The Rationale for the Importance of the Rational Choice Theory in Contemporary Economics

Dragan Miljkovic*

Abstract

Rational choice theory is pragmatically used by mainstream economics to explain and defend the existence and behavior of prevailing social and economic institutions as being optimal. Every deviation in actual individual and institutional behavior from the optimum is attributed to imperfections in the agents’ ability to pursue the optimal actions rather than the implausibility of the underlying norms in rational choice theory. It is shown in the paper that all axioms of rational choice are routinely violated in both market and non-market economic systems and in the capitalist and transitional socio-ideological settings. Thus rational choice defies three propositions that can be adequately accounted for only by realism: (1) There are many truths about the world that we will never know and have no way of finding out; (2) some of our beliefs are false and will never be discovered to be so, and (3) if a belief is true, it would be true even if no one believed it. If individual choice behavior is indeed unpredictable, no normative theory (including rational choice) or generalized positive theories (such as prospect theory) can individually come close to explaining or predicting it. Then, if rational choice (and other normative theories) is to credibly serve its mission of explaining, justifying, and preserving the prevailing economic institutions, economists may as well simultaneously use prospect theory or similar positive theories of individual choice to complement the normative theories of institutional behavior in order to enhance their usefulness.
Key words: individuals, institutions, positivism, rational choice, social norms

1. Introduction

Economics, as a social science, is always a reflection of truths, values, and norms prevailing in a given society. Economists choose mostly to ignore any departure from normative theories. The most striking example supporting this claim in the capitalist, market type of economy is the incredible resilience of the perfect rationality hypothesis. It comes as a no surprise that people in other disciplines, including behavioral and cognitive scientists whose focus is on actual or observed behavior, have a hard time following the abstract normative nature of rational choice theory and its implications in economics. Given the exclusive nature of the guild of economists with some stringent unwritten rules (e.g., too much deviation from the mainstream implies radicalism with all negative implications this word may have), it was up to a few non-economists to make major contributions in the area of individual choice and imperfect rationality and to link them to economic behavior (e.g. Kahneman and Tversky, 1979; Simon, 1955, 1982, 1997; Slovic and Lichtenstein, 1983; Tversky and Kahneman, 1981, 1982, 1992; Tversky, Slovic, and Kahneman, 1990). However, while some of these contributions were recognized, the mainstream economics remain defiant in firmly defending something that, “rationally speaking,” cannot be defended.

Kahneman (1994) noted that economic theory of rational choice supports a very dichotomous notion of rationality. Rational choice is very permissive in some respects, e.g., economic rationality does not rule out extreme risk aversion in small gambles, although this attitude almost necessarily yields inferior aggregate outcomes. At the same time, economic rationality is taken to be synonymous with flawless intelligence. Therefore, a critic of the rationality assumption faces an uphill battle against some well-
fortified “enemy” for several reasons: (1) a definition of rationality which appears to be too permissive in some very important aspects; (2) a willingness of choice theorists to make the theory even more permissive, whenever needed to accommodate apparent violations of its requirements; (3) a methodological position that treats rationality as a maintained hypothesis making it thus very difficult to disprove; and, (4) an apparent readiness to assume the behavior that has not been proved to be irrational is highly intelligent.

In this paper it is hypothesized that institutions, both public and private, within an economic system are products of that system and as such are evaluated using standards and norms defined by the system. For example, markets were created through the process of social evolution to facilitate the exchange of goods. Since trading goods and services in a market is often volatile due to various systemic and non-systemic disturbances (e.g., emergence of speculators in the market, natural or man-caused catastrophic events, etc), institutions regulating the behavior of agents involved in trading (e.g., trading commissions, central banks and their policies, legal institution such as commerce courts, etc) were created by democratic or non-democratic means. These controlling or regulatory institutions were created to prevent the market from achieving the “invisible hand” outcomes. The paradox of this situation is that rational choice theory is at the very core of market economics, but so is justifying the existence of all of these controlling and regulatory institutions. Hence, the very existence of the institutions often depends on their performance measured by the indicators compatible with the values, truths, and norms in that society and economy. On the other hand, individuals’ behavior may or may not be influenced by the social norms, i.e., it may or may not be dependent on them. What is certain is that individuals are not perfectly rational, i.e., there is no such thing as *homo economicus* (Kahneman and Tversky, 1979). Also, the consequences of not adhering to the optimization processes that are a derivative of perfect rationality
hypothesis will rarely shatter one’s life or alter her future behavior significantly. That is mostly due to a very large number of goals and decisions made by an individual at any given time, a lack of knowledge and information, and inability to process the available information perfectly (Geanakoplos, 1989). As such, actual rather than optimal individuals’ behavior should be considered and possibly manipulated in the decision making process of public or private institutions in order to improve their performance and to secure their survival.

The reason why actual rather than optimal individuals’ behavior is relevant can be rationalized on the grounds that even the choices of rational individuals do not necessarily translate through consensus, majority voting, or (especially) dictatorial decrees into a well-defined group preference. This phenomenon called Condorcet’s paradox had been observed a long time ago (in late 18th century) by French philosopher and mathematician Condorcet, but it was formalized in economics science by Kenneth Arrow (1951) in his famous Arrow’s Theorem which asserts that Condorcet’s paradox is a problem for any “reasonable” method of aggregating individual preferences into group preferences. Hence institutions created by individuals via either democratic processes, force, or simply being a product of social evolution are unlikely to consistently provide or lead towards outcomes implied by rational choice.

