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A Critique of the Neoclassical Approach to Consumer Choice

Abstract:
In this paper we analyze neoclassical concepts such as utility maximization and indifference, in order to identify their failure to explain consumer choice. Thus, we study the problems of indifference analysis, and the process of human action itself. We provide a critique of the neoclassical view of consumer choice and contrast it with the Austrian approach.

Key words: neoclassical economics; consumers; choice; utility; perfect information

JEL category: D11

I. Introduction[1]

Despite of immense advancements within economic science, microeconomic textbooks have been teaching the same models for decades (Boulding, 1966; Miller, 2013; Nicholson & Snyder, 2011; Varian, 1992). New advances in behavioral economics[2] and other recent developments complement some of these models. However, others remain almost unchallenged and continue to be presented as the foundation of microeconomic analysis. Since consumer choice is at the very core of economics, indifference analysis has become one of the pillars of the neoclassical approach. Which pillar? The one that pretends to explain how consumers make economic choices.

By studying consumer's preference, neoclassical microeconomics has shifted from cardinal utility theory[3], where it is assumed that utility can be measured in discrete units

[1] The authors wish to thank three anonymous reviewers for their valuable comments. The usual caveats of course apply; we are responsible for all remaining errors

[2] Ultimately perpetuating the premises of neoclassical economics (Laibson & List, 2015).

[3] We will not analyze this approach, since trying to measure valuations and satisfaction is not feasible given the fact that there is no known way of performing such measurement nor of comparing utility. There is no empirical foundation to claim that there is such a thing as "util". See also Rothbard (1962, 267).

named "utils", to ordinal utility theory. The latter consists in comparing baskets of goods, and ordering these according to individual preferences[4].

Thus, mainstream ordinal utility theory assumes that the individual will act based on how he orders or ranks different combinations of goods, while also finding himself indifferent with respect to any or some of these combinations. The individual ranks such combinations according to their utility, and therefore when he faces two (or more) combinations that he regards as exhibiting the *same* utility, he will then be indifferent with respect to choosing one or the other.

In other words, it is assumed that the individual will act by performing an analysis (previous to his decision) *analogous* to a quantitative calculation, where he will weigh combinations of goods and the utility these exhibit, in order to choose the one that will maximize satisfaction[5]. We will analyze the problems with this approach throughout this work, and therefore try to show why it cannot be regarded as a proper understanding of consumer choice.

It is our intention to focus in the neoclassical approach, and not on the entire modern theory of consumer choice. We do so because we understand that the tools neoclassical economists introduced in consumer choice analysis, although developed and improved more recently are still in use. As such, we focus particularly on indifference curves and utility maximization. By doing this, we try to criticize the theory itself, since its assumptions do not coincide with our view on the actual process of consumer choice; rather, this leads to distortion.

Our goal in this paper is, then, to show why the use of indifference analysis, utility maximization and mathematical analysis obscures our understanding of consumer choice, and therefore creates confusion about the nature of the market process in general. Instead, we propose the Austrian understanding of consumer choice, as presented by Mises (1949) and Rothbard (1962).

In section II we wrestle with the concepts of utility and perfect knowledge. Our focus in section III is on the valuation of the budget. The burden of section IV is to deal with the concept of indifference. In section V we encounter human action and its standard and conclude in section VI.

II. Utility and The Qualitative Nature of the Process of Choice

In real life, the individual does not know *a priori* the utility that he will *receive*, only the one that he *expects* to obtain. Therefore, he performs a *qualitative* analysis, where he weighs mentally the different possible choices he may make, but does not make a quan-

[4] See Boulding (1966), Miller (2013), Nicholson & Snyder (2011), Varian (1992). See also Chiang (1984).

[5] For other critiques of this approach, see Barnett II (2003), Block (2009B), Block & Barnett II (2010), Block, Barnett II & Wood (2002), Buchanan (1969), Callahan (2003), McChesney (2013), McKenzie and Tullock (1975), and Rothbard (1956).

titative calculation. Thus, equating this process with a mathematical description, or attempting to make exact predictions based on mathematical models or optimization analysis is both incorrect and irrelevant[6], given that the process is of a different nature than the one treated by mathematics.

Neoclassical micro-economists posit that the process of choosing can best be understood via indifference analysis, which makes possible a legitimate mathematical construction of such process. The difficulty exists because the individual does not know what satisfaction he will attain by choosing a specific combination of goods; he only *speculates* about it. Such speculation is conceptual, not mathematical. He analyzes based on previous conceptualizations and experiences about the goods he chooses, which combination will be expected to be more satisfactory. Even if we could construct a model[7] analogous to the actual decision-making process by means of mathematics, it would be a duplication of what we can easily understand by means of words[8].

Moreover, this theory claims that the individual, in order to maximize his utility function, must allocate resources[9] in such a way that the marginal dollar spent will generate the *same* level of utility. However, this is contradicted by the fact that the only thing the consumer knows is its alternatives and the value judgments he makes of each, but not the *effective* result of any possible choice in terms of utility. In other words, the model could be understood as necessarily assuming perfect knowledge, given that this is a necessary condition in order to assure that expected utility[10] (*EU*) would equal received utility (*RU*)[11].

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[6] A critic may ask, why is it irrelevant to develop a mathematical model? After all, for instance, Newton's work was indeed not irrelevant even if planets didn't know about the law of gravity. Our answer is that it is irrelevant not because it is a model, but because it makes use of mathematical tools in order to explain a process that is better explained in qualitative terms. For example, differentiation and integration require smooth curves, based upon infinitesimally small distinctions. But human action is, instead, discrete, and this is the appropriate subject for economics, we contend.

[7] Any model, whether stated in mathematical terms or not, is indeed a simplification of reality. However, in this case, the models distort reality, and are thus not helpful to advance our understanding of consumer choice.

[8] A critic may say that if it is a duplication of ordinary language, it is not of a *different nature*. However, we do not object the assertion, that is why we say that *even if*...But we do not endorse the possibility.

[9] That are of course constrained by a budget line

[10] It is true that these authors (Becker, 1965; 1968; 1971; 1975; 1981; 1992; Lancaster, 1966; Rosen, 1974) indeed agree with the Austrian approach. This states that the key to consumer choice is the value the individual expects to get, and not the object itself (Mises, 1949, 123). This entire approach affects our understanding from prices to marriage, and the fundamental idea is still the same: expected utility (Schoemaker, 1982). However, the mathematical models used induce confusion, in our view. In the words of Mises (1949, 123): "If a man is faced with the alternative of giving up either one unit of his supply of *a* or one unit of his supply of *b*, he does not compare the total value of his total stock of *a* with the total value of his stock of *b*. He compares the marginal values both of *a* and of *b*. Although he may value the total supply of *a* higher than the total supply of *b*, the marginal value of *b* may be higher than the marginal value of *a*."

[11] Expected value, as presented by Nicolas Bernoulli (1713), assumes that utility functions are linear (or quadratic), and therefore there is no risk aversion. This is demonstrated in the famous St. Petersburg Paradox. However, as Daniel Bernoulli (Nicolas' cousin) explained, the concept of expected utility is more tenable,

Thus, one serious flaw in indifference models[12] is that they assume perfect knowledge[13][14]. However, since perfect knowledge is an attribute no individual can possess (Hayek, 1945, 1974; Kirzner, 1963, 1982), no serious model of consumer choice claiming empirical validity may include it as one of it assumptions, either explicitly, or as in this case, implicitly.[15]

Moreover, a critic may argue that (at least) most neoclassical micro-economists think that the individual takes into account only expected utility; not that he knows a priori what utility he will receive[16]. However, even if the model only assumes expected utility, then it would be as useful as any *other* speculation regarding the future, *all* including uncertainty. Utility function maximization and any further mathematical calculation in this regard would be no more rigorous in this context than simply weighing different options mentally. Mathematics, here, only adds an *illusion* of rigorousness.

