO job versus garbage collector (GC) job among business students.

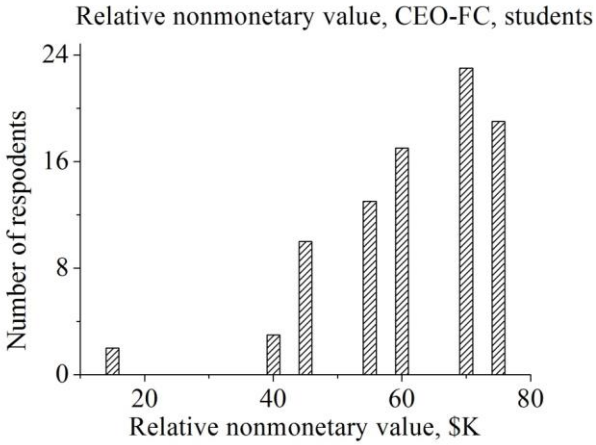

Figure 7: The distribution of the relative nonmonetary value of CEO vs. GC jobs among business students

The comparison of the nonmonetary values obtained in the survey conducted among business students is presented in Table 5.

Table 5: The comparison of the relative nonmonetary values of CEO vs. CF, CF vs. GC, and CEO vs. GC jobs obtained in the survey conducted among business students

Confidence level:	90%
Relative nonmonetary values of jobs:	
ΔV^N_{CEO-FC}	\$39±2 K
ΔV^N_{FC-GC}	\$34±1 K
ΔV^N_{CEO-GC}	\$73±3 K

The relative nonmonetary values of the jobs in Table 5 show perfect consistency, i.e

$$\Delta V^N_{CEO-FC} + \Delta V^N_{FC-GC} + \Delta V^N_{GC-CEO} = 0 \tag{28}$$

that shows no triangular arbitrage In Eq.(28), we used the anticommutative property of relative value presented in Eq.(24).

6.2-Taxi Drivers in Berkeley-Oakland-San Francisco Area

A similar questionnaire with slightly modified amounts of salaries was distributed among taxi drivers from the Berkeley-Oakland-San Francisco area. The respondents were asked about the same choice of jobs, i.e. chief executive officer (CEO), financial clerk (FC) and garbage collector (GC). The total number of valid responses in this survey was 74.

6.2.1-Chief Executive Officer (CEO) vs. Financial Clerk (FC) by Taxi Drivers

In the CEO-FC pair, a CEO position was offered in the questionnaire with the annual salary of \$140K while a financial clerk (FC) position was offered with various salaries as \$145K, \$155K, \$170K, \$180K, \$185K, \$195K, \$200K, and \$210K. The taxi drivers had to check the appropriate

boxes to identify their preferences and the indifference points depending on the offered compensations.

The results of the survey on the comparison of a CEO and FC positions conducted among taxi drivers are shown in Table 6.

Table 6: Results of the survey on CEO vs. FC jobs conducted among taxi drivers

Nonmonetary Value of CEO vs. FC jobs (among taxi drivers)				
Salary of CEO	Salary of FC	Number of respondents	ΔV^{M}_{CEO-FC}	ΔV^{N}_{CEO-FC}
$140 K	$145 K	4	-$5 K	$5 K
	$155 K	4	-$15 K	$15 K
	$170 K	12	-$30 K	$30 K
	$180 K	28	-$40 K	$40 K
	$185 K	14	-$45 K	$45 K
	$195 K	8	-$55 K	$55 K
	$200 K	2	-$60 K	$60 K
	$205 K	2	-$65 K	$65 K

Number of valid responses:	74
Mean on sample $\overline{\Delta V^{N}_{CEO-FC}}$:	$39 K
Standard deviation:	$13 K

Confidence level:	90%
Confidence interval:	±$2 K
Mean on population:	$39±2 K

The column “Number of Respondents” in Table 6 shows the number of respondents who chose the appropriate pairs of salaries as an indifference point. For example, in the first data row in the table, 4 respondents have no preference between a job of CEO with the annual salary $140 K and job of financial clerk if paid $145K annually.

According to the survey (Table 6), the mean relative nonmonetary value of a CEO job versus a Financial Clerk job is $39±2K calculated with the confidence level of 90% from 74 valid responses on the sample taxi drivers.

Figure 8 shows the distribution of the relative nonmonetary value of a CEO job versus a financial clerk (FC) job in the perception of taxi drivers.

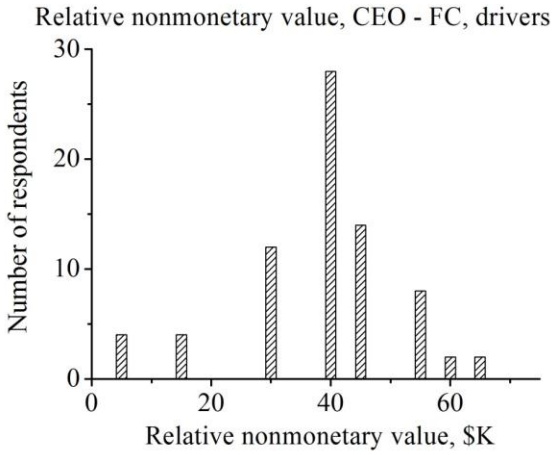

Figure 8: The distribution of the relative nonmonetary value of CEO and FC jobs in the perception of taxi drivers

6.2.2-Financial Clerk (FC) vs. Garbage Collector (GC) by Taxi Drivers

The same taxi drivers as in the previous case were asked to choose between a financial clerk (FC) and a garbage collector (GC) jobs. In the FC-GC pair of jobs, a financial clerk (FC) job was offered in the questionnaire with the annual salary of $50K while a garbage collector (GC) job was offered with a variety of salaries mostly exceeding the compensation for FC to offset the lower nonmonetary value of a GC job against a FC job. The offered annual salaries for a GC job were $75K, $80K, $90, $95K, $100, and $105K. The respondents were to indicate their preferences depending on the offered compensations.