We describe in the second section the foundations of the theory of rational choice and then show the experimental evidence of invariable failure of the most basic rules of the theory when applied to individual choice behavior of people living in market economies. In the third section we show experimental evidence that perfect rationality is equally violated by individuals in non-market economies, and that choice-behavioral patterns of both groups of individuals are very similar. It is experimentally demonstrated in the fourth section that institutional decision making in market economies does not always follow the rational choice pattern either. In the fifth section it is demonstrated that since institutional behavior is evaluated according to prevailing social norms, it is
only rational for public and private institutions to constrain their goals with actual or observed individual behavior. The sixth section concludes the paper.

2. The Theory of Rational Choice and Its Failures in Individuals in Market Economies

Von Neumann and Morgenstern (1944) are considered major contributors to the theory of decision under risk by deriving the expected utility rule from a set of simple principles of rational choice that make no reference to long-run considerations. The axiomatic analysis of the foundations of expected utility reveals six assumptions: four substantive assumptions are consistency (cancellation), transitivity, dominance, and invariance, and two technical assumptions are continuity and comparability. We will describe and order the substantive assumptions by their normative appeal. First is the consistency (cancellation) condition which has been challenged by several economists, last is the invariance (extensionality) condition which has been accepted by almost all economists.

The first of the key qualitative properties that give rise to expected utility theory is consistency (cancellation) or elimination of any state of the world that yields the same outcome regardless of one’s choice. This notion has been captured by different formal properties, such as the substitution axiom of von Neumann and Morgenstern (1944), the extended sure-thing principle of Savage (1954), and the independence condition of Luce and Krantz (1971).

The second basic assumption in models of both risky and riskless choice is the transitivity of preferences. This assumption is a necessary and basically sufficient condition for the representation of preference by an ordinal utility scale $u$ such that $A$ is preferred to $B$ whenever $u(A) > u(B)$. Thus transitivity is satisfied if it is possible to assign to each option a value that does not depend on the other available options.
Transitivity is likely to hold when the options are evaluated separately but not when the consequences of an option depend on the alternative to which it is compared.

Dominance is the third and probably most obvious principle of rational choice. It states that if one alternative is better than another in one state and at least as good in all other states, the dominant alternative should be chosen. A slightly stronger condition is called stochastic dominance. It states that, for unidimensional risky prospects, $A$ is preferred to $B$ if the cumulative distribution of $A$ is to the right of the cumulative distribution of $B$. Dominance is more compelling and simpler than transitivity or consistency, and it serves as the cornerstone of the normative theory of choice.

The last substantive condition in a normative theory of choice is the principle of invariance or extensionality (Arrow, 1982; Kahneman and Tversky, 1979). It states that different representations of the same choice problem should yield the same preferences. In other words, the preferences between options should be independent of their description. Two characterizations that the decision maker would view as alternative descriptions of the same problem should lead to the same choice. The principle of invariance is so basic that it is normally assumed in the characterization of alternatives rather than explicitly stated as a testable axiom. For instance, decision models that describe the objects of choice as random variables all assume that alternative representations of the same random variables should be treated alike. Invariance captures the normative intuition that variations of form that do not affect the actual outcomes should not affect the choice.

2.1 Failure of Principles of Rational Choice

This experiment is from Tversky and Kahneman (1981). The subjects in the study were undergraduate students at the University of British Columbia and the University of California. Chance events were realized by drawing a single marble from a bag containing a specified number of favorable and unfavorable marbles. To encourage
thoughtful answers, one-tenth of the participants were randomly selected and given an opportunity to play the gambles they chose. The same respondents answered problems 1-3, in that order.

Problem 1 (N = 77). Which of the following options do you prefer?
A. a sure gain of $30 [78%]
B. 80% chance to win $45 and 20% chance to win nothing [22%]

Problem 2 (N = 81). Which of the following options do you prefer?
A. 25% chance to win $30 and 75% chance to win nothing [42%]
B. 20% chance to win $45 and 80% chance to win nothing [58%]

It is obvious that problem 2 is obtained from problem 1 by reducing the probabilities of winning by a factor of four. In expected utility theory, due to consistency (cancellation) property, a preference for A over B in problem 1 implies a preference of C over D in problem 2. As we can see that was not the case in this experiment. The majority preference switched from the lower prize ($30) to the higher one ($45) when the probabilities of winning were substantially reduced. Tversky and Kahneman call this phenomenon the certainty effect because the reduction of the probability of winning with certainty to 0.25 has a greater effect than the corresponding reduction from 0.8 to 0.2

Many theorists tried to normatively rationalize for the presence of the certainty effect by relaxing the consistency rule (e.g., Machina, 1982; Quiggin, 1982). However, problem 3 illustrates a related phenomenon called the pseudocertainty effect that cannot be accommodated by relaxing consistency, because it also involves a violation of invariance.

Problem 3 (N = 85). Consider the following two stage game. In the first stage, there is 75% chance to end the game without winning anything, and a 25% chance to move into the second stage. If you reach the second stage you have a choice between:

E. a sure win of $30 [74%],
F. 80% chance to win $45 and 20% chance to win nothing [26%].
Your choice must be made before the outcome of the first stage is known.

Because there is one chance in four to move into the second stage, prospect E offers a 0.25 probability of winning $30, and prospect F offers 0.25 x 0.80 = 0.20 probability of winning $45. Problem 3 is thus identical to problem 2 in terms of probabilities and outcomes. But, as we could see, due to different framing of the problems, the preferences in the two problems differ: most experiment subjects made a risk-averse choice in problem 3 but not in problem 2. Tversky and Kahneman call this phenomenon the pseudocertainty effect because an outcome that is actually uncertain is treated as if it were certain. The framing of problem 3 as a two-stage game encourages respondents to apply cancellation, i.e., the event of failing to reach the second stage is discarded prior to evaluation because it yields the same outcomes in both options. In this framing, problems 3 and 1 are evaluated alike.