How should we understand expected utility? Is it not based on subjective probability? And is not probability a quantitative phenomenon that makes use of statistical concepts such as mean, median, standard error and kurtosis? The viewpoint we favor is that when dealing with money prices a consumer indeed considers numerical calculation,

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since it involves both risk aversion and a form of decreasing marginal utility. He stated (Barathalon, 2014, 204): "There is no doubt that a gain of one thousand ducats is more significant to the pauper than to a rich man though both gain the same amount […] The determination of the value of an item must not be based on the price, but rather on the utility it yields […] the utility is dependent on the particular circumstances of the person making the estimate […] no valid measurement of the value of a risk [a prospect] can be obtained without consideration being given to its utility". Hence, utility (as later Ludwig Von Mises (1949) definitively explained) is entirely subjective. If the utility function involves risk aversion, and therefore its form is $u = \sqrt{x}$ instead of $u = x$, that may solve the challenge of the St. Petersburg Paradox, but it does not answer the problems entailed in dealing with the subject in a mathematical fashion. This is so because multiple factors enter into consideration when dealing with utility and individual choice. How many factors? All that are relevant for the individual, such as risk, decreasing marginal utility, wealth (as in Friedman & Savage, 1948), etc. Moreover, this conceptual framework has more applications in economics, not just consumer choice. Take the Markowitz (1952) model, which includes two parameters (risk and expected return). If we use expected utility, the only way to render this model useful is by assuming that investors have quadratic utility functions and that the returns of financial assets have normal distributions, so kurtosis and skewness are irrelevant. However, this is far from the truth. We do not pretend to treat financial models in this present paper of ours, but it is an example of how a specific theory of utility can affect other areas of economic analysis.

[12] See on this Barnett (2003), Block (1980; 1999; 2003; 2007; 2009A; 2009B), Block & Barnett (2010), Callahan (2003), Collingwood (1945), Hoppe (2005), Hülsmann (1999), Machaj (2007), Rothbard (2004; 265-267), Sotelo & Block (2014), Wysocki (2016), and Wysocki & Block (Forthcoming).

[13] There are many models which focus on decision under uncertainty, but we are dealing here not only with those that assume perfect knowledge, but also with those that *imply* it.

[14] If we must, we could conceive of illustrating the neoclassical perfect knowledge as a limit where C is knowledge which tends to infinity, and therefore, $EU = RU$: $\lim_{C \to \infty} EU = RU$.

[15] We do not regard what we say in the text at this point as very controversial. Full knowledge has always been an integral part of the perfectly competitive model. For example, The Economic Times (Undated) defines perfect competition, in part, as: "Consumers have perfect knowledge about the market and are well aware of any changes in the market." Here, we are merely applying this "insight" to indifference curve analysis.

[16] That is, from the point of view of the consumer, he has *some* knowledge of his preferences and how much satisfaction would an extra unit of a good give him.

but its probability analysis is qualitative.[17]In fact, the consumer makes a subjective analysis based on how he understands the relevant factors, all according to his subjectivity[18]. Indeed, he may make any numerical calculations he wants, but the outcome of his action will be subjected to case probability (rather than class probability, as stated by Mises, 1949, 107-113), so certainty will not be attained nor can this result be expected.

Individual preferences change, and there is risk aversion. For example, "Prospect theory" (Kahneman & Tversky, 1979) divides the analysis of alternatives, and their evaluation, where there is a standard of wealth variation that is considered. This, in turn, is affected by the risk aversion of the consumer, which has been studied by behavioral economics (De Pablo, 2017, 201-205). For instance, take the the asymmetry with which individuals consider certain outcomes with respect to results subjected to a specific probabilistic component. For instance, there is a preference for a loss of x+1 (with a probability a, where $a < 1$), instead of a certain loss of x. There is also, according to these authors, an asymmetry between loss and gain, where losses are more intensely felt than gains. Therefore, the consumer will prefer a certain gain of x, rather than a gain of x+1 (with a probability a, where $a < 1$), but at the same time prefer a loss of x+1 (with a probability a, where $a < 1$), to a certain loss of x. That is, there is a supposed incoherence in behavior in this respect between gain and loss.

What is the praxeological approach on this? It is that gain and loss scenarios are different, and therefore will be analyzed in a different light. It must be remembered, also, that the individual acts according to a value scale, and the cost of any human action is the best discarded alternative (otherwise known as opportunity cost). But observe the following, the best discarded alternative is indeed not the *only* one in the possible alternatives ranked in the value scale. Hence, we may conjecture that the reason for the asymmetry between loss and gain is that when the individual gains something, that indeed outweighs the rest of the alternatives. However, when there is a loss, it is not just that the individual did not attain the end he intended, but also *lost the opportunity of attaining all other ends in his value scale* (and not only the opportunity cost). Hence, when gaining the individual attains end 1, but when losing, he does not attain end 2 (the opportunity cost), end 3,…, end n. Thus, there is an asymmetry between gain and loss, where the probabilistic component is judged according to the certainty of the gain or loss, and therefore is contrasted with this fact.

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[17] Although probability is usually stated in a mathematical fashion, e.g., the mean, variance, standard error, etc. when the individual is choosing, he uses a subjective view of probability, although, to be sure, he can make calculations that deal with specific monetary quantities with regard to his decisions.

[18] This could be related to the concept of subjective expected utility (Savage, 1954; de Finettti, 1970; Pfanzagl, 1967, 1968; Von Neumann & Morgenstern, 1944 [1953]) although there are important differences (mainly, the use of mathematical tools). For a critique of this approach in the mainstream of economics, see Allais (1953).

Moreover, it seems that, when facing a loss, the consumer finds himself in a different context. That is, when preparing for the action *ex ante*, he only considers the individual utility he expects to attain from the ends according to his value scale, where the only relevant ones are the first end he chooses to pursue and the best discarded option (the opportunity cost). But when considering a loss, he does not regard these ends individually. Here, the first end he wished to attain which did not deliver the utility expected is analyzed in comparison with *all* the other possible ends (including the opportunity cost). For example, in the first case the individual chooses an apple (first choice) before banana (second choice), whereas in the second, if the apple is rotten, he not only experiences a loss in purchasing the apple rather than a banana, but also grapes, oranges, etc., enter the analysis. Anything would have been better than having no food at all. Thus, the asymmetry (although the cost, indeed, is the bananas he did not eat).

In the probability approach, adding a probabilistic factor to the attainment of the end or the loss, which gives rise to their asymmetry, could be explained because of the aforementioned dynamics. We may assume that there is a preference for a loss of x+1 (with a probability a, where $a < 1$), instead of a certain loss of x, because the context is the probability 1-a of *not* losing with respect to the certain loss of x. In the case of gains, the consumer will prefer a certain gain of x, rather than a gain of x+1 (with a probability a, where $a < 1$), because the probability 1-a of losing takes implicitly into account all the other alternatives.

Let us approach this matter in a different way. We are challenged to explain why a loss will weigh more heavily on the consumer than an objectively equal gain. For example, welfare decreases more from the loss of a pen than it increases from a gain of the identical object. But why should we have to explain this at all, any more than would have to account for the fact that at a given time, a person values an apple more than a banana. In both cases it is perfectly acceptable to chalk his up to subjective tastes. Many mainstream economists (particularly some behavioral economists) posit that this ranking is irrational. However, that is it no more irrational than preferring an apple to a banana, or the reverse. *De gustibus non est disputandum*. Not only is there no disputing of tastes, there is no explaining of them either, at least not on the part of the dismal science, where we properly take them as a given.

