A Holistic Review of Framing Effect: Theories and Applications

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Abstract. Framing effect is an important judgemental bias observed in human behavior. However, despite numerous theoretical and empirical progressions on framing effect in economics, there are still shortcomings to rationalize the discussion. This paper tries to provide a comprehensive understanding of current research on framing effect by discussing/ its definition, its relationship with preferences, and its current theoretical stage. More specifically, its application in people's retirement social benefit choosing behavior is extensively discussed. Based on the current literature about framing, this paper also points out the potential future directions of theoretical and empirical research.

Keywords: framing effect · definition · preference · retirement social benefit choosing behavior

1 Introduction

Traditional economic models assume that rational agents make decisions based on their preferences and their evaluation of the potential outcomes [1]. Agents choose in alternative options to maximize their expected utility [2, 3]. However, this is far from reality where people make choices which seems to contradict with what the optimization theory predicts. Real world people are far from rational agents, due to their biased nature and limited decision-making capabilities. Various other factors affect the decision process and outcomes, among which stands the effect of framing.

When the choices are framed to highlight different features, people's choice would be altered even with the same potential outcomes. A famous laboratory example is the Asian Decease problem presented by Tversky and Kahneman [4], in which subjects were asked to choose from alternative life-saving programs with one emphasizing the survival and another emphasizing the death. Even with the same mathematical probabilities of death and survival under these different programs, subjects chose significantly differently. They were risk taking in the survival program and risk averse when facing the death program. In this case, the different framing of the same problem triggered different attitude towards risk involving gains and losses, which ultimately leads to the swing of people's choice.

Framing effects are not restricted to the laboratory environment where other choice-related variables can be properly controlled. Human decisions are often subconsciouly

G. Ali et al. (Eds.): ISEMSS 2022, ASSEHR 687, pp. 1634–1643, 2022.
https://doi.org/10.2991/978-2-494069-31-2_192

manipulated by different frames in various real life scenarios (e.g., who to vote in an election, which portfolio to invest, whether to contribute to a public good, etc.). To better understand the mechanism of decision making, economists have made efforts to develop theories to explain framing as a systematic bias in people's cognitive behavior. Theorists and empiricists have developed various explanations and documented many important findings regarding framing effects. However, a coherent perception of framing is still lacking, and a complete work to conclude the related research into a general framework are not yet be done.

This paper aims at fill in the lack of cohesiveness in the literature by providing a summarizing clue of the concept of framing effects, its relationship with choice and preference, and some of its most important empirical application. By focusing on the most important works in the study of framing effects, this paper reviews the development of the definition and the theory of framing, to put it into a precise description framework. Following this, the relationship between framing and traditional important economic topics, such as preference and the revealed-preference theory, is discussed. Then, the paper provides an integrated enquiry into the effect of framing on people's important decisions (e.g., retirement social benefit choosing). Overall, a summarizing framework of the theories and empirical findings aims to be provided for better understanding of future scholars.

The following of this paper is structured in this way: Sect. 2.1 discusses the background and definition of framing effects; Sect. 2.2 discusses the relationship between framing effects and revealed preference; Sect. 2.3 discusses the framing effects in people's retirement social benefit choosing behavior; Sect. 3 provides a conclusion.

2 Framing Effect

2.1 Background and Definition

The starting point of research on framing effects in modern psychology and economics originates from decision making problem. A typical decision problem consists of the options of choices, the possible outcomes, and the contingencies that relate the outcomes to options [4]. The problem is framed as a particular form to the decision maker, with or without awareness. Based on the definition provided by Tversky and Kahneman [4], this decision frame refers to the decision maker's concepts of options, outcomes and contingencies associated with the particular option. In other words, the three components of decision problem can be viewed by different people from a variety of perspectives and be constructed as having implications for multiple values or conditions. By appropriate manipulation of the formulation of problems and consideration of individual and social characteristics, people's conceptualization and thought process of a particular decision can be unconsciously affected and elaborately tailored. By changing people's conceptualization and thinking, the choices and outcomes of the same decision makings may be different, which leads to the violation of implicitly assumed consistency and coherence of preference in the traditional choice making theory.