An example of the violation of dominance is taken from Tversky and Kahneman (1986, p. S263). They find that when there is a non-transparently framed problem, there is a great chance that both invariance and dominance will be violated.

Problem 4 (N = 88). Consider the following two lotteries, described by the percentage of marbles of different colors in each box and the amount of money you win or lose depending on the color of a randomly drawn marble. Which lottery do you prefer?

<table>
<thead>
<tr>
<th>Option A [0%]</th>
<th>90% white</th>
<th>6% red</th>
<th>1% green</th>
<th>1% blue</th>
<th>2% yellow</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0</td>
<td>win $45</td>
<td>win $30</td>
<td>lose $15</td>
<td>lose $15</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Option B [100%]</th>
<th>90% white</th>
<th>6% red</th>
<th>1% green</th>
<th>1% blue</th>
<th>2% yellow</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0</td>
<td>win $45</td>
<td>win $45</td>
<td>lose $10</td>
<td>lose $15</td>
<td></td>
</tr>
</tbody>
</table>
It is obvious to see that option B dominates option A: for every color the outcome of B is at least as good as the outcome of A. Thus participants (all of them) had no problem in choosing B over A. This is an expected outcome given that the relation of dominance is very transparent.

Problem 5 is effectively identical to problem 4. It is framed, however, in such a way that colors yielding the same outcomes (yellow and blue in A and red and green in B) are combined. This kind of operation is very often performed by the decision makers if no dominated prospect is detected.

Problem 5 (N = 124). Which lottery do you prefer?

Option C [58%]
- 90% white
- 6% red
- 1% green
- 3% yellow
- 0$ win $45 win $30 lose $15

Option D [42%]
- 90% white
- 7% red
- 1% green
- 2% yellow
- 0$ win $45 lose $10 lose $15

The formulation of problem 5 did two things: simplified the options, i.e., there are four rather than five colors of marbles in each box, and masked the relation of dominance. At the same time, the attractiveness of option C was enhanced by having two positive and one negative outcome relative to two negative and one positive outcome in D. That, in all likelihood, led 58 percent of participants to choose the dominated alternative C. The results of problems 4 and 5 suggest that two formulations of the same problem elicit different preferences, in violation of invariance. Also, the dominance rule holds when its application is transparent, but not when the dominance is masked by a frame in which the inferior option yields a more favorable outcome in an identified state of the world (such as drawing the green marble in problem 5).

Finally, there were numerous studies that demonstrated the failures of transitivity (e.g., Tversky, 1969; Slovic and Lichtenstein, 1983; Tversky, Slovic, and Kahneman,
These studies hypothesized that, where the structure of the choice set permitted, it would be simpler to compare alternatives dimension by dimension than to evaluate the combined worth of each alternative separately (across dimensions) and then compare these overall evaluations. Furthermore, small differences (for example, below some threshold of discrimination) are likely to be ignored, even for an important dimension.

Tversky (1969) tested and confirmed these hypotheses by creating sets of gambles in which this sort of information processing led to systematic, predictable intransitivities. Gambles in his study contained only two dimensions, the probability of winning and the amount to win. For his experiment the participants’ probability was the dominant dimension. However, if the difference between gambles was small, then the amount to win controlled the decision. Then, given the set of gambles \(a, b, c, d,\) and \(e\) with probabilities of \(7/24, 8/24, 9/24, 10/24,\) and \(11/24\) to win \$5.00, \$4.75, \$4.50, \$4.25, \$4.00 respectively, \(a\) was generally chosen over \(b, b\) over \(c, c\) over \(d,\) and \(d\) over \(e,\) presumably because the difference in payoffs outweighed the slight difference in probabilities within each of these pairs. However, \(e\) was typically chosen over \(a\) because of the relatively large difference in probabilities. The intransitivities in this case arose from the tendency of subjects (participants) to compare gambles on each dimension. If they had combined dimensions and made holistic evaluations separately for each gamble and compared these to determine their choices, then the intransitivities would not have occurred. Comparison within dimensions is a natural way to choose among multidimensional objects.

3. The Theory of Rational Choice and Its Failures in Individuals in Non-Market Economies

All experiments mentioned in the previous section were conducted among undergraduate students in U.S. and Canadian universities. Thus the assumption is that a vast majority of them grew up and lived all their lives only in capitalist, market
economies. However, this fact should have nothing to do with individual choice since it is assumed in rational choice theory that perfect rationality is an intrinsic (natural) rather than learned behavior. We have already seen that all four substantive conditions of rational choice are readily violated in experiments including subjects from market economies. In order to test the intrinsic nature of these substantive conditions, we replicated the same experiments among subjects in transition, non-market economies, namely among undergraduate students in Serbian and Bosnian universities. But notice that this is a tricky issue: if the behavior of these subjects is, statistically speaking, the same as the behavior of the subjects in Tversky and Kahneman (1981, 1986) than we may conclude that, based on such consistency, we indeed have the intrinsic behavior present. Only such intrinsic behavior of individuals is not consistent with the rational choice hypothesis. On the other hand, if the behavior of subjects in this study turns out to be consistent with the rational choice hypothesis than the perfect rationality may be, after all, the natural way the individuals behave. The only difficulty left if such a finding is obtained, would be to explain where the differences in individual behavior between the two groups of people came from. Keeping that in mind, these experiments are also conducted to make a contribution to the literature as a means of showing their comparative cultural effects.

The results of the experiments are below. Notice that experiments are ordered in the same way as in the previous section in order to facilitate comparisons. The same subjects participated in all the experiments.