Choice does not depend on *a priori* knowledge of future outcomes, but rather on *previous* conceptualization and identification of goods (those that will be chosen or not by the individual) with such concepts. That is to say, action presupposes evaluation, which depends on identification of concretes by means of concepts. If there were perfect knowledge, then no utility maximization analysis would be required, given that the individual would know the optimum combination *automatically*. Moreover, perfect knowledge is almost never explicitly claimed as a pillar of the model, and even if it were, it neither would correspond with reality, nor would constitute a predictive nor explanatory tool.

For example, if the individual must choose between pizzas or hamburgers, and he

gives the nod to the former, the fact that one or all pizzas he consumed in the past had been satisfactory does not imply that it would be the case now[19]. The individual chooses based on his concepts and predilections (of a *qualitative* nature), not because of a specific measurement following quantitative considerations. It cannot be seriously contended that the individual makes a quantitative analysis of the total amount of pizzas he ate in his life and their corresponding received utilities. However, we may assume from the fact that he *chose* pizzas that these may have given him *more* satisfaction than hamburgers (but not how much more). In addition, if a neoclassical micro-economist contended that indifference analysis tries to precisely model the latter fact (or that this is the mathematical counterpart of such process), the refutation is that it is an unnecessary complication (Occam's razor), since this can be easily understood without incorporating mathematics.

Although it could be contended that weighing different options mentally is analogous to making a calculation in order to maximize a utility function, they are categorically different. Otherwise, one would have to accept that it would be the same to compare two different colors (e.g. red and green) with two different magnitudes (e.g. fifty-two and seventy-eight).[20] Of course, quantity and quality are not the same nor need be so. Consumer choice deals with quantities only insofar as there are magnitudes involved (either with respect to number of goods, or prices), but need not be restricted to it. Consumer preference and choice involve both quantity *and* quality.

Indifference curve analysis is partially predicated upon ordinal utility. The consumer chooses between 10x units of good X and 20y units of Y good, on the one hand, and 30x units of X plus 15y units of Y on the other hand. Which one is more highly ranked? That is an aspect of ordinality. But the indifference curve analytic tool is also based on cardinal not only ordinal utility. For example, when the budget line is tangent to the indifference curve, the equation describing this point is as follows: MUx/Px = MUy/Py. However, MUx and MUy are clearly cardinal, not ordinal numbers as they are being divided by Px and Py, respectively. In contrast, ordinal numbers, such as tenth, fifteenth, cannot be divided, or multiplied, added or subtracted. Only cardinal numbers can be so treated. Hence, cardinality. Two for the price of one. Cardinality is not absent from indifference analysis, despite the claim of neoclassic micro-economists.

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[19] The problem of induction. See Popper (1959).

[20] This is our attempt to give an example of a comparison between two things that are radically incommensurable, such as color and number: how can we compare the color red with the number 10? The same goes for comparing the mental process of choosing (of a qualitative nature), with calculating in order to maximize a utility function (of a quantitative nature). It is incorrect. The color red (or any other color) is an attribute of the human vision of wavelength. Thus, it is indeed a concept defined by the length of a wave, and this is a number. But this is a theoretical categorization of the perception, not the perception itself. You can explain to a blind person that color is defined by the length of a wave, but you cannot convey the experience of seeing it from that description, unless you *already know the concrete* that is conceptualized under that description in the first place, which is of course of a qualitative nature.

Maximization of utility, therefore, is achieved when the basket that maximizes utility presents a marginal rate of substitution (the slope of the indifference curve) that equals the price ratio (the slope of the budget constraint). However, the equation allows us to make this analysis, because it is an *equation*[21]. Therefore, cardinality slips in[22].

Here are several possibilities of why such was the outcome of the consumer's choice mentioned above regarding pizzas:

1 – The consumer may have never tried hamburgers before, and given that he is highly averse to risk, he prefers to choose what he already knows, i.e. what he had already experienced.

2 – It may be the case that both options are equally distasteful for the consumer, but he chooses one because he is having dinner with other friends who would prefer pizza.

3 – The consumer may have tried hamburgers before, but not pizzas. However, given that he found hamburgers distasteful, he prefers the unknown.

The possibilities are numerous, but the common denominator is that choice is not performed in a vacuum. Previous conceptualization, evaluation, positive and negative emotions associated with different goods, context, all play a part in consumer choice. In addition, any analysis is contextual, given that the individual takes into account factors that would change the ranking in different circumstances:

4 – The individual is on a date, and he prefers to choose something according to the choice of his lady friend, given that he values her well-being more than eating something else.

True, there are neoclassical models that include risk aversion and others where one person's utility depends on another's, but the basic method is flawed; not that indifference analysis could be made more complex as to include these considerations.

Yes, the individual chooses one good or combination of goods above others, but this does not imply that he makes any quantitative analysis. In this respect, one (including the individual itself) can only say that he *more highly* values his choice than any other

[21] In other models, such as the von Neumann-Morgenstern (1944 [1953]) utility function, based on decision under risk, it could be argued that there is cardinality as determined by the use of probability.

[22] Pierre Garello (whom we thank for his valuable comments) has pointed us out that, it is true that according to the von Neumann-Morgenstern framework the cardinality consists in that the utility function representing the preferences of the decision maker are unique up to an affine transformation. Following Celcius and Fahrenheit, when the temperature goes for 2°C to 4°C we cannot claim that it is *twice* as warm, although the temperature recorded is indeed twice as high, numerically. However, the key is what we regard as *affine* transformation. In the equation above, it is cardinality, nonetheless.

alternative, but neither he nor anyone else can say by how much (quantitatively). Only ordinal utility is legitimate; not the cardinal variety thereof. There is no such measurement as a "util" or unit of happiness. To infer that this is analogous to maximizing a utility function just because both are analyses or comparisons, is the same as to equate the music with the score because both deal with the same subject.

This can be clearly seen once one analyzes how a consumer maximizes utility according to neoclassical microeconomics. In order to find how the consumer maximizes its utility by consuming optimum quantities of goods (B_1, B_2) of a specific basket, we must employ Lagrange multipliers. This is so because we assume that utility maximization is subject to a restriction, in this case a budget.

Given that the utility function $U = F(B_1, B_2)$, and the restriction (g) is given by the function $\mu B_1 + xB_2 = c$, where μ, x and c are constants, we must maximize U subjected to the aforementioned restriction.

To achieve that, we must first equate the restriction to zero:

$$c - \mu B_1 - xB_2 = 0$$

Later, we proceed to construe the Lagrangian ($\mathcal{L}$) along with the function that we propose to optimize:

$$\mathcal{L} = F(B_1, B_2) + \lambda (c - \mu B_1 - xB_2)$$

Once we specify it, we proceed to search for the partial derivatives and equate them to zero:

$$\frac{\partial \mathcal{L}}{\partial B1} = 0$$

$$\frac{\partial \mathcal{L}}{\partial B2} = 0$$

$$\frac{\partial \mathcal{L}}{\partial \lambda} = 0$$

Hence, we can infer from these the values of B_{1i}, B_{2i} y λ_i, where in B_{1i} and B_{2i} we find critical points. To learn if these are maxima or minima, we need to calculate the second derivatives:

$$\partial^2 \mathcal{L}/\partial B_1, \partial^2 \mathcal{L}/\partial B_2, \partial^2 \mathcal{L}/\partial B_1 B_2 = \partial^2 \mathcal{L}/\partial B_2 B_1$$

And, also, with these we can construe the Bordered Hessian $|\overline{H}|$, that equals the Jacobian $|J|$. We operate this way because, given the former values, if $|\overline{H}| > 0$ we can state that we found a maximum of U, or vice versa:

$$|J| = \begin{vmatrix} 0 & \frac{\partial g}{\partial B1} & \frac{\partial g}{\partial B2} \\ \frac{\partial g}{\partial B1} & \partial 2\mathcal{L}/\,\partial \mathrm{B1} & \partial 2\mathcal{L}/\,\partial \mathrm{B1B2} \\ \frac{\partial g}{\partial B2} & \partial 2\mathcal{L}/\,\partial \mathrm{B2B1} & \partial 2\mathcal{L}/\,\partial \mathrm{B2} \end{vmatrix} = |\overline{H}|$$

Where, if $|\overline{H}| > 0 \rightarrow (B_{1i}, B_{2i})$ are a maximum; and if $|\overline{H}| < 0 \rightarrow (B_{1i}, B_{2i})$ are a minimum.