Table 7: Results of the survey on FC vs. GC jobs conducted among taxi drivers

Nonmonetary Value of FC vs. GC jobs (among taxi drivers)				
Salary of CF	Salary of GC	Number of respondents	ΔV^{M}_{FC-GC}	ΔV^{N}_{FC-GC}
$50 K	$75 K	4	-$25 K	$25 K
	$80 K	6	-$30 K	$30 K
	$90 K	35	-$40 K	$40 K
	$95 K	18	-$45 K	$45 K
	$100 K	9	-$50 K	$50 K
	$105 K	2	-$55 K	$55 K

Number of valid responses:	74
Mean on sample $\overline{\Delta V^{N}_{CEO-FC}}$:	$41 K
Standard deviation:	$7 K

Confidence level:	90%
Confidence interval:	±$1 K
Mean on population:	$41±1 K

The results of the survey on the comparison of FC and GC jobs conducted among taxi drivers are shown in Table 7.

According to the survey, the mean relative nonmonetary value of a finance clerk (FC) versus a garbage collector (GC) jobs is \$41±1K calculated with the confidence factor of 90% on sample of 74 taxi drivers (valid responses).

Figure 9 shows the distribution of the relative nonmonetary value of a financial clerk (FC) job versus a garbage collector (GC) job among taxi drivers.

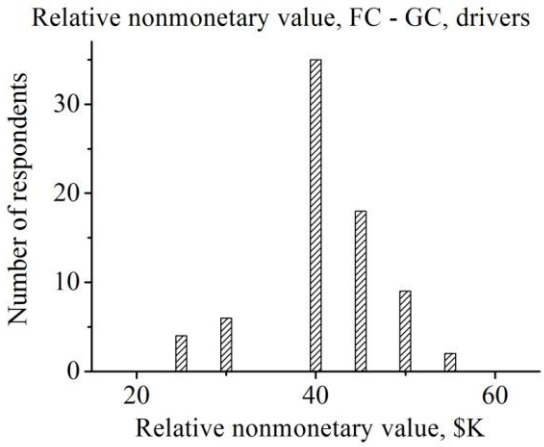

Figure 9: The distribution of the relative nonmonetary values of FC vs. GC jobs in the perception of taxi drivers

6.2.3-Chief Executive Officer (CEO) vs. Garbage Collector (GC) by Taxi Drivers

Finally, the taxi drivers were given the choice between two jobs, CEO and GC. The position of CEO was offered at annual salary of \$140K while the job of garbage collector (GC) was offered at \$155K, \$180K, \$185K, \$195K, \$200K, \$210K, and \$215K which was unrealistically high but might offset the nonmonetary status of the CEO job.

The results of the choice made by the taxi drivers are shown in Table 8. The mean value of the relative nonmonetary value of a CEO job vs. a (GC) job is \$81K±3K with 90% confidence on the sample of 74 taxi drivers.

Table 8: Results of the survey on CEO vs. GC jobs conducted among taxi drivers

Nonmonetary Value of CEO vs. GC jobs (among taxi drivers)				
Salary of CEO	Salary of GC	Number of respondents	ΔV^{M}_{CEO-GC}	ΔV^{N}_{CEO-GC}
\$140 K	\$185 K	4	-\$45 K	\$45 K
	\$195 K	5	-\$55 K	\$55 K
	\$200 K	6	-\$60 K	\$60 K
	\$210 K	8	-\$70 K	\$70 K
	\$220 K	21	-\$80 K	\$80 K
	\$230 K	11	-\$90 K	\$90 K
	\$235 K	9	-\$95 K	\$95 K
	\$240 K	1	-\$100 K	\$100 K
	\$250 K	9	-\$110 K	\$110 K
		Number of valid responses:		74
		Mean on sample $\overline{\Delta V^{N}_{CEO-FC}}$:		\$81 K

Standard deviation:	\$18 K

Confidence level:	90%
Confidence interval:	±\$3 K
Mean on population:	\$81±3 K

Figure 10 shows the distribution of the relative nonmonetary value of a chief executive officer (CEO) job versus a garbage collector (GC) job among taxi drivers.