Problem 1.a (N = 60). Which of the following options do you prefer?
C. a sure gain of $30 [85%]
D. 80% chance to win $45 and 20% chance to win nothing [15%]

Problem 2.a (N = 60). Which of the following options do you prefer?
C. 25% chance to win $30 and 75% chance to win nothing [30%]
D. 20% chance to win $45 and 80% chance to win nothing [70%]
The violation of consistency here is even more obvious than in Tversky’s and Kahneman’s experiment. More importantly, there is no statistical difference in behavior of the two subject groups.

Problem 3.a (N = 65). Consider the following two stage game. In the first stage, there is 75% chance to end the game without winning anything, and a 25% chance to move into the second stage. If you reach the second stage you have a choice between:

G. a sure win of $30 [77%],
H. 80% chance to win $45 and 20% chance to win nothing [23%].

Your choice must be made before the outcome of the first stage is known.

The result of this experiment, statistically speaking, is not different from the result reported in problem 3. We can see in this example that due to different framing a so called pseudocertainty effect takes place and the invariance is violated, i.e., problems 2.a and 3.a, although virtually same, are evaluated differently.

Problem 4.a (N = 62). Consider the following two lotteries, described by the percentage of marbles of different colors in each box and the amount of money you win or lose depending on the color of a randomly drawn marble. Which lottery do you prefer?

Option A [0%]

<table>
<thead>
<tr>
<th>%</th>
<th>White</th>
<th>Red</th>
<th>Green</th>
<th>Blue</th>
<th>Yellow</th>
</tr>
</thead>
<tbody>
<tr>
<td>90%</td>
<td>6%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>2%</td>
</tr>
<tr>
<td>$0</td>
<td>win $45</td>
<td>win $30</td>
<td>lose $15</td>
<td>lose $15</td>
<td></td>
</tr>
</tbody>
</table>

Option B [100%]

<table>
<thead>
<tr>
<th>%</th>
<th>White</th>
<th>Red</th>
<th>Green</th>
<th>Blue</th>
<th>Yellow</th>
</tr>
</thead>
<tbody>
<tr>
<td>90%</td>
<td>6%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>2%</td>
</tr>
<tr>
<td>$0</td>
<td>win $45</td>
<td>win $45</td>
<td>lose $10</td>
<td>lose $15</td>
<td></td>
</tr>
</tbody>
</table>

Problem 5.a (N = 62). Which lottery do you prefer?

Option C [50%]

<table>
<thead>
<tr>
<th>%</th>
<th>White</th>
<th>Red</th>
<th>Green</th>
<th>Yellow</th>
</tr>
</thead>
<tbody>
<tr>
<td>90%</td>
<td>6%</td>
<td>1%</td>
<td>1%</td>
<td>3%</td>
</tr>
<tr>
<td>$0</td>
<td>win $45</td>
<td>win $30</td>
<td>lose $15</td>
<td></td>
</tr>
</tbody>
</table>
Option D [50%]

<table>
<thead>
<tr>
<th>90% white</th>
<th>7% red</th>
<th>1% green</th>
<th>2% yellow</th>
</tr>
</thead>
<tbody>
<tr>
<td>0$</td>
<td>win $45</td>
<td>lose $10</td>
<td>lose $15</td>
</tr>
</tbody>
</table>

Here again, when the same problem was presented in a transparent way (problem 4.a) it was easy for the participating subjects to choose the dominant lottery. When the transparent formulation was substituted with non-transparent formulation of the problem in 5.a, we saw the violation of both dominance and invariance. These results were statistically not different from the results in problems 4 and 5.

The results of these experiments confirm that choice behavior of individuals in market and non-market economies is statistically identical but inconsistent with substantive assumptions of the rational choice theory. Thus intrinsic or natural choice behavior among individuals exists but cannot be identified with perfect rationality. The only theory of choice capable of explaining the failures of all four substantive conditions in normative rational choice theory is prospect theory (Kahneman and Tversky, 1979; Tversky and Kahneman, 1992). However, it is a purely positive choice theory. It can be briefly summarized as follows. Value is assigned to gains and losses rather than to final assets, i.e., the objects of choice are prospects framed in terms of gains and losses. Probabilities are replaced by decision weights. The valuation rule is two-part cumulative functional. The value function is normally concave for gains and convex for losses (S-shaped). It is generally steeper for losses than for gains. The weighting function is inverse S-shaped. Decision weights are generally lower than the corresponding probabilities, except in the range of low probabilities. For instance, overweighting of small probabilities contributes to the popularity of both insurance and lottery. On the other hand, underweighting of high probabilities contributes both to the prevalence of risk aversion in choices between probable gains and sure things, and to the prevalence of risk seeking in choices between probable and sure losses. Risk aversion for gains and
risk seeking for losses are further enhanced by the curvature of the value function in the
two domains. The pronounced asymmetry of the value function, which is in this theory
labeled as loss aversion, explains the extreme reluctance to accept mixed prospects. The
shape of the weighting function explains the certainty effect. It also explains why this
phenomenon is most readily observed at the two ends of the probability scale, where the
curvature of the weighting function is most pronounced.

To quote Arrow (1982), “The most damning criticism of risk-benefit analysis
from experiments is the evidence for what Tversky and Kahneman (1981) have called
framing.” Because framing effects and the associated failures of invariance and
dominance are ubiquitous, no adequate positive theory of choice can ignore these
phenomena. Likewise, because invariance and dominance are normatively indispensable,
no adequate prescriptive theory should permit its violation! Consequently, it seems that
the dream of constructing a theory that is acceptable both positively and normatively
appears unlikely or even unrealizable (Miljkovic, 2005).