Is this process analogous to actual consumer choice? Not in our view.

True enough, the individual, by weighing options that deal with money prices, does indeed resort to calculations of different kinds. However, we object to the idea that these calculations are mathematical in nature, despite the fact that numerical calculations can indeed take place. For instance, the individual may think: 'should I buy one apple at $10, or get an orange and a banana for $10 in total?' He will compare the subjective evaluation he makes of the apple at $10, and the orange and banana at the same price. His calculation considers the price (which is of course numerical) because he compares the value of both options *given* their prices, but he does not make anything worth mentioning as a mathematical calculation, or one analogous to it. Money, translated in numerical terms, confuses the issue[23]. Now consider the case of barter: if the individual must choose between exchanging a chair for an apple on the one hand, and a banana and orange on the other, it is clear that the weighing and calculation he performs is not of a mathematical nature. Rather, it is subjective, qualitative.

There is a sense in which mathematical analysis reproduces the consumer choice process, and that is in the presentation of the options available to the individual. In the example above, he faces two options: an apple at $10, and a banana and orange for $10. So, we can construct ratios between these, and this can be indeed shown in mathematical terms. But this convoluted manner of putting the matter would only be a duplication of what we can easily understand by means of words. However, this is where the analogy ends, because the consumer choice process is not a mathematical calculation, but a subjective evaluation of choices. There is no way to express, in mathematical terms, why an individual chooses one option instead of another without resorting to units of utility. This is not only so in the case of cardinal utility, but also ordinal utility. Why? Because the comparison of MUx/MUy = Px/Py is not just a presentation of rankings or orders, but an equation that gives the impression of the existence of some kind of difference in utility. That is, between option 1 and option 2, stated in mathematical terms, there is not just the

[23] In other words, commercial transactions are predicated upon *inequations*, not equations. If someone buys an apple for $10, and we present the following equation: 1 Apple = $10, that explains nothing about the value that the consumer places on the apple, nor why he is buying it. All we can know is that he values the apple he obtains *more* than the money he pays for it.

idea that option 1 is more valued than 2, but that there is a differential that consists in a specific quantity (although mathematics does not say, nor need to say, what it is). The actual consumer choice process, in our view, constitutes, instead, a heuristic method.

Utility maximization, it could be argued, is not the most important part of neoclassical theory. The latter consists of the logic behind the ordering of different bundles of goods, and that is indeed based on preference and indifference. The model contemplates certain assumptions that direct such ordering processes, such as transitivity,[24] monotonicity, etc. Insofar as the individual follows such guidelines, he will be able to choose, according to his budget and the prices of the goods, the combination of bundles that represents an optimum, that is, a maximization of utility. However, if utility maximization is not the most important part, but the ordinal ranking of different combinations is, then why do we have to resort to maximization analysis and mathematical models in the first place?

Let us be clear on this. It is perfectly legitimate to construct models in order to understand a specific subject, for example the movement of the leg despite the fact that man need not know nor think about it when moving this appendage of his.[25] But it must be a model *faithful* to the leg's movement. This is precisely what is not present in indifference analysis and utility maximization regarding consumer choice. Also, the methodological debate of the importance of the realism of assumptions is relevant here. Following Friedman (1953 [1966]), the key is not the realism of assumptions, but the capacity to predict that is the standard by which to judge a theory. The problem is that the theory in this case neither helps us predict nor understand the process. The assumptions, also, as we see are not correct.

Roderick T. Long explains on this regard:

> As an empiricist, Friedman takes a theory to explain a phenomenon if it enables us to predict the phenomenon's occurrence; whereas for Austrians, to explain economic phenomena is, in Ludwig Lachmann's phrase, 'to make the world around us intelligible in terms of human action and the pursuit of plans' (Lachmann 1977, pp. 261–62). As philosopher Peter Winch shows, these two conceptions of explanation are radically different:
>
> 'The important question for us is: in what circumstances could one say that one had *understood* this sort of behaviour? . . . Weber often speaks as if the ultimate test were our

[24] This concept is unobjectionable when it comes to height and weight. If A is taller (heavier) than B, and B is taller (heavier) than C, it follows, logically, that A is taller (heavier) than C. However, just because baseball team X beats Y, regularly, and Y overcomes Z, it by no means follows that X will outscore Z. Similarly, a person prefers apples to bananas, and bananas to carrots. We are not at all entitled to deduce from this that he will rank apples higher than bananas. The A>B choice is made at time t_1; the B>C decision occurs at time t_2. The person might have changed his tastes in the interim. Even if he did not, we still cannot infer from A>B, coupled with B>C, that A>C. Not every decision pattern is transitive, no matter how conducive to mathematics this might be. We cannot allow the mathematical dog to wag the economic tail, at least not in the dismal science. In our profession, it must be the other way around.

[25] Joke: the centipede was asked how he locomotes. He looked down, and couldn't do it anymore.

ability to formulate statistical laws which would enable us to *predict* with fair accuracy what people would be likely to do in given circumstances. . . . [But] we might well be able to make predictions of great accuracy in this way and still not be able to claim any real understanding of what those people were doing. The difference is precisely analogous to that between being able to formulate statistical laws about the likely occurrences of words in a language and being able to understand what was being *said* by someone who spoke the language. . . . [A] man who understands Chinese is not a man who has a firm grasp of the statistical probabilities for the occurrence of the various words in the Chinese language. (Winch 1990, p. 115).'

Moreover, the Friedmanite position would be on shaky ground even if predictive power were the central point of economics. Suppose it turns out that wildly false assumptions do have some predictive value; from a Misesian point of view, when we find an empirical regularity we still need a correct theory to determine whether this regularity can be expected to hold over a broad or a narrow range of circumstances. (Long (2006, 4)

IV. The Valuation of the Budget and the Concept of Equilibrium

Another point typically ignored with respect to indifference models is the value the individual places on his budget. Although it is *said* that he intends to spend all of his budget in the combinations of goods that are presented to him via different indifference curves in order to maximize his utility, it is not all but ignored that the necessary condition for any exchange to take place is that the value received (*VR,* from the combination of goods) needs to be higher than the value delivered (*VD*, generally in the form of money but may be any other commodity)[26]. This is a fundamental point, since here we must take into account the concept of *equilibrium*[27].

We are accustomed to refer to equilibrium in the Pareto sense (Wagner, 2017, 20); that is, in such situations where no individual may improve his condition without worsening that of others'. This occurs also in the individual case, where it is not possible to improve one's own situation given the context where action takes place. Nevertheless, if we must consider as the basis of any exchange that $VR > VD$, then we could say that in any exchange where $VR > VD$ it is true that *an* equilibrium is in fact taking place[28].

This is so independently of the differential (δ) that hypothetically exists between the valuations of both individuals exchanging (given that it cannot be measured), and between the valuations of the goods (or money) delivered and those received by the same individual, i.e. if $VR > VD$ holds, then the exchange will occur. Therefore, as long as it holds, $VR - VD = \delta$ is positive.

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[26] Although this is implied by the premise that the individual intends to spend the budget, its significance with respect to the concept of equilibrium and the process of choice will be explained below.

[27] It is possible that the consumer may rank possible uses of the budget in the following order (thus making the model consistent on this regard): 1) Purchasing the basket (x*, y*) in *t*; 2) Keeping the budget for *t1*; 3) Spending the budget on basket (x, y).

[28] See on this a discussion on the concept of equilibrium in the work of James M. Buchanan in Wagner (2017, 20-21).