Although the literature of the empirical evidence of framing effects have been largely enriched in the following decades, scholars have not yet reached an agreement on a general and precise definition of framing effects. In their proceeding studies, Tversky and

Kahneman [5] gave an explanative definition of framing—it is controlled by the way the choice problem is presented as well as by norms, habits, and expectancies of the decision maker. The usefulness of this definition is to conveniently construct a descriptive theory of choice making process, which is the prospect theory. A wide variety of how framing influences economic decisions have been studied in the following decades. To name a few, Andreoni [6] and Willinger et al. [7] studied how positive and negative framing affects the cooperation in public good experiment, Bateman [8] incorporate framing into the theory of reference-dependent preferences. These studies were conducted without a formal definition and theory of framing effects. Another empirical research [9] gave a descriptive definition of framing effects, which is said to be present when different ways of describing the same choice problem change the choices that people make, even though the underlying information and choice options remain essentially the same. By the nature of complexity in choice making process, it is difficult to reach a consensus on how to describe and define framing effects. However, recent literature has made a remarkable progress in developing a precise definition and model of framing.

- Tversky and Kahneman [5]: Framing is controlled by the way the choice problem is presented as well as by norms, habits, and expectancies of the decision maker.
- Angreoni [6] and Willinger et al. [7]: How positive and negative framing affects the cooperation in public good experiment.
- Bateman [8]: Incorporate framing into the theory of refrence-dependent preferences.
- Cookson [9]: Framing effects is to be present when different ways of describing the same choice problem change the choices that people make, even thoung the underlying information and the choice options remain essencially the same.

One accurate and descriptive definition of framing is given by Chong and Druckman [10]. In their definition, individual's attitude towards an object is a weighted sum of evaluative beliefs about that object, and the set of dimensions that affects those evaluative beliefs forms an individual's frame. By changing the presentation of the same object (for example, highlighting different aspects of the object, focusing on either positive or negative consequences, etc.), one's frame can be manipulated through the changing in the dimension of the evaluative beliefs, and the corresponding weight of these beliefs. For instance, when being presented with the choice of whether to take a vaccination, people would put more weight on the effects of the vaccine rather than other features such as the packaging color. When the effects of the vaccine are reported using "effective rate" rather than "ineffective rate", people would more likely to put a positive attitude to the vaccine. Chong and Druckman [10]'s definition intuitively and descriptively presents the potential ways that framing affects the formation of attitudes, but it fails to take consideration of the psychological mechanism of framing in changing people's evaluative beliefs, and the mechanism of how changes in framing ultimately leads to changes in people's choices and behaviors.

To relate frames to people's choices, one can refer to a second strand of literature. Salant and Rubinstein [11] developed a framework which models choice in the presence of framing effects. They define frame as including observable information that is irrelevant in the rationale assessment of the choice alternatives, but nonetheless affects choice. Based on this definition, the framework they presents is an extension of the classical model of choices by considering the new developments of bounded rationality and behavioral economics. In standard approach, a choice problem is a non-empty subset of a finite set of choice alternatives, and a choice function attaches to every choice problem a single element in this non-empty subset. The indeterminacy in choice is captured by "choice correspondence", which attaches the non-empty subset of the choice problem to every choice problem itself. By including a set of frames, the extended choice problem is a pair of the original standard choice problem and the frame. The extended choice function assigns an element of the choice problem (subset of the set of choice alternatives) to every aforementioned pair. The advantage of this framework is that it could be used to explore the boundaries of the transitivity and possibly completely binary relation that describes behavior under the circumstances of frames. It can also be facilitated when induced choice correspondence cannot be described by a traditional maximizing of a preference relation. This framework enriches the model of choice with frames, and could be utilized in explaining a wider ranges of behavioral anomalies where the traditional theories seem to fall short.

The theory of framing effects is tightly associated to the empirical observation of inconsistent-preference behavior. Despite those remarkable works that have already existed in the definition and modelling of framing effects, further precise definition combining the aforementioned aspects of attitudes and choices is needed, in order to better understand the mechanism of framing and its application to various economic contexts. One of those very important contexts are the relationship between framing and the theory of revealed preferences, for which I will discuss in the next subsection.