4. Institutional Choice and Perfect Rationality

It is argued here that institutions within an economic system are products of that
system and are therefore evaluated using the norms existing in that system. This holds
for both private and public institutions. In a market capitalist economy they would
include not only the mix of private enterprises, but also state enterprises, policy making
and social planning entities. In terms of their choice behavior all of these entities are
inevitably optimizers: profit maximizers, cost minimizers, social welfare maximizers, or
some other type of the rent seeking optimizers. And the system in which they operate is
set in a way that they must be optimizers. After all, there are always alternative goods or
services on the market offered by other producers or eager decision-makers wanting to
alter current policies. The only problem with this concept is that all of these institutions
are evaluated based on the premise of perfect rationality and consequential optimization,
while their actual choice behavior may not be rational at all. Each of these institutions has the same “irrational” individuals as the decision and policy makers. There is no obvious reason why these individuals would be able to have more knowledge and information, or be able to process the available information more accurately in their professional than in their private lives. This point is illustrated with another series of experiments similar to those conducted in sections 2 and 3. The problems 6-11 are from Miljkovic (2005).

The over-weighting of outcomes that are obtained with certainty relative to outcomes that are merely probable gives rise to violations of the expectation rule (Allais, 1979; Tversky and Kahneman, 1981). The same respondents (n = 76) answered problems 6 and 7, which illustrate the violation of consistency. A number in brackets following each question indicates the percentage of respondents who chose that particular answer. The text preceding the questions asked in problems 6 and 7 is identical.

**Problem 6 (n = 76)**

There is a bakery in the city producing and selling Christmas fruitcake. You are the sales manager of the bakery and your job is to sell the fruitcake. You must choose only one out of two different box types for your fruitcake. Both box types are designed to carry the same weight. Box type X is modest looking and box type Y is very fancy looking. Which box type would you choose considering that initial market screening led you to believe that:

*a* if you use box type X the bakery will make a sure profit of $10,000 selling the fruitcake, [63%]

*b* if you use box type Y there is 80% chance the bakery will make a profit of $15,000 and 20% chance the bakery will make no profit (will break even) selling the fruitcake? [37%]

**Problem 7 (n = 76)**

c) If you use box type X there is 25% chance the bakery will make a profit of $10,000 and 75% chance the bakery will make no profit (will break even) selling the fruitcake, [33%]
If you use box type Y there is 20% chance the bakery will make a profit of $15,000 and 80% chance the bakery will make no profit (will break even) selling the fruitcake? [67%]

Just like in problems 1 and 2, we can see the violation of consistency due to the certainty effect because the reduction in the probability of making a $10,000 profit from certainty to 0.25 has a greater effect than the corresponding reduction of the probability of making $15,000 profit from 0.8 to 0.2 whereas in the expected utility theory a preference for a over b in problem 6 implies a preference for c over d in problem 7.

The failure of transitivity due to preference reversal is presented next. It is hypothesized in the next experiment that, where the structure of the choice set permits, it is simpler and more natural to compare the alternatives dimension by dimension than to evaluate the combined worth of each alternative separately and then compare these overall evaluations. We believe, furthermore, that small differences (e.g., below some threshold of discrimination) are often ignored even for an important dimension.

**Problem 8 (n = 73)**

There is a bakery in the city producing and selling Christmas fruitcake. You are the sales manager of the bakery and your job is to increase the sales of the fruitcake. There are indications that a supermarket chain from the city is willing to purchase all of the bakery’s fruitcake if an agreement about price could be reached. Preliminary negotiations led you to believe that:

- **a)** There is 12/22 probability the supermarket chain will purchase the fruitcake at $20.00 per box,
- **b)** There is 13/22 probability the supermarket chain will purchase the fruitcake at $19.00 per box,
- **c)** There is 14/22 probability the supermarket chain will purchase the fruitcake at $18.00 per box,
- **d)** There is 15/22 probability the supermarket chain will purchase the fruitcake at $17.00 per box,
- **e)** There is 16/22 probability the supermarket chain will purchase the fruitcake at $16.00 per box.
What would be your decision if you have to choose between:

1. (a) or (b)
2. (a) or (c)
3. (a) or (d)
4. (a) or (e)
5. (b) or (c)
6. (b) or (d)
7. (b) or (e)
8. (c) or (d)
9. (c) or (e)
10. (d) or (e)
11. (b) or (a)
12. (c) or (a)
13. (d) or (a)
14. (e) or (a)
15. (c) or (b)
16. (d) or (b)
17. (e) or (b)
18. (d) or (c)
19. (e) or (c)
20. (e) or (d).

Alternatives in this experiment contain only two dimensions: probability of purchase and price per box. The expected values (not indicated to the participants of the experiments) are $10.91, $11.23, $11.45, $11.59, and $11.64 for the alternatives a, b, c,
\(d\), and \(e\) respectively. Since the present design renders the evaluation of payoff differences easier than that of probability differences, it is hypothesized that at least some experiment participants would ignore small probability differences, and choose between adjacent alternatives on the basis of the price.\(^8\) However, since the expected value is negatively correlated with the price, it is further hypothesized that for alternatives lying apart in the chain, some participants would choose according to the expected value, or the probability of purchase. Such a pattern of preference must violate transitivity somewhere along the chain from \(a\) to \(e\).

The experiment consisted of three test sessions, one session every week. In each session, all 20 pair comparisons were presented. Each of the 20 pairs was replicated four times in each session. The order of the pairs was randomized. No indifference judgment was allowed. The following criterion was used to identify the participants with potentially intransitive preferences. On the majority of the adjacent pairs, \(i.e.,\) three out of four, a participant had to prefer the alternative with the higher price, while on the extreme pair, she had to prefer the one with a higher expected value or to choose \(e\) over \(a\). An alternative was said to be preferred over another one if it was chosen on at least two out of three sessions.