Thus, *VD* is highly relevant, since the following scenarios may take place:

a) *VR* < *VD*, in which case no transaction would occur. Thus, the equilibrium point, where the higher possible indifference curve is tangent to the budget line, would be irrelevant. This indicates that no further exchange can take place. Nevertheless, this would be contrary to the model's assumption, i.e. that the individual intends to spend his entire budget in buying the combination of goods. This means that the model assumes implicitly that *VR* > *VD*.

b) *VR* = *VD*, and therefore no transaction would take place, given that the value placed on the goods received and the money delivered is the same. Exchange would be impossible; why would anyone bestir himself to make such a trade, given that he could not thereby improve his condition, even ex ante? Again, this would also go against the implicit assumption of the model, stated in the previous point.

c) *VR* > *VD*, being this a case where equilibrium in fact takes place.

Although indifference analysis considers the value of the budget insofar as the individual intends to attain utility maximization by spending it, it does not take into account the value of the budget as concerns equilibrium. Therefore, it pretends to support the idea that individuals will always maximize utility; that is when $VR - VD = \delta$ is the highest, where in reality the individual will always transact such that *VR* > *VD*.

These three situations demonstrate three different cases[29]: first, where the value of the budget line is above the highest achievable indifference curve (a), so the transaction does not take place and the tangency point of the highest indifference curve is irrelevant[30]; (see diagram 1).

In the second case, the value of the budget line is the same as the highest indifference curve (b), in which case a transaction is irrelevant; (see diagram 2). We cannot overemphasize the point that the tangency case depicted herein is illogical. It states that the consumer is willing to trade his entire budget for a package of goods A and B. But no rational person would ever purchase anything unless he could thereby *improve* his economic situation. And here, by hypothesis, he can do no such thing.

States Rothbard (1956) in this regard: "The concept of demonstrated preference is simply this: that actual choice reveals, or demonstrates, a man's preferences; that is, that his preferences are deducible from what he has chosen in action. Thus, if a man chooses to

[29] A critic may object to our use of graphs in order to present our idea criticizing indifference analysis and mathematical tools, while at the same time making use of these techniques. However, this is the best way to illustrate our objections within the framework of indifference analysis itself; we do so not because we think these tools are useful per se.

[30] This is because the transaction does not take place, although mathematically it is tangent. See diagram 1. But the point is that, since the budget line is valued, Un has a lower value for the individual than the budget line. Thus, no transaction takes place.

spend an hour at a concert rather than a movie, we deduce that the former was preferred, or ranked higher on his value scale. Similarly, if a man spends five dollars on a shirt we deduce that he preferred purchasing the shirt to any other uses he could have found for the money. This concept of preference, rooted in real choices, forms the keystone of the logical structure of economic analysis, and particularly of utility and welfare analysis."

And finally where the value of the budget line is below the highest indifference curve (c) (where $VR > VD$). Since the model assumes that the individual intends to spend all of his budget, then it implicitly avers that the value of the budget will be below the highest indifference curve achievable. But, as shown below (in diagram 3)[31] what about the lower indifference curves? Could it be possible that $VR > VD$ for parts of the budget line and the lower indifference curves? Could it be the case there are lower indifference curves that are valued less than the *entire* budget? What proportion of the budget is more valuable than such indifference curves? If $VR > VD$ holds, then transactions would take place (although maximization does not).[32]

However, if we assume that the highest achievable indifference curve is Un[33], we must take into account that even if the individual intends to spend all his budget (B), the utility (U) received by the combinations of goods indicated in indifference curves *Un-1, Un-2,…,Un-α*, would still indicate other possible equilibria (if transactions were made regarding them). This is so because, unless the only possible equilibrium would take place in Un (from where we infer that $VR > VD$), then in spending parts of the budget (B x p, where p is the proportion of B in order to acquire the different combinations of each indifference curve) in those combinations of goods represented by the indifference curves lower than Un it would also be the case that $VR > VD$ (in *Un-1, Un-2,…,Un-α*), after *Un-α* being the case where $VR \leq VD$, where a) and b) take place (see diagram 4).

Here we can see that there is not necessarily one possible equilibrium in the case of indifference models, but multiple possible equilibria. Moreover, this is true despite of the fact that there is only one point where utility is maximized, and where the δ between VR and VD is the highest. This is true, except in the case where we would assume that the only possible point where $VR > VD$ is Un, *indicating an unrealistic assumption given that we would be reducing possibilities of exchange almost completely*.

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[31] The superficial reader (this included one of the co-authors of this paper, at least initially) might not see any difference between diagrams 1, 2 and 3. There is a distinction, albeit a subtle one: Although all three present a case where the budget line is tangent with the highest indifference curve, in the cases shown in diagram 1 and 2 there is no transaction (given that $VR < VD$ and $VR = VD$, respectively), whereas in the case presented in diagram 3 there is.

[32] We use Buchanan's concept of equilibrium (see fn. 24) where as long as individuals exchange, there is an equilibria. Armen A. Alchian's concept of efficiency is relevant on this regard, since John R. Lott Jr. (1997, 186) wrote: "That was when Armen defined the notion of efficiency. He defined efficiency as 'Whatever is, is efficient.' If it wasn't efficient it would have been something different. Of course, if you try to change anything that is there, that is efficient too."

[33] That is, its combinations of goods deliver a level of Utility *Un*.

Let us now consider the cases in which the higher budget line crosses the two lower indifference curves in diagram 4. The traditional interpretation of such points is that they represent attainable, but inefficient, allocations of resources. Why inefficient? This is due to the fact that with that budget line, higher indifference curves are attainable. Our analysis leads in an entirely different direction. In the days of sailing ships and fortresses meant to repel them, the temperature of a cannon ball was judged too hot if spittle refused to attain contact with it. In like manner, we say that these points J and K cannot "contact" or, that is, even exist. Why not? This is due to the fact that they both depict situations where the consumer (inefficiently, to be sure) purchases a combination of goods with his budget. But, again, we run into the same difficulty: why, ever, would he do any such thing when there is no way he can improve his well-being, not even, once again, ex ante.

Diagram 4 shows two equilibria, one for the higher budget line, one for the lower. But, that is precisely what we are rejecting: equilibrium does not necessarily imply optimality in the sense of maximization. For a transaction to take place, only $VR > VD$ needs to hold. To assume that utility maximization as presented in indifference models is the standard by which individuals choose, is to assume that if no maximization is possible, the individual will not choose. But individuals may transact even if they don't maximize their utility. The fundamental condition of exchange is $VR > VD$, not that $VR - VD = \delta$, where δ is the highest level possible. We invite the reader to think if it is more sensible to assume that transactions take place whenever $VR > VD$ (including the cases where utility maximization is achieved), or *only* when utility maximization is present. Moreover, if the model pretending to show how the consumer chooses must consider only utility maximization as its standard, or the simple, universal condition of every exchange: $VR > VD$.

On the other hand, if we would assume that there are no points where $VR < VD$, therefore indicating that the budget has zero utility for the individual ($B \rightarrow U = 0$), then different equilibria would take place on every internal point of the budget line (given that the individual intends to spend his entire budget). Thus, equilibria would appear in *every* point indicated by indifference curves, *independently* of the (highest possible) curve tangent to the budget line. This is so because, despite of the fact that the individual intends to acquire more with its budget, if $VR > VD$ then any exchange could conceivably take place.