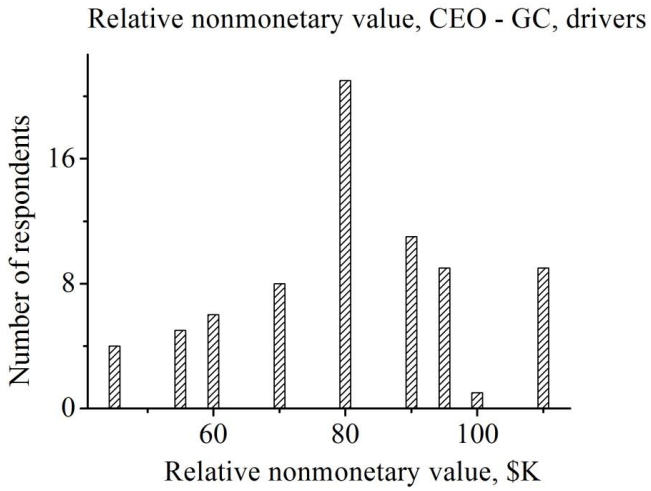

Figure 10: The distribution of the relative nonmonetary value of a CEO and a GC jobs in the perception of taxi drivers

The comparison of the relative nonmonetary values obtained in the survey conducted among taxi drivers is presented in Table 9.

Table 9: The comparison of the relative nonmonetary values of CEO vs. CF, CF vs. GC, and CEO vs. GC jobs obtained in the survey conducted among taxi drivers

Relative nonmonetary values of jobs by taxi drivers:	
Confidence level:	90%
ΔV^N_{CEO-FC}	\$39±2 K
ΔV^N_{FC-GC}	\$41±1 K
ΔV^N_{CEO-GC}	\$81±3 K

The relative nonmonetary values of the jobs in the perception of taxi drivers as in Table 9 show perfect consistency, i.e.

$$\Delta V^N_{CEO-FC} + \Delta V^N_{FC-GC} + \Delta V^N_{GC-CEO} = 39 + 41 - 81 = -1 \qquad (28)$$

that shows no triangular arbitrage within the confidence intervals. In Eq.(29), we used the anticommutative property of relative value presented in Eq.(24).

6.3-Construction Workers in Berkeley-Oakland-San Francisco Area

The similar surveys were conducted among construction workers from Berkeley, Oakland, and San Francisco. They were given a task of identifying their preferences and the indifference points for the same pairs of jobs including chief executive officer (CEO), financial clerk (FC), and garbage collector (GC). The total number of valid responses in this survey was 77.

6.3.1-Chief Executive Officer (CEO) vs. Financial Clerk (FC) by Construction Workers

In the CEO-FC pair, a CEO position was offered in the questionnaire with the annual salary of \$140K while a financial clerk (FC) position was offered with various salaries as \$145K, \$155K, \$170K, \$175K, \$185K, \$195K, and \$210K. The construction workers had to check the appropriate boxed to identify their indifference points.

The results of the survey on the comparison of a CEO and FC positions conducted among construction workers are shown in Table 10.

Table 10: Results of the survey on CEO vs. FC jobs conducted among construction workers

Nonmonetary Value of CEO vs. FC jobs (among construction workers)				
Salary of CEO	Salary of FC	Number of respondents	ΔV^{M}_{CEO-FC}	ΔV^{N}_{CEO-FC}
\$140 K	\$145 K	3	-\$5 K	\$5 K
	\$155 K	5	-\$15 K	\$15 K
	\$170 K	9	-\$30 K	\$30 K
	\$175 K	17	-\$35 K	\$35 K
	\$185 K	29	-\$45 K	\$45 K
	\$195 K	6	-\$55 K	\$55 K
	\$210 K	8	-\$70K	\$70 K

Number of valid responses:	77
Mean on sample $\overline{\Delta V^{N}_{CEO-FC}}$:	\$41 K
Standard deviation:	\$15 K

Confidence level:	90%
Confidence interval:	±\$3 K
Mean on population:	\$41±3 K

According to the survey (Table 10), the mean relative nonmonetary value of a CEO job versus a Financial Clerk job is \$41±3K calculated with the confidence level of 90% on the sample of 77 construction workers.

Figure 11 shows the distribution of the relative nonmonetary value of a CEO job versus a financial clerk (FC) job in the perception of construction workers.

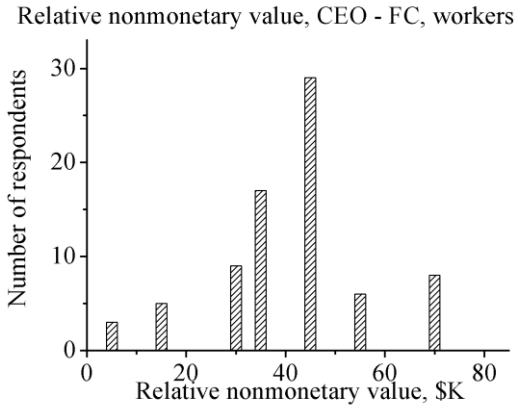

Figure 11: The distribution of the relative nonmonetary value of CEO and FC jobs in the perception of construction workers

6.3.2-Financial Clerk (FC) vs. Garbage Collector (GC) by Construction Workers

The same construction workers as in the previous case were to choose between a financial clerk (FC) and a garbage collector (GC) jobs. In the FC-GC pair, a financial clerk (FC) job was offered in the questionnaire with the annual salary of $50K while a garbage collector (GC) job was offered with a variety of salaries mostly exceeding the compensation for FC to offset the lower nonmonetary value of a GC job against a FC job. The offered annual salaries for a GC job were $65K, $70K, $75K, $80K, $90, $95K, $100, and $105K. The respondents were to indicate their preferences depending on the offered compensations.