A total of 27 out of 73 participants in the experiment violated transitivity in some way, but 24, or approximately 33 percent of the participants violated transitivity according to our criterion. That is, 24 participants chose between adjacent pairs according to the price and between the extreme alternatives according to probability or expected value. This result is extremely unlikely under the hypothesis that intransitivities are due to random choices. Had this been the case, one should have expected the violations to be uniformly distributed with an equal number of violations in each of the two directions.
The next experiment concerns decisions between conjunctions of risky prospects with monetary outcomes. Each participant made two choices, one between favorable prospects and one between unfavorable prospects. It was assumed that the two selected prospects would be played independently.

**Problem 9** (n = 76)

There is a bakery in the city producing and selling Christmas fruitcake. The bakery packages its fruitcakes in two different box types. Both box types are designed to carry same weight. Box type X is modest looking and box type Y is very fancy looking. A large buyer of their fruitcake is a retail company which consists of two large supermarkets (let us call them supermarkets 1 and 2). You are the purchasing manager of the retail company facing the following situation.

The general manager of your company ordered you to purchase the fruitcake and sell in both supermarkets in order to help bail-out the bakery, a long-time business partner, from a financial crisis.

**Decision 1:** Please make your choice for supermarket 1 considering that your initial analysis of the purchases by supermarket 1 showed that:

a) If you choose box type X, supermarket 1 will make a sure profit of $2,400; [61%]

b) If you choose box type Y there is 25% chance that supermarket 1 will make a profit of $10,000 and 75% chance that supermarket 1 will make no profit (will break even). [39%]

**Decision 2:** Please make your choice for supermarket 2 considering that your initial analysis of the purchases by supermarket 2 showed that:

c) If you choose box type X supermarket 2 will make a sure loss of $7,500; [18%]

d) If you choose box type Y there is 75% chance that supermarket 2 will make a loss of $10,000 and 25% chance that supermarket 2 will incur no loss (will break even). [82%]

The majority choice in decision 1 is risk averse, while the majority choice in decision 2 is risk seeking. This is a common pattern: choices involving gains are usually risk averse, and choices involving losses are often risk seeking, unless the probability of
Because the participants considered decisions 1 and 2 simultaneously, they actually expressed a preference for the portfolio \(a\) and \(d\) over the portfolio \(b\) and \(c\). The interesting thing about it is that the preferred portfolio is dominated by the rejected portfolio! Below are presented the combined alternatives.

\[a\) and \(d\): 25\% \text{ chance to make } \$2,400 \text{ profit and } 75\% \text{ chance to lose } \$7,600.\]
\[b\) and \(c\): 25\% \text{ chance to make } \$2,500 \text{ profit and } 75\% \text{ chance to lose } \$7,500.\]

When the alternatives are presented in aggregated form, the dominant alternative is invariably chosen. In the format of problem 9, however, 58\% of participants chose the dominated combination \(a\) and \(d\), and only one participant chose \(b\) and \(c\). The contrast between the two formats also illustrates a violation of invariance which is always likely to produce the violation of stochastic dominance and vice versa.

Now we consider an illustrative example in which the invariance condition is violated. Furthermore, we discuss some of the factors that lead to these violations.

**Problem 10 (n = 76)**

There is a bakery in the city producing and selling Christmas fruitcake. You are the manager of the bakery. Assume that the bakery was presented with a gift of \$10,000. However, you are conditioned by the gift donator that either their logo appears on a side of the fruitcake box (call this event \(X\)) or to distribute flyers to all stores in town selling the fruitcake showing in that way the support for the donator’s activity, whatever that might be (call this event \(Y\)). You must choose between event \(X\) and event \(Y\).

\[a\) If you choose event \(X\) the bakery will \textbf{gain} \$2,000 for certain; [61\%] \]
\[b\) If you choose event \(Y\) there is 50\% chance that the bakery will \textbf{gain} \$4,000 and 50\% chance that the bakery will \textbf{gain} nothing. [39\%] \]

**Problem 11 (n = 76)**
There is a bakery in the city producing and selling Christmas fruitcake. You are the manager of the bakery. Assume that the bakery was presented with a gift of $14,000. However, you are conditioned by the gift donator that either their logo appears on a side of the fruitcake box (call this event X) or to distribute flyers to all stores in town selling the fruitcake showing in that way the support for the donator’s activity, whatever that might be (call this event Y). You must choose between event X and event Y.

\[ a \] If you choose event X the bakery will lose $2,000 for certain; [18%]

\[ b \] If you choose event Y there is 50% chance that the bakery will lose nothing and 50% chance that the bakery will lose $4,000. [82%]

The majority choice is risk averse in problem 10 and risk seeking in problem 11, although the two problems are essentially identical. In both cases one faces a choice between $12,000 for sure and an even chance of $14,000 and $10,000. Problem 11 is obtained from problem 10 by increasing the initial endowment by $4,000 and then subtracting from both alternatives the amounts which were added in problem 10. This variation has a substantial effect on preferences. Additional questions showed that variations in initial wealth have little or no effect on choices. This implies that preferences are quite insensitive to small changes of wealth but highly sensitive to corresponding changes in reference point. These observations show that the effective carriers of values are gains and losses (changes in wealth) rather than states of wealth as implied by the rational model.

These experiments clearly illustrate the violation of all four substantive assumptions of the rational choice theory. Future business managers clearly demonstrated how their choices are anything but perfectly rational. One can object to these findings by suggesting how these subjects would have performed differently if they had more time to consider their options more carefully. While that may or may not be true we often witness irrational business or policy decisions attained with having plenty of time in hand.
By concluding that both individual and institutional choice behavior is not perfectly rational we come to the main question: What place, if any, the rational choice theory should have in economic analysis?