VD and *VR* are not equivalent to the objects that are traded, but rather the subjective evaluation the individual makes of the objects delivered (money or other goods in barter) and received.[34] The use of the word 'value' in *VD* and *VR* can be confusing for this reason. The individual neither delivers nor receives *a* value, but an object that is *valued*. The essence of the exchange is that he gains a value (for him) and delivers a value (that

[34] It is said that peanut butter and jelly are complements, and that beer and wine are substitutes. But even the most thorough chemical analysis of these four items will yield any such truth. Rather, this situation stems, solely, from the tastes of most people. Nor need this claim be true for all. Some people might like to mix these two beverages and drink them together. In that case, beer and wine would be complements!

he places below what he gets). The nomenclature of *VD* and *VR* are only shortcuts, abbreviations for this insight. But this important clarification must be taken into account. That is why the claim that the optimization process is described by a stopping rule is erroneous. The agent, for instance, does not sacrifice one additional unit of what he gives until *VR=VD*, because if he reaches that point, he does *not* trade any more. It is precisely because the individual will continue to trade up to the point when the decreasing marginal utility of the object he receives is above the increasing marginal utility of the object he delivers is that no optimization (in the mathematical sense) takes nor can take place. That is, even if *VR=VD* applies in only one point (where the highest indifference curve is tangent to the budget line, in a corner solution) it would be irrelevant.

This concept of equilibrium is better understood if we follow Brennan and Buchanan (1985 [2000], 29): "The economist, who conceptually observes the trading process and who sees no violations of the basic rules, can assign an 'efficient,' or 'maximum value,' label to the equilibrium result. In so doing, he is not evaluating the result against any scale external to the participants in the trade, nor is he introducing some value scale of his own."

The individual makes choices according to his subjective evaluation in the *ex-ante* sense. So, the consumer choice process itself, if it is voluntary, *only* follows the equilibrium concept in the sense of Buchanan & Brennan (1985), not the neoclassical approach.[35] Let us apply this concept of equilibrium to neoclassical analysis in order to show the problem in the model. Following Buchanan & Brennan, if no rules are violated, the outcome of the trading process is always efficient. Here, there is indeed a dissociation between the notion of equilibrium and efficiency per se, and "Within the rules, as defined, the trading outcome must always be 'efficient,' and there is no way the economist can define an 'efficient' allocation independent of trade itself. The economist is forced to bring his own evaluative criteria to bear on the rules of trade rather than on the results of trade" (Brennan & Buchanan, 1985 [2000], 29). Precisely. The rule that must not be changed is that the exchange be voluntary. The economist cannot judge efficient allocations of resources independent of this fact. This is the meaning of Rothbard's (1956 [1997]) claim that preference is only demonstrated in action (this is similar to Samuelson's revealed preference; 1938).

This is not the equilibrium concept used in neoclassical analysis but is the concept that *should* be used. By avoiding it, neoclassical analysis mistakenly equates mathematical optimization with equilibrium.

Indifference curve analysis, in its mathematical fashion, confuses marginal utility, because it makes the economist lose focus on the conceptual framework behind the law

[35] Buchanan was not an avowed Austrian economist in general, but insofar as praxeological subjectivism is concerned, he could indeed be categorized in this manner. See on this Buchanan (1969A), and Buchanan & Thirlby (1981)

of diminishing marginal utility, derived from the logical structure of the relation between the unit to be acquired or given up and the quantity of stock already available to the actor. Thus, Rothbard (1962, 24-25) explains:

> The important consideration is the *relation between the unit to be acquired or given up and the quantity of supply (stock) already available to the actor.* Thus, if no units of a good (whatever the good may be) are available, the first unit will satisfy the most urgent wants that such a good is capable of satisfying. If to this supply of one unit is added a second unit, the latter will fulfill the most urgent wants remaining, but these will be less urgent than the ones the first fulfilled. Therefore, the value of the second unit to the actor will be less than the value of the first unit. Similarly, the value of the third unit of the supply (added to a stock of two units) will be less than the value of the second unit. It may not matter to the individual *which* horse is chosen first and which second, or *which* pounds of butter he consumes, but those units which he does use first will be the ones that he values more highly. *Thus, for all human actions, as the quantity of the supply (stock) of a good increases, the utility (value) of each additional unit decreases* (emphasis in the original).

IV. The Concept of Indifference

Another relevant point, often claimed by Austrian School economists (Block, 1980, 2009A; Rothbard, 1956, 1962), is that it is not only the case that the model presents inconsistencies, but that it is also incorrect, given that there is no such thing as indifference in the field of human action. Quite the opposite, preference and only preference is revealed through action[36]. The concept of indifference with regard to human choices lacks *economic* sense[37].

On the other hand, another difference between the utility that corresponds to the budget line and the utility that corresponds to indifference curves is that the former is in an *accomplishment*, an aspect of wealth already attained, whereas the utility of indifference curves represents only *potential* utility. The latter depends on the individual exchanging and acquiring the combination of goods corresponding to the indifference

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[36] For an analysis of "Revealed Preference Theory" (which is quite different than the Austrian sense of "preference reveals itself through action"), see Samuelson (1938). For a critique of the Austrian approach to microeconomics, see Caplan (Undated, 1999, 2001, 2003), and their rebuttals by Block (1999, 2003, 2007).

[37] Callahan (2003), explains: „The crucial assumption they share is that only preferences revealed in action are relevant to the economist. Those are the preferences that played a role in actual economic activity. A psychologist or an epistemologist might have something to say about preferences not acted on, but the economist does not. No Austrian of which I am aware has ever held that the only thing going on in a person's head during the day are his preferences as revealed in his choices". On the concept of indifference in the context of specific classes of goods, see Zanotti (1990, 22). Moreover, a purely random choice in a given context may suffice, that is, the standard for choosing a unit in that context is the convenience of taking the first one at hand, since any unit of a given good is deemed good enough there. However, observe that this is different from saying that the agent is indifferent between the units, because he effectively chose one, and not the others (even if the explanation for this is that the chosen unit was the one that was most at hand).

curve. Thus, actual and potential utility are different, which renders the model even more unrealistic[38].

One of the main problems with the indifference model is that it omits the fact that there is such a thing as the value of money, i.e. a utility of the budget.[39],[40] Implicitly, the model equates exchange of goods *at market prices* with exchange of *goods*. Therefore, the model omits the subjectivity of the valuation of money during exchanges at market prices, and equates such exchanges with *direct* exchanges of goods. Murray Rothbard (1962, 236) explains:

> It is evident that, with money being used for all exchanges, money prices serve as a common denominator of all exchange ratios. Thus, with the above money prices, anyone can calculate that if one horse exchanges for five ounces and one barrel of fish exchanges for 1/20 ounces, then one horse can, indirectly, exchange for 100 barrels of fish, or for 80 dozen eggs, or 5/3 of an hour of X's labor, etc. Instead of a myriad of isolated markets for each good and every other good, each good exchanges for money, and the exchange ratios between every good and every other good can easily be estimated by observing their money prices. Here it must be emphasized that these exchange ratios are only *hypothetical*, and can be computed at all only *because of the exchanges against money*. It is only through the use of money that we can hypothetically estimate these 'barter ratios,' and it is only by intermediate exchanges against money that one good can finally be exchanged for the other at the hypothetical ratio. Many writers have erred in believing that money can somehow be *abstracted* from the formation of money prices and that analysis can accurately describe affairs 'as if' exchanges really took place by way of barter. With money and money prices pervading all exchanges, there can be no abstraction from money in analyzing the formation of prices in an economy of indirect exchange." (Emphasis added)

As an example, if someone buys a banana at $10, and an apple has a market price of $5, this does not mean that he will be able to exchange a banana for two apples, or vice versa. This is so because the first transaction was influenced by the value of money with respect to the banana, whereas at the second the banana with respect to the apples was relevant. Item A costs $5, and item B $10. That conclusion cannot be deduced from the fact that you will be able to exchange two A's for one B. This is so because market prices indicate relative prices, but you cannot deduce all possible exchanges from them. The person who pays $5 for an A may not pay $10 for a B, and vice versa.[41] The standards of value will be different in both situations, and *therefore* the transactions will be different

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[38] For an analysis of Utility and Price, see Kirzner (1963, 45-141).