2.2 Framing Effect and Revealed Preference

One of the main objectives of economics is to study people's decision-making and discover individual preferences. Under the classical theory, in which preferences are independent of the feasible set of choice outcomes (i.e., not affected by the frame), revealed preference approach can be well applied to the choice data to unmask people's preference. However, the existence of framing effects challenges the classical theory of preferences, by the violation of the fundamental properties such as consistent and coherence. In the setting of framings, people's preferences are dependent on or even constructed from the context encountered by the choosing individual. In other words, there is not such a consistent preference as a benchmark for people to make choice decision under various presentation scenarios. In this case, the traditional revealed preference approach might lose power in recovering people's preference from choice data. Such a framing effect raises deep suspects on the welfare conclusions from traditional revealed preference analysis. How to correctly interpret such a theoretical contradiction and deal with the difficulties in the empirical research of preference with the existence of framing effects remains to be systematically answered.

In the study of framing and preference, one stream of literature [12] tried to solve the theoretical puzzle by clarifying the difference between framing and misconceptions in the choice problem recognition. In an experimental setting in which directions are presented by the experimenters to the subjects, the systematic errors in the subjects' choices which seems to violate the properties of standard preferences may not be a reflection of framing.

Instead, it could be that there is a specific form of mistake made by individuals in the standard choice elicitation procedures, caused by the misconceptions of the game form. To distinguish preference-based choice from the mistake-based choice, the authors performed an experiment similar to testing a scale by measuring a known weight. By deploying the Becker et al. [13]'s method, a systematic mistake was identified as a failure of game form recognition, after controls for the subjects' preferences. It is very tempting to interpret this mistake as the effect of framing and thus lead to a false conclusion that the observed choice data in the experiment reveals labile preferences. However, misconceptions can lead to anomalous choices and outcomes even with the consistent and procedural invariant preferences. Choices that do not satisfy the property of invariances can be merely due to mistakes and thus need not reflect a nonstandard preference based on framing theory. Thus, when using framing theory to interpret the seemingly contradictory choice outcomes both in the experimental settings and the real-world settings, one must be cautious about the separation of framing and other confounding misconception effects, such as the fuzziness of choice descriptions and unclear perceptions of the choice rules. In fact, this literature provides us a new prospect to reconsider the framing effects through the lens of people's changing perceptions, other than the labile preferences. Intriguing questions such as whether framing triggers the misconceptions of game form recognition are worth studying, to further develop the theory of choice and preference.

Goldin and Rech [14] incorporates the framing effects into the analysis of revealed-preference. It is far from enough to merely clarify the possibility of the masquerade of framing in misperception problems. A more important issue is how to restructure the revealed preference analysis with the presence of framing effects. The revealed preference states that, ceteris paribus, rational individual's choice behavior is the best indicator of their underlying preferences. Goldin and Rech [14] developed a framework for preference identification that is grounded in the middle between different approaches to confront the problem of preference identification in the scenarios with framing effects. In their theoretical methods, the assumptions of revealed preference can be maintained except for the case that an apparent framing effect is observed. If there are evident framing effects, the assumptions can be relaxed as much as is required to accommodate with the specific scenario. This approach can be utilized to identify preferences of various groups of both consistent and inconsistent decision makers, which contributes to the convenience of empirical research. There is great generality of this framework, because that the central behavioral assumptions—frame monotonicity and that consistent decision makers choose optimally—still holds under a wide range of models in this framework. However, the main drawback of this framework is that it makes the implicit assumption that the presence of the framing effect is the only reason that decision makers' choices fail to reflect their preferences. Apparently, this is very unrealistic, since a variety of other important factors can also induce the false reflection of preferences, such as incomplete access of information, limited cognitive ability, etc. On the one hand, these factors may lead people to choose against their intended preference if it is assumed that their indeed exists a stable preference. On the other hand, these factors that are irrelevant with the final choice potential outcomes may leads to unstable preferences, making "identification" impossible. Further study related to the issue of preference with framing must be done to fill in the obvious vacancy in current literature, or that the ground of preference and choice theory would be highly unstable.