The results of the survey on the comparison of FC and GC jobs conducted among construction workers are shown in Table 11.

Table 11: Results of the survey on FC vs. GC jobs conducted among construction workers

Nonmonetary Value of FC vs. GC jobs (among construction workers)				
Salary of CF	Salary of GC	Number of respondents	ΔV^{M}_{FC-GC}	ΔV^{N}_{FC-GC}
$50 K	$60 K	1	-$10 K	$10 K
	$70 K	2	-$20 K	$20 K
	$75 K	15	-$25 K	$25 K
	$80 K	19	-$30 K	$30 K
	$90 K	18	-$40 K	$40 K
	$95 K	16	-$45 K	$45 K
	$100 K	5	-$60 K	$60 K
	$105 K	1	-$65 K	$65 K

Number of valid responses:	77
Mean on sample $\overline{\Delta V^{N}_{CEO-FC}}$:	$36 K
Standard deviation:	$11 K

Confidence level:	90%
Confidence interval:	±$2 K
Mean on population:	$36±2 K

According to the survey, the mean relative nonmonetary value of a finance clerk (FC) versus a garbage collector (GC) jobs is \$36±2K calculated with the confidence factor of 90% on the sample of 77 construction workers.

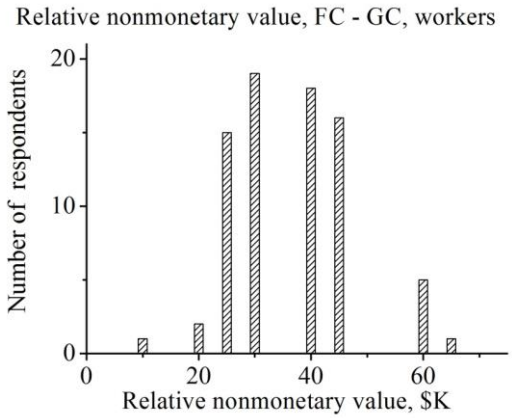

Figure 12: The distribution of the relative nonmonetary values of FC vs. GC jobs in the perception of construction workers

Figure 12 shows the distribution of the relative nonmonetary value of a financial clerk (FC) job versus a garbage collector (GC) job among construction workers.

6.3.3-Chief Executive Officer (CEO) vs. Garbage Collector (GC) by Construction Workers

Finally, the construction workers were given the choice between two jobs, CEO and GC. The position of CEO was offered at annual salary of \$140K while the job of garbage collector (GC) was offered at \$165K, \$175K, \$185K, \$195K, \$200K, \$205K, \$210K, \$215K, \$230K, \$240K, \$245K, \$250K, and \$255K which were unrealistically high in the expectation to offset the nonmonetary status of the CEO job.

The results of the choices made by the construction workers are shown in Table 12. The mean relative nonmonetary value of a CEO job vs. a (GC) job is \$77±3K with 90% confidence on the sample of 77 construction workers.

Table 12: Results of the survey on CEO vs. GC jobs conducted among construction workers

Nonmonetary Value of CEO vs. GC jobs (among construction workers)				
Salary of CEO	Salary of GC	Number of respondents	ΔV^{M}_{CEO-GC}	ΔV^{N}_{CEO-GC}
\$140 K	\$165 K	1	-\$25 K	\$25 K
	\$175 K	1	-\$35 K	\$35 K
	\$185 K	3	-\$45 K	\$45 K
	\$195 K	4	-\$55 K	\$55 K
	\$200 K	6	-\$60 K	\$60 K
	\$205 K	7	-\$65 K	\$65 K
	\$210 K	15	-\$70 K	\$70 K
	\$215 K	17	-\$75 K	\$75 K
	\$230 K	6	-\$90 K	\$90 K
	\$240 K	5	-\$100 K	\$100 K
	\$245 K	2	-\$105 K	\$105 K
	\$250 K	1	-\$110 K	\$110 K
	\$255 K	9	-\$115 K	\$115 K

Number of valid responses:	77
Mean on sample $\overline{\Delta V^N_{CEO-FC}}$:	\$77 K
Standard deviation:	\$21 K

Confidence level:	90%
Confidence interval:	±\$3 K
Mean on population:	\$77±3 K

Figure 13 shows the distribution of the relative nonmonetary value of a chief executive officer (CEO) job versus a garbage collector (GC) job among construction workers.

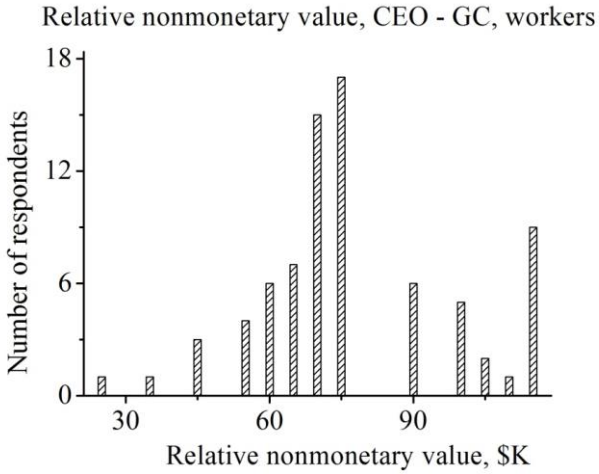

Figure 13: The distribution of the relative nonmonetary value of a CEO and a GC jobs in perception of construction workers

The comparison of the nonmonetary values obtained in the survey conducted among construction workers is presented in Table 13.

