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Tolerance for Ambiguity

Ambiguous situations are those in which the probabilities of possible outcomes are not fully known. Therefore, tolerance for ambiguity means the ability to tolerate situations where we do not have the full knowledge about the odds of consequences of our decisions. Most of the decisions that we make have consequences that are at least partially ambiguous. Many of our political decisions entail some degree of ambiguity. For example, when we vote in presidential elections, we cannot precisely foresee how likely our candidate is to stick to and be successful in implementing her or his program. We also cannot objectively and accurately predict the likelihood of their focusing on any particular social problem once they've been elected. Similarly, when we vote in a tax referendum, we can't be sure how likely the policy that we vote for is to be successful. The macroeconomic conditions may unexpectedly change, affecting the effectiveness and appropriateness of the policy choice. And when special interest groups lobby politicians, they can't be sure how likely their efforts are to be reciprocated.

People differ in the amount of ambiguity that they are willing to tolerate and thus, independent of their political beliefs, may make different political choices. They may vote differently in elections than they do in referenda, and prefer different candidates and parties depending on issues and occasions. In general, people dislike ambiguity and, when given a choice, prefer situations without any unknowns. As the English proverb says, "Better the devil you know than the devil you don't know." Other things being equal, people on average should be happier in political systems that involve less ambiguity. The concept of ambiguity tolerance and aversion has been used to motivate policy and regulation.

Certainty, Risk, and Ambiguity in Decision Theory

In most of the situations that we experience, ambiguity is inherently paired with risk. Yet, it is important to distinguish between ambiguity and risk since these two concepts have different theoretical foundations and different behavioral and political implications.

Certainty

Choice under certainty is a situation where you know exactly what the consequence of your decision is going to be. This of course implies that there is only one possible consequence. There are some situations in life that are 100% certain. These include, for example, all of our consumption decisions. If you decide to buy a car for a certain amount of money, after you pay for it you are sure to get it. If you purchase a bar of chocolate, you are sure to get it as well. But even in situations that seem to be certain, some aspects of choice are not fully known. For example, when you purchase a car you usually cannot fully predict how likely you are to be fully satisfied with your purchase and how much you will enjoy driving your new car. This leads to some level of uncertainty even in consumption decisions.

Risk Versus Ambiguity

Frank Knight, University of Chicago economist, was the first to make the distinction between risk and ambiguity. He distinguished between "measurable uncertainty," henceforth labeled by economists as *risk,* and "unmeasurable uncertainty," which took the name of *ambiguity*.

Risk

A risky situation is one in which a decision may lead to one or more undesirable consequences out of a larger set of possible consequences. It is thus opposite to a choice under certainty, when following your choice you know exactly what is going to happen. It is assumed that when making decisions in risky situations, you know exactly how likely each of the consequences is. In other words, the level of risk involved is measurable because you objectively and precisely know the probability distribution over all possible outcomes of your choice. When deciding between different options, you tradeoff between the outcomes and their probabilities according to your own assessment. Some people are willing to tolerate more risk than others, meaning that they are less sensitive to the variability in outcomes. An example of a risky choice is a situation when you decide to make a bet with your friend on the basis of a coin toss. Let's say that the winner has to buy the loser a pizza. Your decision whether to pick heads or tails as your winning side is a risky decision. The consequence of your decision is not certain—when you toss a coin you cannot be sure whether it will fall on tails (or heads), but the odds of heads and tails are fully and objectively known to be 50–50 each. In general, people dislike risk and, if given a choice, tend to prefer certain to risky option even if the risky option pays more in expectation.

Ambiguity

Ambiguous situations are different from risky situations in that the likelihood of the consequences is not precisely known. In other words, the amount of risk is not measurable. Most of our everyday choices involve elements of both risk and ambiguity: Our decisions can lead to many different outcomes and we rarely know exactly how likely they are. For example when you illegally park your car in a new neighborhood, you do not know for sure how likely you are to be fined. When you decide to run for office in a student union election you know you will either win or lose but you cannot predict how likely each of these consequences is.

Partial Versus Full Ambiguity

Some decisions involve more ambiguity than others. For example, when you buy groceries from an online store that you have shopped from before, your assessment of the likelihood of receiving good-quality groceries will be more precise than when you shop from a store for the first time. Experience and education are some of the factors that allow us to reduce ambiguity. Situations, people, or objects that we got to know through education or experience become more predictable and thus less ambiguous.

Ellsberg Paradox

Daniel Ellsberg popularized the distinction between risk and ambiguity (first discussed by Frank Knight in 1921) in a behavioral paradox that he observed in 1961. To understand the Ellsberg paradox, imagine an urn filled with 90 balls: 30 of these balls are red and the remaining 60 are either black or yellow. Thus a bet based on the contents of the urn will involve risk (we know for sure that 1/3 of the balls are red and 2/3 are not red) as well as ambiguity about how many balls are black and how many are yellow. Ellsberg has shown that people's behavior is systematically inconsistent when making decisions based on the composition of such urn.

In Ellsberg's paradox, you are asked to choose between two bets. After you chose a bet, you pick one ball from the urn without looking, and the color of the ball you picked determines your payment. If you choose bet A, you will receive $100 if you draw a red ball and nothing

otherwise. If you choose bet B, you will receive $100 if you draw a black ball and nothing otherwise. Which one would you prefer? Most people prefer bet A. Choosing A is consistent with people believing that they are more likely to win bet A than bet B. In other words, they must believe that there are more red balls than black balls in the urn.