5. Putting Institutions and Individuals Together

The above question is a very difficult and significant one because it is not only or maybe even primarily an economics question but also a philosophical and ideological issue. Before we answer it we must know what the purpose of economics as a discipline is. For instance, is economics primarily concerned with institutions or individuals? One can easily see how heavy this question is. Institutions are inevitably linked with, or even better, they are a product of the organization of society (Greif, 1994). Individuals on the other hand precede and create (and abandon) institutions, but they (i.e., individuals) are largely independent from institutions in their actions including their choice behavior. Is it then appropriate to use the existing social norms and standards to evaluate the actual behavior of both institutions and individuals, and later to prescribe the “medicine” which will remedy the actual behavior and help direct it towards meeting the norm(s)? This seems to reduce individuals to mere social objects rather than subjects. Such a qualification of an individual certainly does not bode well with modern social sciences. To paraphrase von Mises (1942, 1944), even if a chorus of people were simultaneously to say “We,” it would still be individuals who were saying it!

Designating individuals to be perfectly rational is unjustifiable for at least two reasons. First, individuals are expected to have perfect knowledge or information, and further to be able to perfectly process that information. We have demonstrated the failure of these assumptions in this paper and listed many more papers which conclude the same. Moreover, we have demonstrated the failure of these assumptions across borders and political and economic systems. Secondly, and more importantly, perfect rationality limits an individual’s freedom to choose according to her preferences. That in turn
implies that a person is not aware of what she is, and that she does not have to take the full responsibility of her existence and her actions on herself. While in most cases there is not a ban or physical or legal restraint to choose or act in any particular way, we as economists choose in our rational choice theory to penalize those who are not perfect optimizers. By doing that we impose institutional will on individual behavior and furthermore justify it by using the same arguments used in creating “one superior” system of institutions. This, ideologically speaking, is very exclusive and because of that dangerous.

One additional, but certainly non-negligible, reason for popularity and dominance of rational choice theory in economics is the ability of this theory to be easily presented using the language of mathematics. There is this fascinating notion present among economists that the extensive use of mathematics somehow makes economics more exact. Rather than further dwelling on this point a quote from von Mises (1942, p.252) seems to be appropriate: “It is a fallacy to recommend to the social sciences the use of mathematics and to believe that they could in this way be made more ‘exact.’ The application of mathematics does not render physics more exact or more certain. Let us quote Einstein’s remark: ‘As far as mathematical propositions refer to reality they are not certain and as far as they are certain they do not refer to reality.’” Perfect rationality can be linked easily and elegantly with the mathematical theories of optimization. It is very tempting to declare a theory superior because it is “optimal.” After all, nothing can be better than an optimum. It is safe to say here, however, that as far as rational choice theory axioms are considered mathematical certainty, they do not refer to reality.

Now we are ready to go back to our original question: What place, if any, the rational choice theory should have in economic analysis? In the market economies, since they are our main concern, the rational choice theory still must have a prominent role. Since the state of the affairs in market economies is normally evaluated by evaluating the

Rationale for Rational Choice Theory
institutions of the system, the institutional choices must be evaluated as well. In that sense only, one can use the following reasoning by Geanakoplos (1989, p. 1): “My point of view is that behavior (i.e., institutional behavior only in the context of this paper) may be only boundedly rational, but it need not be any less goal oriented and purposeful, and therefore any the less predictable.” Considering the previous statement, rational choice theory is then pragmatically used by mainstream social science to explain and defend the existence and behavior of prevailing social and economic institutions as being optimal. Every deviation in actual individual and institutional behavior from the optimum is attributed to imperfections in an agents’ ability to pursue the optimal actions rather than the implausibility of the underlying norms in rational choice theory. Yet it is not because of a lack of alternative choice theories which are more connected with reality; it is because serious criticism of rational choice does points to a system failure, and that is a dangerous road to pursue for an economist. Challenging status quo has always been a tricky proposition in all spheres of life. It is especially so in social sciences where challenging status quo means also undermining the existing power structure. Hence it is easy to label those economists who are brave enough to challenge rational choice as being too radical or incompetent. Many more will, for that reason, shy away from such challenges. One should notice that people who provided the most constructive criticism of rational choice in economics are not economists at all (e.g., Simon, Kahneman, Tversky, Slovic). It was easier to accept the criticism coming from those who are not a part of the economics establishment, and who, after all, do not know economics as well as do the economists! How to reconcile these alternative theories with existing institutional and power structures is an unenviable question left to economists to deal with, and there may not be a clear answer to it.

Positive choice theories, such as prospect theory, provide sufficient evidence about systematic deviations in actual (observed) individual choice behavior from rational
choice theory axioms. Some suggest (e.g., Miljkovic 2005) how prospect and other positive theories may be used to predict human behavior. However, all observations and analyses of individual choice offer little proof of goal oriented and purposeful behavior. Even without any scientific evidence each and every one of us can easily recall situations when we made different choices in similar situations, remember how goals changed or multiplied causing our actions to change, or how differently framed problems caused us to change our reasoning and decisions. Prospect theory only helped in getting the attention of economists since it was presented in a way and using a language that our normative minds could relate to. Yet it also ignores the heuristically inconsistent patterns in human behavior. As Simon (1982) pointed out, human minds are too simple to comprehend fully the nature of human behavior and to accept that heuristics are its modus operandi. Heuristic positivism cannot be understood in pragmatist context but rather in realism context. According to Nagel (1997), there are three propositions that can be adequately accounted for only by realism: (1) There are many truths about the world that we will never know and have no way of finding out; (2) some of our beliefs are false and will never be discovered to be so, and (3) if a belief is true, it would be true even if no one believed it. If individual behavior is indeed unpredictable, no normative theory (including rational choice) or generalized positive theories can come close to explaining or predicting it. After establishing that evaluating individual choice should not be limited by institutional normativism, the issue becomes how can normative institutional choice and heuristic positive individual choice co-exist in economic theory?