[39] We note that the integration of money in Don Patinkin's (1956 [1965]) theory of value is relevant, but we do not believe changes the substance of our critique on the cases we analyze.

[40] Not only is this omitted, it is also logically incompatible with indifference curve analysis.

[41] This would only occur at equilibrium, but in the real world we are never at equilibrium, only always tending in that direction.

(given that the utilities of the coffee, newspaper and money are different).[42] However, this is precisely what is indicated at the point of tangency of the highest indifference curve possible and the budget line, i.e. the equilibrium of the consumer:

$$\frac{MUx}{MUy} = \frac{Px}{Py} \rightarrow \frac{MUx}{Px} = \frac{MUy}{Py}$$

This equation presumes to show that, at the aforementioned point the marginal utility garnered by the last unit of the budget spent on each good is the same. Therefore, it is contended, there is an equilibrium and utility maximization is attained. However, the problem is that this means equating the exchange of two goods at market prices, with the exchange of two goods by themselves (or baskets of goods). Accordingly, money and its value would be *irrelevant*[43].

According to the Austrian School, this is not the proper way of explaining consumer choice. The individual does not maximize utility when the marginal utility of the unit of the budget is *equal* to the marginal utility of the final unit of good acquired, but, rather, "when he buys even the last unit whose decreasing marginal utility exceeds the increasing marginal utility of the good delivered in exchange (for example, money)" (Cachanosky, 1986, 9[44]). The former is the case where $VR = VD$ (and where as we have seen there would be no exchange), whereas the latter is the case of $VR > VD$, i.e. the *last* case where such condition holds (and therefore exchange may take place)[45].

V. Human Action and its Standard

Indifference curve analysis also assumes that human behavior follows patterns that could be modeled by means of differential calculus and involve a continuous function (be-

[42] Another explanation is that these initial transactions took place at time t_1. It is now time t_2, and all sorts of relevant considerations might have changed. An additional one is that transitivity only holds true in mathematics. In the reality of economics, commercial transactions do not obey the dictum that things equal to the same thing are necessarily equal to each other. Again, there is the issue of profit. If, contrary to fact conditional coming up so beware, if a banana were worth exactly two apples, there are no gains to be made from trading them at par, even ex ante.

[43] Money therefore would be only relevant with respect to the quantity that could be acquired of both goods (or combinations), thus establishing the budget line which will later determine the utility maximization of the consumer with respect to the tangency to the highest possible indifference curve.

[44] Translated from the original in Spanish by the first mentioned author of the present paper.

[45] Of course, Friedrich Hayek's concept of utility is similar to the one we regard as correct. That is, the services rendered by an object or a person correspond to the use that the consumer thinks of the service he can extract from the object or person. In this respect, if the consumer acts freely, has a stable pattern of preferences and engages in rational action, he will stop his action as soon as the subjective opportunity cost of an additional action exceeds the expected gain from such action. A quantitative analysis, we must add, is an extrapolation from monetary costs (which explains the neoclassical economics derivation of demand curves by resorting to utility functions, and supply curves by using cost functions). But it is not necessary in order to make sense of utility or consumer choice in this respect.

ing the most relevant example the case of the indifference curve that presents the same utility).

However, reality is the opposite: human beings only choose and act by taking into account subjectively relevant units, i.e. discrete units. It is not the case that the individual acts according to continuous variables, but that *because* he chooses and acts with regard to variables whose units are *able* to be divided (on many occasions), it is mistakenly *inferred* that the consumer's decisions and actions take into account continuous intervals of such variables. Nevertheless, this deduction is only used as a premise in order to develop models and use differential calculus as to build curves and be able to derivate (with the purpose of analyzing the options of the acting agent and determine, identify and predict utility maximization points, etc.). However, it is not implicit *in* human action.

This is so because the individual does not obtain utility based on infinitesimally small proportions of the same unit, given that there are no units of utility per se and received utility is obtained from the consumption of the *relevant* unit, *as* a unit (not of its fragments)[46]. The only thing actually identified in human action are specific points in the Cartesian plane, where action effectively takes place (e.g. the acquisition of a specific quantity of goods obtained by means of the exchange of a determinate amount of money).

That it is intended to identify other points in the plane in relation to the one (or ones) that effectively take place only implies that the intention is to justify the *model*, not *to* accurately depict human action. The curves are built based on imaginary units such as those of utility and the existence (or *relevancy*) of fragments of such units are merely assumed. Such units are abstractions impossible to quantify and merely descriptive of a pretended identification of human behavior. We cannot continue the reasoning and assimilate to such non-existent, unquantifiable and abstract units, fragments of itself in order to build a theory by using mathematical tools, differential calculus, and planes with continuous functions, and pretend to be making *real* analyses of human action[47].

The fundamental mistake is to take human behavior as quantifiable based on hypothetical abstract units, as if these were real.[48] This error repeats itself both in the theory of cardinal utility and in that of ordinal utility (as presented in Neoclassical

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[46] Although the consumption of a unit implies the consumption of all the parts of such unit, this is not relevant to the individual at the time of making *economic* decisions.

[47] A critic may say that this type of analysis does not pretend to be realistic, but rather useful to understand some aspects of reality. However, we reject both claims.

[48] According to Friedman (1956), unrealistic assumptions should be no bar to economic theories; prediction, not accuracy, is the desiderata. One would be hard pressed, however, to come up with a prediction based on indifference curve analysis. In this regard, even when public finance literature uses this technique to make predictions, such as that people save more given higher interest rates, this is hardly a conclusion that can be reached only by means of indifference analysis. For support of Friedman, see Boland (1979). For a critique, see Rappaport (1986).

Microeconomics)[49]. This is because the utility received by baskets of goods, or units of goods, only shows the utility attained. And this utility is received *a posteriori* of choosing the acquisition of the goods in specific (discrete) quantities. We cannot deduce from this fact the existence of fragments of such utility or that these necessarily exist only because utility was received through consumption, given that such consumption may not be separated nor could be made so under certain circumstances (some goods cannot be divided in order to consume them).

For instance, if a person eats a slice of pizza, it is not that the utility received came separately from the cheese and the bread, but rather from both at the same time[50]. If he ate them separately, they would be two different goods, and no longer a slice of pizza[51]. We face a *non sequitur*, because from the fact that utility is received through the consumption of a combination of goods we cannot deduce that such utility is quantifiable, comparable in numerical terms nor much less explained in its nature by continuous functions and able to be modeled through the differential calculus.

The Austrian approach has been criticized by none other than Robert Nozick (1977), who claimed that the Law of Marginal Utility requires "indifference" among each unit. This is so, he claimed, because in order to substitute one unit for another, one needs to be "indifferent" among them.

However, this is a mistake, as Zanotti (1990, 22) explains:

> Nozick has objected that from the fact that one person chooses *a* does not imply that it does not want nor prefer *b*. It is true. But our contention that every action implies choosing between *a* and *b* does not mean deducing that the person does not prefer *b*, rather that since not every necessity could be satisfied at the same time, then the acting agent must create a value scale and set his priorities, according to which he will option. Perhaps, respect to this observation by Nozick we may say that every action implies to choose between *a* and *non a.*[52]

Indifference (although having psychological implications), has no economic relevancy whatsoever.

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[49] The Austrian approach on ordinal utility is different. See Klein (2012), C. Menger (1871), K. Menger (1973), Mises (1933), and Rothbard (1962).

[50] The consumer may indeed say that he enjoyed the cheese more than the bread of the pizza, but he cannot quantify it by separating their "utilities". Only an ordinal analysis is correct, coherent, not a cardinal one.

[51] Another example is to assume that the utility reported by the use of a pair of shoes implies that, if only one shoe would be used then it will report half of the latter's utility, when it most likely be useless without the other shoe. Therefore, it would provide low or zero utility.