Now imagine that you are asked to choose between another set of bets. In bet C, you get $100 if the ball is red or yellow, nothing otherwise. In bet D, you get $100 if the ball is black or yellow. Which one would you prefer? Most people when asked prefer bet D. This implies that they must think they are more likely to win in bet D than in bet C, which given that yellow is the winning color in both bets is equivalent to saying that you believe that there are more black than red balls. Such belief is of course inconsistent with the observed choices between bets A and B.

This behavioral paradox can be explained by ambiguity aversion. Notice that in each situation, one of the bets has known probability of winning and the other has an unknown probability of winning. The majority of people prefer the option with known probability of winning, even though this cannot be reconciled with a consistent belief about how many black versus yellow balls there are in the urn. On the basis of these inconsistencies in behavior, Ellsberg suggested that people have a preference for known risks or, alternatively, that they are averse to ambiguity. Indeed in both of the situations, people tend to choose the bet with known odds of winning rather than the one with the ambiguous odds of winning. In general, people prefer to gamble with known probabilities rather than with unknown probabilities, even if objectively they are mathematically the same. This is taken to mean that people dislike ambiguity or sometimes that they are pessimistic about the odds of favorable consequences when these are not precisely specified.

Sources and Models of Ambiguity Aversion

There is no single widely accepted explanation for, or model of, ambiguity aversion. In general, the literature is split between modeling ambiguity aversion as a rational or an irrational element of choice.

One explanation of the type of choices observed in Ellsberg paradox is that they represent a rational response by people who lack enough information to form precise and reliable beliefs about the odds of consequences. We can build mathematical models to take such informational limitations into account. The seminal model here is the *maxmin expected utility* model by Itzhak Gilboa and David Schmeidler (1989). This model assumes that in unknown situations people always assume that the worst possible scenario is most likely. Many extensions and variants of Gilboa and Schmeidler's theory have been proposed.

Ambiguity Aversion as a Mistake

The competing view is that Ellsberg paradox behavior is a manifestation of irrationality and as such cannot be represented with a mathematical model of choice. In an experimental study, Yoram Halevy found that ambiguity tolerance in Ellsberg's paradox correlates with mathematical sophistication; that is, those subjects who were mathematically sophisticated were not ambiguity averse. In light of these findings, one can interpret a subset of the behaviors in Ellsberg's paradox as mistakes due to lack of mathematical competence.

Behavioral Findings on Ambiguity in Decision Making

Ambiguity Tolerance

Ambiguity aversion has now been replicated in hundreds of scientific studies in settings similar to Ellsberg's paradox. Nevertheless under some conditions people do not show aversion to ambiguity. People tend to be ambiguity tolerant (or even seeking) in situations where the consequences are losses (rather than gains) and when the odds of consequences can rationally be inferred to be very small (see, e.g., Tymula et al., 2013, Kocher, Lahno, &, Trautmann, 2015). More research with more representative samples is needed to fully understand when ambiguity aversion and when ambiguity tolerance prevail, respectively.

Individual Differences in Ambiguity Attitudes

Individuals differ in their attitudes toward ambiguity in some systematic ways. It is plausible to expect that societies with more ambiguity-tolerant members will have different political outcomes than those with more ambiguity-averse members. Similarly, people will sort toward different political options and views based on their willingness to tolerate the unknown. To give a more practical example, in an experimental study Agnieszka Tymula and colleagues found that younger people seem to be more willing to tolerate more ambiguity than older people.

Policy Implications

In situations where there is no ambiguity, preferences for ambiguity lose relevance. In situations where ambiguity attitudes lead to suboptimal outcomes, one could intervene by providing individuals with sufficient information to reduce or eliminate ambiguity.

The concept of ambiguity aversion has been used to explain a wide range of people's behaviors—from insurance and health purchases, stock market participation, puzzles, and selective abstention in elections.

Ambiguity Tolerance as a Personality Trait

In psychology and sociology, tolerance for ambiguity has been conceived as an emotional and perceptual personality variable. Numerous questionnaires have been invented to measure tolerance for ambiguity since the first contribution by Else Frenkel-Brunswick that has been cited more than 1,000 times. Whereas in decision making, the concept of *ambiguity* is clearly defined as incomplete information about the probability distribution over outcomes, ambiguity as a concept that relates to social perception is more broadly defined and has gone through changes since its conception. Ambiguity in this literature can stand for authoritarianism, prejudice, vagueness, incompleteness, fragmentation, unstructured, lack of information, uncertainty, inconsistency, contradiction, or unclearness. For a comprehensive review, see Adrian Furnham and Joseph Marks (2013).

Correlation Between Ambiguity Tolerance and Other Individual Characteristics

In her seminal contribution on ambiguity, Frenkel-Brunswick argued that ambiguity tolerance relates to different aspects that characterize individuals, such as emotional and cognitive functioning, beliefs, attitude systems, interpersonal and social functioning, and problem-solving behavior. Using a variety of questionnaires, tolerance for ambiguity has been found to correlate positively with authoritarianism (e.g., Budner, 1962; Frenkel-Brunswick, 1948).

See also Attitudes; Conformity; Decision Making; Disengagement; Economics and Political Behavior; Emotions and Political Decision Making; Framing Effects; Personality Traits; Rational Choice

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Further Readings

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