Table 13: The comparison of the relative nonmonetary values of CEO vs. CF, CF vs. GC, and CEO vs. GC jobs obtained in the survey conducted among construction workers

Relative nonmonetary values of jobs by construction workers	
Confidence level:	90%
ΔV^N_{CEO-FC}	\$41±3 K
ΔV^N_{FC-GC}	\$36±2 K
ΔV^N_{CEO-GC}	\$77±3 K

The relative nonmonetary values of the jobs in the perception of construction workers in Table 13 show perfect consistency, i.e.

$$\Delta V^N_{CEO-FC} + \Delta V^N_{FC-GC} + \Delta V^N_{GC-CEO} = 41 + 36 - 77 = 0 \tag{30}$$

Eq.(30) shows no triangular arbitrage. In Eq.(30), we used the anticommutative property of the relative value presented in Eq.(24).

6.4-Restaurant Waiters

The waiters from different restaurants in San Francisco Downtown area participated in the survey. They were given the choice of same three pairs of jobs. The total number of valid responses in this survey was 72.

6.4.1-Chief Executive Officer (CEO) vs. Financial Clerk (FC) by Restaurant Waiters

In the CEO-FC pair of jobs, a CEO position was offered in the questionnaire with the annual salary of $140K while a financial clerk (FC) position was offered with various salaries as $145K, $155K, $160K, $170K, $180K, and $190K. The construction workers had to check the appropriate boxed to identify their indifference points.

The results of the survey on the comparison of a CEO and FC positions conducted among restaurant weters are shown in Table 14.

Table 14: Results of the survey on CEO vs. FC jobs conducted among restaurant waiters

Nonmonetary Value of CEO vs. FC jobs (among restaurant waiters)				
Salary of CEO	Salary of FC	Number of respondents	ΔV^{M}_{CEO-FC}	ΔV^{N}_{CEO-FC}
$140 K	$145 K	8	-$5 K	$5 K
	$155 K	9	-$15 K	$15 K
	$160 K	17	-$25 K	$25 K
	$170 K	20	-$30 K	$30 K
	$180 K	12	-$40 K	$40 K
	$190 K	6	-$50K	$50 K

Number of valid responses:	72
Mean on sample $\overline{\Delta V^{N}_{CEO-FC}}$:	$27 K
Standard deviation:	$12 K

Confidence level:	90%
Confidence interval:	±$2 K
Mean on population:	$27±2 K

According to the survey (Error! Reference source not found.), the mean relative nonmonetary value of a CEO job versus a Financial Clerk job is $27±2K calculated with the confidence level of 90% on the sample of 72 restaurant waiters.

Figure 14 shows the distribution of the relative nonmonetary value of a CEO job versus a financial clerk (FC) job in the perception of restaurant waiters.

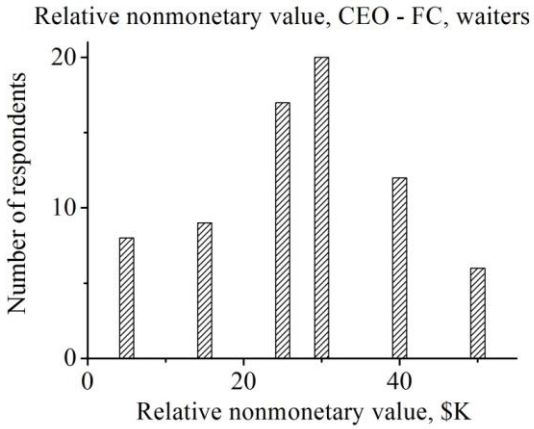

Figure 14: The distribution of the relative nonmonetary value of CEO and FC jobs in the perception of restaurant waiters

6.4.2-Financial clerk (FC) vs. Garbage Collector (GC) by Restaurant Waiters

The restaurant waiters were also asked to choose between a financial clerk (FC) and a garbage collector (GC) jobs. In the FC-GC pair, a financial clerk (FC) job was offered in the questionnaire with the annual salary of $50K while a garbage collector (GC) job was offered with a variety of salaries mostly exceeding the compensation for FC to offset the lower nonmonetary value of a GC job against a FC job. The offered annual salaries for a GC job were $65K, $85K, $90, $100K, $105, and $110K. The respondents were to indicate their preferences depending on the offered compensations.

The results of the survey on the comparison of FC and GC jobs conducted among construction workers are shown in Table 15.