[52] Translated from the original in Spanish by the first mentioned author. Other critics of Nozick on this matter include Block (1980). Hoppe (2005) reject's Block's analysis. Block (2009A) and Barnett & Block (2010) respond to Hoppe (2005).

VI. Conclusion

As we tried to show throughout this work, the neoclassical model of consumer choice is not able to properly explain human action nor decision-making processes. In the spirit of lending rigorousness to its conclusions by adding mathematics, it only ends up confusing the student of economics and obscuring the proper understanding of social phenomena.

While it could be unwise to rule out mathematics as a tool in order to explain phenomena in the social sciences, it is equally unwise to over-mathematize the science of economics in order to bring an illusion of certainty (Herbener, 1996; Leoni & Frola, 1977; Mises, 1938, 1949, 1953). Economic theory can certainly be expanded and illustrated by the use of mathematical models (Moorhouse, 1993), but this does not mean that mathematics can *replace* theory altogether.

Indifference curves and budget constraints models deal with unquantifiable abstractions such as utility, pretending to mathematize it through utility maximization analysis. They also omit the value of money and make use of the concept of indifference, which has no economic relevancy. All these mistakes appear due to the obsession of neoclassical economics with mathematics. An alternative explanation, is what Fritz Machlup (1956) correctly defined as the "inferiority complex of the social sciences".

Since consumer choice is at the core of economics, it is of the utmost importance to renew its study *as* economic theory, and overcome the mistakes of the past. Economics is not a branch of mathematics, but mathematics is a tool in order to *aid* economic theory.

What should replace the neoclassical model? The best candidate is the Austrian School, with its understanding of the heuristics of the consumer choice process, that is of a qualitative, and not quantitative, nature. The evaluation phase of the decision is the key to understanding consumer choice, and this is an entrepreneurial dimension that neoclassical economics does not consider. As entrepreneurs, consumers make decisions in the *ex-ante* sense in order to attain the highest end possible in their value scale, given the means at their disposal. However, also as entrepreneurs, they check *ex post* to determine if the outcome was gainful, or if they experienced a loss, and then act accordingly in the next iteration. That is, consumer choice is a process of trial and error, guided by the ordinal ranking of ends and a continuous process of checking profit and loss. Preferences are continually tested in the market, and utility is not a fixed unit. This is why the consumers tend to be open to new products and services, and why they sometimes regret their previous choices.

Mathematics may try to build models to emulate the choice process, but it is incapable of transmitting the essential of consumer choice: a non-quantitative process that is guided by conceptual evaluation and contextual considerations, where the key is that the consumer will try to achieve the best outcome on the basis of his means, but not as the result of an analysis analogous to a utility function maximization.

The decision process consists of two phases, setting the problem and evaluating what course of action to take[53]. The former is the one that involves the entrepreneurial dimension, and neoclassical economics takes it as a given. The latter is the one analyzed by neoclassical economics, and which has all the problems we have reviewed in this work. Hence, this approach does not help us understand consumer choice, neither its context nor its evaluation process.

It is of the utmost importance to bring back theory[54] to the center of economic science, and use mathematics only for its proper role: a subservient tool.

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[53] We owe this distinction to Pierre Garello.

[54] See Rothbard (1957, 1997), Selgin (1988) and Smith (1999).

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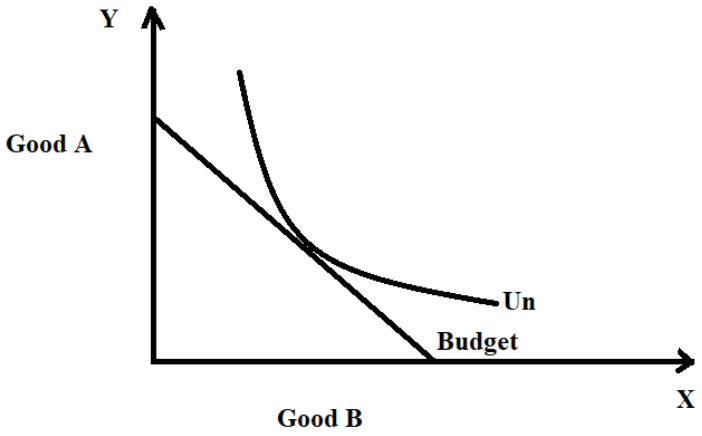
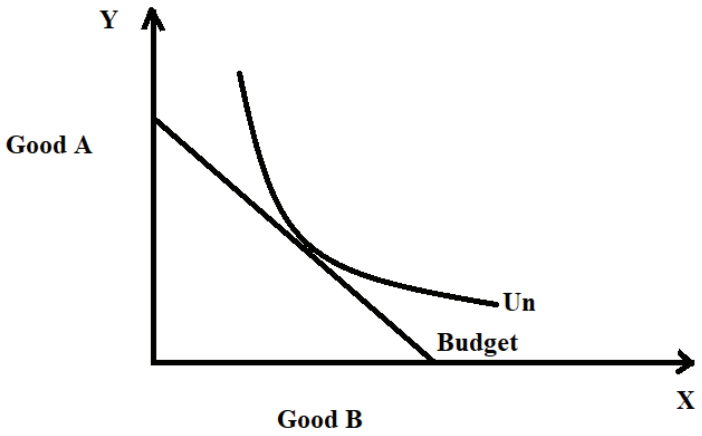
Diagram 1



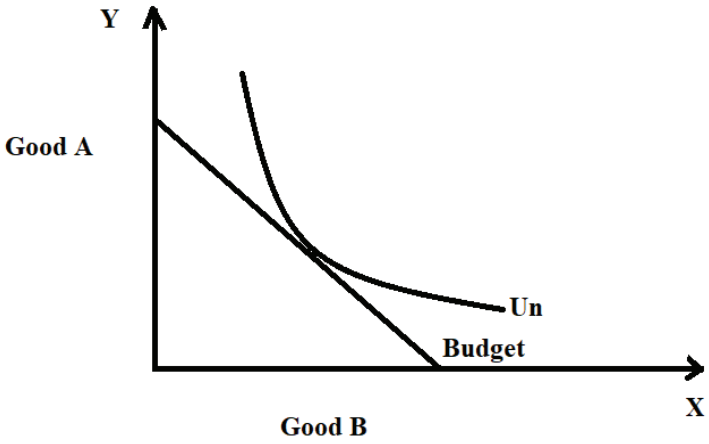
VR < VD → No Transaction

Diagram 2



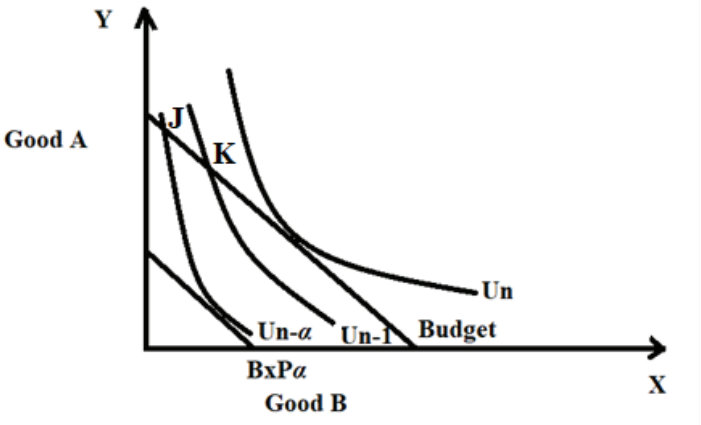
VR = VD → No Transaction (Irrelevant)

Diagram 3



VR > VD → Transaction

Diagram 4



Budget tangent with Un → VR > VD → Transaction

BxP1 tangent with Un-1 → VR > VD → Transaction

BxP(α+1) tangent with Un-(α+1) → VR > VD → Transaction

BxPα tangent with Un-α → VR < VD or VR = VD → No Transacti