Incorporating framing effects into the study of preferences has received increasing attention by the scholars and have become a fruitful research area. In essence, framing is closely related to people's preferences, by falsefully revealing or even shifting them. According to both the classical economic theory and the real-world observation, people make choices not only based on their preferences, but also based on the real situation they encounter, and the choice frame they are presented to. Thus, one natural question to ask is that how framing affects people's important economic decisions. In the next session, I will specifically focus the impact of framing on people's retirement social benefit choosing behavior, which can be framed in various ways and is closely related to people's late-life welfare.

2.3 Framing Effect and Retirement Social Benefit Choosing Behavior

Framing can have considerable impact on people's welfare by altering people's retirement social benefit choices. Retirement social benefit are essential for people's late-life welfare and living quality. A person's life can be divided roughly into two phases, the wealth accumulation (i.e., education and work) phase and the wealth decumulation (i.e., retirement) phase [15]. In the late life period, elders are often provided with some sort of social benefits either as a source of income for subsistent consumption or as a reward to their earlier work. Such social benefits (including pensions, returns from some investment portfolios, annuities, etc.) generally require people to have a mandatory saving account into a fund pool in their early life and to choose a claiming option from various benefit-realization methods. Developed countries (for example, the U.S.) generally make adjustment to those methods to make them actuarially equalized no matter when and how the person chooses to claim the benefits.

In the real-world retirement social benefit choosing scenarios, many observed behaviors are difficult to be explained by a classical expected utility maximization model. In terms of the annuitization choices, fewer consumers are observed to voluntarily choose to annuitize their retirement savings, which leads to a large forgone welfare gain. Despite the actuarially equivalent benefits of different claiming times of social security, people show systematic variance in the preference and choices of the claiming date. Moreover, the annuitization and investment decision seems to show systematic difference across different genders and people who have different demographic characteristics and economic status. Instead of relying solely on the classical expected utility maximization model, a behavior bias explanation related to the framing effects could at least partly explain these anomalous observed behaviors.

To inspect the factors that contribute to people's low rate of annuitization, Brown et al. [15] proposed a hypothesis that different framing of the annuity choices triggers the loss and gain asymmetry. This induces people to consider annuity in the frame of "investment component", which focus on the risk and return combination feature. In the context of investment component, annuity seems riskier than other investment choices (because that its return depends on people's death date, which can be considered as being randomly determined) even their benefits are adjusted to be actuarially equivalent. To test this hypothesis, Brown et al. [15] conducted an experiment in which subjects were presented with different frames which highlighted different features of annuity. In this way, the authors obtained the stated preferences of people over annuity choices that may not be offered in the observations in the market but that can be directedly used to test the hypothesis. The experiment results show that positive and negative framing significantly affects people's choice between annuity and other alternative investment options. In specific, when being presented with the investment frame, people's dislike of illiquidity and loss of control are triggered, leading to higher probability of not choosing the annuity, despite its actuarial equivalence with its alternatives. Annuities in the real world are too often presented with features in this "investment frame", which leads people to dislike the annuity. From the result, it can be safely deduced that framing effects powerfully explains the under-annuitization problem. Based on this study, advocators of annuities could induce more people to annuitize their retirement income and then realize the welfare by presenting people with a positive frame, such as a frame that highlights the continuity of income streams and the smoothness of consumption possibility which can be generated by a choice of annuitization.