Table 15: Results of the survey on FC vs. GC jobs conducted among construction workers

Nonmonetary Value of FC vs. GC jobs (among restaurant waiters)				
Salary of CF	Salary of GC	Number of respondents	ΔV^{M}_{FC-GC}	ΔV^{N}_{FC-GC}
$50 K	$65 K	7	-$15 K	$15 K
	$85 K	6	-$35 K	$35 K
	$90 K	41	-$40 K	$40 K
	$100 K	12	-$50 K	$50 K
	$105 K	4	-$55 K	$55 K
	$110 K	2	-$60 K	$60 K

Number of valid responses:	72
Mean on sample $\overline{\Delta V^{N}_{CEO-FC}}$:	$40 K
Standard deviation:	$10 K

Confidence level:	90%
Confidence interval:	±$2 K
Mean on population:	$40±2 K

According to the survey, the mean relative nonmonetary value of a finance clerk (FC) versus a garbage collector (GC) jobs is \$40±2K calculated with the confidence factor of 90% on the sample of 72 restaurant waiters.

Figure 15 shows the distribution of the relative nonmonetary value of a financial clerk (FC) job versus a garbage collector (GC) job among restaurant waiters along with the normal distribution (a dashed curve) with the mean of \$40K and standard deviation of \$10K.

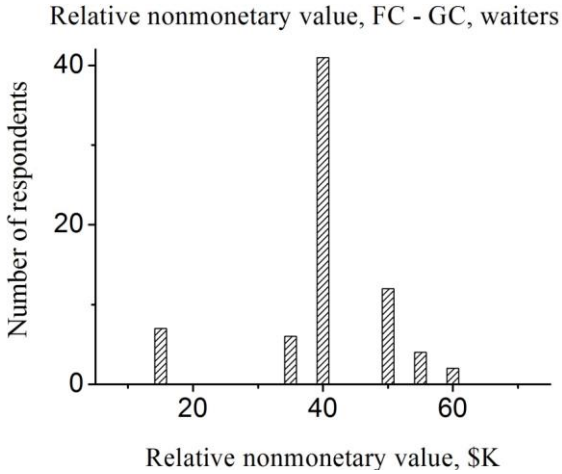

Figure 15: The distribution of the relative nonmonetary values of FC vs. GC jobs in the perception of restaurant waiters

6.4.3-Chief Executive Officer (CEO) vs. Garbage collector (GC) by Restaurant Waiters

Finally, the restaurant waiters were given the choice between two jobs, CEO and GC. The position of CEO was offered at annual salary of \$140K while the job of garbage collector (GC) was offered at \$185K, \$195K, \$205K, \$220K, \$245K, and \$250K which was unrealistically high but might offset the nonmonetary status of the CEO job.

The results of the choices made by the construction workers are shown in Table 16. The mean value of the nonmonetary value of a CEO job vs. a (GC) job is -\$68±3K with 90% confidence on the sample of 72 restaurant waiters.

Table 16: Results of the survey on CEO vs. GC jobs conducted among restaurant waiters

Nonmonetary Value of CEO vs. GC jobs (among restaurant waiters)				
Salary of CEO	Salary of GC	Number of respondents	ΔV^{M}_{CEO-GC}	ΔV^{N}_{CEO-GC}
\$140 K	\$185 K	10	-\$45 K	\$45 K
	\$195 K	14	-\$55 K	\$55 K
	\$205 K	23	-\$65 K	\$65 K
	\$220 K	19	-\$80 K	\$80 K
	\$245 K	4	-\$105 K	\$105 K
	\$250 K	2	-\$110 K	\$110 K

Number of valid responses:	72
Mean on sample $\overline{\Delta V^{N}_{CEO-FC}}$:	\$68 K
Standard deviation:	\$17 K

Confidence level:	90%
Confidence interval:	±$3 K
Mean on population:	$68±3 K

Figure 16 shows the distribution of the relative nonmonetary value of a chief executive officer (CEO) job versus a garbage collector (GC) job among restaurant waiters with the mean of $68K and standard deviation of $17K.

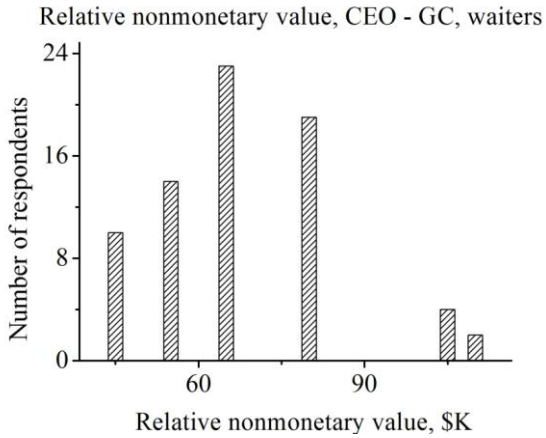

Figure 16: The distribution of the relative nonmonetary value of a CEO and a GC jobs in perception of restaurant waiters

The comparison of the relative nonmonetary values obtained in the survey conducted among construction workers is presented in Table 17.

Table 17: The comparison of the relative nonmonetary values of CEO vs. CF, CF vs. GC, and CEO vs. GC jobs obtained in the survey conducted among construction workers

Relative nonmonetary values of jobs by construction workers:	
Confidence level:	90%
ΔV^N_{CEO-FC}	$27±2 K
ΔV^N_{FC-GC}	$40±2 K
ΔV^N_{CEO-GC}	$68±3 K

The relative nonmonetary values of the jobs in the perception of construction workers in Table 5 show excellent consistency, i.e.

$$\Delta V^N_{CEO-FC} + \Delta V^N_{FC-GC} + \Delta V^N_{GC-CEO} = 27 + 40 - 68 = -1 \tag{31}$$

that shows no arbitrage within the confidence intervals. In Eq.(31), we used the anticommutative property of relative value presented in Eq.(24).