The answer seems to be obvious. The need to create institutions requires these institutions to be evaluated in order to be modified or abandoned if necessary. Institutional decision making must be scrutinized using the same norms that were applied when the institutions were created. The optimizing institutions of a market economy inevitably must and do interact with individuals. Institutions sometimes depend on
individual behavior without any ability to affect it, while sometimes they are able to alter or modify individual behavior in order to enhance their own (i.e., institutional) performance. But it is always a constrained optimization problem for the institutions: maximizing their own objective subject to individual behavior. Notice that this approach gives a much better chance to evaluate the optimizing institution’s choice behavior correctly because it separates the effect of true individual behavior on expected institutional optimum, i.e., the deviations from optimum standards can be attributed to institutional inefficiencies rather than to inefficiencies among individuals who interact with the institution. This approach is certain to inconvenience the practical nature of pragmatist institutional decision makers given the heuristic nature of individual behavior; however, it seems to most closely resemble the world of economic agents and their actions.

6. Conclusion

The quest for one best choice theory that is both normative and positive is unlikely to give us a satisfactory answer ever. If such theory was to exist, it would mean that all of those diverse and different individuals perceive the world around them in the same way. Moreover, all of them are able to process what they perceive in the same way. Later they decide to choose in the same way. Finally, they all would have to agree how that is the best way to go and then to be evaluated according to what they agreed is the best.

Institutions are sometimes a product of consensus among individuals or groups. The examples of that would be actions by individuals in national assemblies such as the recommendation of creation of legal institutions such as courts; law and enforcement offices or agencies such as sheriffs or marshals; creation of preferential trade agreements among nations, etc. Sometimes they are a product of one’s (individual, group, or some other entity) power. For example, institutions of medieval taxes have often been the
product of a ruler’s unconditional powers (Greif, 2005). Finally, the unconscious processes of social evolution are often responsible for creation of many institutions. Examples in economics would be abundant and to list a few we can mention the institutions of money, barter, or general exchange of goods. Institutions sometimes exist for a day and sometimes for centuries. But for as long as they exist they are subject to continuous evaluation by those who created them and by those who opposed or were indifferent to their creation. Individuals on the other hand exist irrespective of what institutions dominate a society. Individuals choose sometimes in accord with institutional norms and sometimes in discord with them. Their choice is sometimes affected by institutional norms and sometimes it is not. But at the end of the day institutions are there to serve individuals who may change them at will. Thus institutional norms cannot supersede individual choice. Therefore evaluating individual choice behavior according to any norm violates the principles of individual freedom to choose. When it comes to basic needs such as choice, institutional powers superseding individual freedom was often proved in history to be a dangerous venue to pursue.

Modern economics, with the rational choice theory as its cornerstone, is also a product of social institutions that we have. Generality of results produced by this theory (which we often proudly emphasize) brings us only as far as the assumptions we make will allow us to go. And not to be mistaken, the assumptions always conform to the institutions that we have. The generalized positive theory of individual choice, which we can conveniently borrow from behavioral scientists, may add a touch of reality and human face to what we as a profession are trying to do. Heuristic positivism may be a more realistic description of actual individual behavior, yet it may not be implementable in empirical analysis due to limitations of human brains and intellect. Then, if rational choice (and other normative theories) is to credibly serve its mission of explaining, justifying, and preserving the prevailing economic institutions, economists may as well
simultaneously use prospect theory or similar positive theories of individual choice to complement the normative theories of institutional behavior in order to enhance their usefulness.

References:


*Direct correspondence to:
Dragan Miljkovic, Professor
North Dakota State University
Department of Applied Economics
NDSU Dept. 7610
Fargo, ND 58108-6050
Phone: 701-231-9519
E-mail: Dragan.Miljkovic@ndsu.edu
Footnotes:

1 Simon and Kahneman are Nobel Prize Laureates in economics.

2 Comprehensive reviews of some of these theories can be found in Camerer (1992) or Fishburn (1988).

3 There will be no detailed, formal description of these key properties because they are well known. However, numerous references will be listed to facilitate an eager reader.

4 All experiments in section 2 have been conducted in the US and Canadian universities, and their sources are listed throughout section 2.

5 The subjects were undergraduate students at the University of Belgrade, Serbia, and in the Business School at Trebinje, Bosnia and Herzegovina. The original problems and questions were translated in Serbian and Bosnian language, the official languages in these two countries.

6 All respondents were undergraduate or graduate students majoring in either agribusiness or business administration at the University of Illinois, Missouri State University, and St. Bonaventure University. Each participant in the experiments completed at least one course in microeconomics and statistics. There was no reward for their participation because it was suggested in the studies that both used and not used rewards that no
significant difference in responses was determined between the two groups (Tversky and Kahneman, 1981; Tversky, 1969).

7 The assumption made here is that one must choose between the two offered alternatives, \textit{i.e.}, no residual probability placed on the event described by the supermarket chain not being willing to purchase at all is accounted for.

8 Alternatives are called adjacent if they are a step apart along the probability or the price scale \textit{(i.e., a and b, b and c, c and d, and d and e)}. Alternatives are called extreme if they are at the extreme (first and last) steps along the probability or the price scale \textit{(i.e., a and e)}. Finally, the alternatives are called “irrelevant” if they are neither adjacent nor extreme \textit{(i.e., a and c, a and d, b and d, b and e, and c and e)}. 