Annuity is but one member of a larger family of retirement social security. From the effects of framing on the choice of annuity, we would naturally suspect that there exist similar framing effects in the claiming of other social securities. It is important to understand the channels and consequences of such effects, because that social security claiming have a huge impact on people's retirement welfare and late life quality. Extending from the previous research, Brown et al. [16] studied how people's claiming date of social security is affected by the information framing. The benefits of different claiming date are adjusted to be actuarially equivalent. However, different people may have different optimal claiming date, given their heterogeneity of life expectancy and other factors such as education level and financial situation. The authors designed an experiment in a survey setting to test how expected claiming ages vary according to the way in which benefits are described when the claiming age changes. These frames are pairwise grouped into breakeven-symmetric frame, consumption-investment frame, gains-losses frame, and older-younger anchoring frames. The experiment results confirm the idea that different frames generate economically and statistically significant differences in expected claiming ages. Specifically, the breakeven frame, which present the decision as a risky bet on one's length of life and downplaying the longevity insurance aspects of the choice, generates an expected claiming age that is approximately 15 months earlier than the symmetric frame, which simply states the facts about how benefits would change for an alternative claiming date. Because that the expected claiming ages in the experiment are correlated with actual claiming ages, this research could shed light on the people's real world claiming date choice and social benefit. Policy makers could introduce some welfare-oriented framing to guide people to choose wisely among different but suitable claiming dates. Since people can use internet to claim the benefit nowadays, their choice could be recorded into a pooled dataset to conduct a field experiment study of the effects of different framings. This approach will not only enable us to check the external validity of the laboratory experiment results, but also provide useful policy guidelines for those who aim at increasing the welfare of the elderlies.

Apart from the general effects of framing on the social security choice, there are great heterogeneity in individua effect depending on both the observable and unobservable individual characteristics. Due to different gender and economic characteristics of people, the effect of framing on the social security choices may be different. Agnew et al. [17] designed an experiment to investigate the interaction between framing and gender characteristics and default setting, and its impact on people's choice between annuities and other investments. They collected the subjects' financial literacy and rate of risk aversion before the experiment. Then, the subjects were presented with three slides that highlighted the potential gains, the potential loss of choosing annuity, and the neutral one. The results show that, after controlling for risk aversion and financial literacy, female subjects are significantly more likely to choose the annuity than male subjects in the neutral frame without a default option. Also, more risk averse and less financially literate individuals are more likely to choose annuity option. These results confirm the theoretical prediction of the impact of framing effects on people's annuity choices, and further shed light on the differentiated impacts due to gender and economic characteristic differences. Different frames lead different people to choose different annuity methods, which would induce different welfare outcomes. Potentially, the welfare change due to different framings can be studied by comparing people's satisfaction with the annuity outcomes between different biased frames and a neutral frame, using a larger sample by online or offline field experiments.

These three strands of literature have contributed in explaining the observed anomalous choices in the retirement social security claiming. In general, low-annuitization rate can be explained by the negative frame people usually received from the investment agents, different timing of benefits claiming can be explained by the different characteristics-focus of framing regardless of each individual's theoretical optimal claiming time, and the effect of framing is heterogeneous among people with different gender and economics characteristics. All these literatures could lead to a future research topic, which is related to the welfare effects of different framings. Ideally, we can design a longitudinal research program. In this program, a large sample of people with controllable and comparable characteristic variables could be randomly grouped into different subsamples to be presented with different frames. Then, they would make a decision choice among various actuarially equivalent social security investments, including annuities. We could track their financial well-being and satisfaction with their own choices over their retirement lifetime to study how the frame-induced choices affect their welfare. Through this collected dataset, we could inspect how welfare is affected by framing effects. This would contribute to the literature by documenting the welfare impact of framing effects and could also be used as a policy guide to increase people's late-life wellbeing.

3 Conclusion

This paper starts from a review of the development of the theory of framing effects and its definition, which tries to provide a general description of framing combining the existed definition based on attitude and the model of choices. Then, the relationship between framing effects and traditional economic theories concerning preferences, especially the revealed-preference theory is discussed. One empirical example of the framing effect, which is people's anomalous choice in retirement social benefits, is provided and discussed from different perspectives. Overall, this paper provides a holistic clue for the existing theoretical and empirical researches about the framing effects, which could be served as a useful reference for researchers in the related fields.

Following the line of this paper, future studies concerning the framing effects could extend from both a theoretical and empirical perspective. Theoretically, a more comprehensive definition and model of framing effects combining its causes, mechanism and consequences is still needed. Its relationship with important economic and psychological concepts other than preferences is still to be studied. With the foundational work of laboratory experiments, more field studies concerning the impact of framing on people's real-world choices can be conducted with the conveniency of more public available micro data and more sophisticated longitudinal research design, to draw useful implications about the welfare analysis and policy suggestions under the existence of framing.

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