7-ANALYSIS OF THE RESULTS BY ALL GROUP OF RESPONDENTS

All measured relative nonmonetary values of the jobs assessed in the survey are presented in the aggregate form in Table 18.

Table 18: Aggregate table for the relative overall result obtained

Relative nonmonetary values of jobs / Categories of respondents	ΔV^{N}_{CEO-FC}	ΔV^{N}_{FC-GC}	ΔV^{N}_{CEO-GC}
Business students	\$39±2K	\$34±1K	\$73±3K
Taxi drivers	\$39±2K	\$41±1 K	\$81±3 K
Construction workers	\$41±3 K	\$36±2 K	\$77±3 K
Restaurant waiters	\$27±2 K	\$40±2 K	\$68±3 K

As evident from the above table, the mean relative nonmonetary value (the difference in nonmonetary values) for a CEO against a FC jobs is the highest for the construction workers and least for the restaurant waiters. Similarly, the mean relative nonmonetary value of an FC job against GC job is found to be highest for the taxi drivers, and lowest for the business students. Finally, the mean relative nonmonetary value of a CEO job against a GC job was found the highest for the taxi drivers lowest for the restaurant workers.

The survey showed good consistency of the measured relative nonmonetary values among various social groups of respondents. Also, the results show good assessment transitivity, i.e.

$$\Delta V^{N}_{CEO-GC} = \Delta V^{N}_{CEO-FC} + \Delta V^{N}_{FC-GC} \tag{32}$$

which was very good in each category of respondents. The assessment of the relative nonmonetary values of a chief executive officer (CEO) job against a garbage collector (GC) in all four surveys was very close to the sum of the relative nonmonetary values of a chief executive officer (CEO) job against a financial clerk (FC) job and a financial clerk (FC) job against a garbage collector (GC) as shown in Table 18 and Eqs.(30)-(32).

The consistency of the survey results presented in this paper and collected in the aggregate form in Table 18 clearly support the validity of the indifference point method proposed in this paper for measuring the nonmonetary component of general value.

8-CONCLUSION

This paper proposed and practically used the methodology of measuring the nonmonetary component of general value based on indifference point. According to the concept of general value, value is composed of two components: monetary and nonmonetary [2]. Both components play an equally important role in the value assessment and decision making. In the today's world, most people still view value through the prism of money only. Considering money alone or its perception is not enough for the assessment of value as was clearly illustrated and described in the paper, where the concept of general value was introduced in [2]. The nonmonetary component of value is specific to an individual or to a social group.

The nonmonetary component of general value is often referred to as the nonmonetary value. These two terms are completely synonymous.

The most important role in assessment, decision making, and trading is played by the difference of values rather than by the absolute level of value. Thus, measuring the difference of nonmonetary value between any two entities is more important than measuring the absolute level of the nonmonetary value. The difference of the nonmonetary values between two entities is referred to as a relative nonmonetary value. This is similar to the notion of potential energy in physics where only the difference (gradient) of potential energies makes

real sense in motion while the absolute value of the potential energy is just a purely theoretical concept.

We have introduced the methodology of measuring the relative nonmonetary value. The methodology is based on finding the indifference point. The indifference point is the situation when an individual is neutral in choosing between two entities or between two action scenarios. The indifference point takes place when the general values of the choices are equal. In the indifference point, the relative nonmonetary value (difference of the nonmonetary values) of two choices is equal to the difference of the monetary values of these choices with the opposite sign as indicated in Eq.(24).

We conducted surveys to measure relative nonmonetary value of different jobs (chief executive officer (CEO), financial clerk (FC), and garbage collector(GC)) in the perception of different social groups of people (business students, taxi drivers, construction workers, and restaurant waiters) with the sample sizes varying from 72 to 124 valid responses per survey. The measured relative nonmonetary values of jobs are very consistent inside the groups and between the groups, and meet the transitivity rule defined in Eq.(32) and showed practically no triangular arbitrage of the mean relative nonmonetary value.

The introduced method of measuring relative nonmonetary values turns the theory of general value from a powerful theoretical concept to a practical approach in the assessment of decision making by individuals and groups of people.

Bibliography

1. Aityan, Sergey K. (2011), Price-Value Potential for Near-Perfectly Competitive Markets, American Journal of Economics and Business Administration, vol. 3 (4), p. 623–635, Mode of access: http://thescipub.com/PDF/ajebasp.2011.623.635.pdf
2. Aityan, Sergey K. (2013), The Notion of General Value in Economics, International Journal of Economics and Finance, vol. 5, No. 5, pp. 1-14, 2013, Mode of access: http://ccsenet.org/journal/index.php/ijef/article/view/26698/16304
3. Becker, Gary (1968), Crime and Punishment: An Economic Approach, The Journal of Political Economy, vol.76, No. 2, pp.169–217. Mode of access: http://www.jstor.org/discover/10.2307/1830482?sid=21106242972313&uid=4&uid=2&uid=3738936
4. Blackaby, D. H. and P. D. Murphy (1995), Earnings, Unemployment and Britain's North-South Divide: Real or Imaginary?, Oxford Bulletin of Economics and Statistics, Vol. 4, pp. 487–512. Mode of access: http://onlinelibrary.wiley.com/doi/10.1111/j.1468-0084.1995.tb00036.x/pdf
5. Brown, Charles (1980), Equalizing Differences in the Labor Market, Quarterly Journal of Economics, vol. 94, No.1, pp.113-134, Mode of access: http://dx.doi.org/10.2307/1884607
6. Chipman, John S. and James C. Moore (1980), Compensating Variation, Consumer's Surplus, and Welfare, American Economic Review, vol. 70, No. 5, pp. 933-949
7. Gale, Bradley T. and Donald J. Swire (November 2006), Value-Based Marketing & Pricing. Working Paper of Customer Value, Inc., pp. 1-19. Mode of access: http://www.cval.com/pdfs/VBMarketingAndPricing.pdf
8. Gossen, Hermann H. (1854), Die Entwickelung der Gesetze des menschlichen Verkehrs, und der daraus fließenden Regeln für menschliches Handeln (1854). In English: The Laws of Human Relations and the Rules of Human Action Derived Therefrom (1983), MIT Press, ISBN 0-262-07090-1

9. Han, Seungjin and Shintaro Yamaguchi (2015), Compensating wage differentials in stable job matching equilibrium, Journal of Economic Behavior & Organization, Elsevier, vol. 114(C), pages 36-45
10. Hicks, John R. (1939), Value and Capital: An Inquiry into some Fundamental Principles of Economic Theory, Oxford: Clarendon Press
11. Jevons, William S. (2010), The Theory of Political Economy. Kessinger Publishing. (Original work published 1879)
12. Kahn, Alfred E. (1979), Applications of Economics to an Imperfect World, American Economic Review, vol.69, No.2, pp.1-13
13. Kahneman, Daniel and Amos Tversky (1979), Prospect Theory: An Analysis of Decision Under Risk, Econometrica, vol. 47, No. 2, pp. 263-291
14. Kahneman, Daniel, Paul Slovic, and Amos Tversky (1982), Judgment under Uncertainty: Heuristics and Biases. Cambridge: Cambridge University Press
15. Kahneman, Daniel and Amos Tversky (2000), Choices, Values, and Frames. Cambridge: University Press
16. Kahneman, Daniel (2011), Thinking, Fast and Slow. Farrar, Straus and Giroux
17. Marshall, Alfred (1890), Principles of Economics, London: Macmillan and Co., Ltd
18. Marx, Karl (1992), Capital: A Critique of Political Economy (Vols 1-3). Penguin. (Original work published 1867)
19. McKenzie, Richard. B. and Gordon Tullock (1981), The New World of Economics: Explorations into the Human Experience (Chaps. 2, 20). New York: Irwin
20. Menger, Carl (2007), Principles of Economics, CreateSpace. (Original work published in 1871)
21. Pollis, Adamantia and Bertram L. Koslin (1962), On the Scientific Foundations of Marginalism. American Journal of Economics & Sociology, 21(2), 113-130, Mode of access: http://dx.doi.org/10.1111/j.1536-7150.1962.tb00829.x
22. Ricardo, David (1817), The Principles of Political Economy and Taxation, Republished by Dover Publications (2004), 320 p.
23. Rhoads, Steven E. (2007), Concise Encyclopedia of Economics (Marginalism). D. R. Henderson (Ed.). Liberty Fund, Inc.
24. Rosen, Sherwin (1974), Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition. Journal of Political Economy, vol. 82, No.1, pp. 34-55. Mode of access: http://dx.doi.org/10.1086/260169
25. Rosen, Sherwin (1983),The Equilibrium Approach to Labor Market, NBER Working Paper Series, Working Paper 1165, Mode of access: http://www.nber.org/papers/w1165.pdf
26. Samuelson, Paul A. and William D. Nordhaus (2004), Economics, McGraw-Hill, ISBN 0-07-287205-5
27. Schulak, Eugen M. and Herbert Unterköfler (2011), Austrian School of Economics, Ludwig von Mises Institute
28. Simon, Herbert A. (1955), A Behavioral Model of Rational Choice. Quarterly Journal of Economics, 69, 99-118. http://dx.doi.org/10.2307/1884852
29. Simon, Herbert A. (1972), Theories of Bounded Rationality, North Holland Publishing company, pp. 161-176. Mode of access: http://mx.nthu.edu.tw/~cshwang/teaching-economics/econ5005/Papers/Simon-H=Theoriesof%20Bounded%20Rationality.pdf
30. Skousen, Mark (2005), Vienna & Chicago, Friends or Foes?: A Tale of Two Schools of Free-Market Economics. Capital Press
31. Smith, Adam (1776), The Wealth of Nations, Republished by Simon & Brown (2012), 482 p.
32. Walras, Leon (2010), Elements of Pure Economics. Routledge. (Original work published 1874, 1877)
33. Wieser, Friedrich von (1889), Der natürliche Wert, Wien: Hoelder
34. Wieser, Friedrich von (2012), Natural Value, (W Smart, Ed., & C. A. Malloch, Trans.). (Original work published 1889)

