Games and Economic Behavior 73 (2011) 459–478

Contents lists available at ScienceDirect

Games and Economic Behavior

www.elsevier.com/locate/geb

The framing of games and the psychology of play

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ARTICLE INFO

Article history:
Received 26 July 2008
Available online 16 February 2011

JEL classification:
C91
C72
D64
Z13

Keywords:
Framing
Psychological game theory
Guilt aversion
Reciprocity
Public good games
Voluntary cooperation

ABSTRACT

Psychological game theory can provide rational-choice-based framing effects; frames influence beliefs, beliefs influence motivations. We explain this theoretically and explore empirical relevance experimentally. In a 2×2 design of one-shot public good games we show that frames affect subject's first- and second-order beliefs and contributions. From a psychological game-theoretic framework we derive two mutually compatible hypotheses about guilt aversion and reciprocity under which contributions are related to second- and first-order beliefs, respectively. Our results are consistent with either.

1. Introduction

Experiments in psychology and economics have shown that the framing of decisions may matter to preferences and choice (cf. Pruitt, 1967; Selten and Berg, 1970). This may reflect a failure by decision makers to exhibit "elementary requirements of consistency and coherence", as found by Tversky and Kahneman (1981) in a classic paper. Our main objective is to theoretically articulate, and experimentally illustrate, a further reason why framing may matter. We make no reference to irrationality. Framing may influence play in games by influencing motivation that depends on beliefs, about choices and beliefs, in subtle ways.

Our message partly echoes the insight that focal points may influence coordination, as first noted by Schelling (1960) and explored experimentally by Mehta et al. (1994). The idea is that a strategic situation may possess cues that influence *beliefs about others' choices*, which in turn may have bearing on a person's rational choice. We push beyond this observation as follows: If players are emotional or care for the intentions and desires of others, then framing may influence behavior

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0899-8256/$ – see front matter
doi:10.1016/j.geb.2011.02.003

independently of how beliefs about others' choices change. Frames may influence *beliefs about others' beliefs*, which in itself may influence such a person's choice even if his or her belief about others' actions is given.

The upshot is that framing may play a special role in *psychological games*, as defined by Geanakoplos et al. (1989) and Battigalli and Dufwenberg (2009). These structures differ from standard games in that payoffs depend on beliefs (about choices and beliefs), not just actions. A body of recent work (cited in more detail below) in experimental economics and behavioral theory argues that psychological games are needed to capture some important forms of motivation, like reciprocity or guilt aversion (a desire not to let others down).

In psychological games, motivation depends on beliefs directly, so if beliefs are changed motivation may flip too. The key contribution of this paper is to tie this observation in with framing effects: frames may influence beliefs, which spells action in psychological games. We propose to understand this as a two-part process: (i) frames move beliefs, and (ii) beliefs shape motivation and choice. The hypotheses we will derive based on psychological game theory entail specific statements about (ii). As regards (i) no comprehensive theory exists yet. We discuss some relevant conjectures based on what has been reported in the economic and psychological literature but leave a thorough theory development for future research.

Section 2 provides theoretical elucidation regarding the potential relevance of our approach to framing effects; Sections 3–5 set the stage for and report results on an experiment designed to explore the empirical relevance. We choose a public good game as our workhorse and use a 2×2 design which varies the framing along the dimensions of 'valence' and 'label' (described in more detail below). From a psychological game-theoretic framework we derive two mutually compatible hypotheses about guilt aversion and reciprocity under which contributions are related to second- and first-order beliefs, respectively. Our results are consistent with either. As regards the impact of our frames we do not have preconceived hypotheses based on theory, but our results are in part at odds with previous findings (in particular, contributions are higher under a neutral label than under a community label). These latter results may be of some independent interest to the experimental literature on framing in public goods (and social dilemma) games; in Section 6 we discuss and compare results.

2. Framing effects in psychological games

Part of our message is reflected in the literature on focal points. Schelling noted that in some games certain choices are 'focal', which may facilitate coordination. A classic example involves two persons meeting in New York City: going to Grand Central Station may be focal. Here focal points are created by properties possessed by a strategy, but one can also imagine how focal points are similarly created by framing. Consider the two following games:

The let's-get-7 game:

	a	***b***
a	(9, 9)	(0, 8)
b	(8, 0)	(7, 7)

The let's-get-9 game:

	a	***b***
a	(9, 9)	(0, 8)
b	(8, 0)	(7, 7)

Are these games the same? They have player sets, strategy sets, and payoff functions in common. However, their names differ, and different names may trigger different beliefs in the players' minds. They may, for example, coordinate on different equilibria in the two cases.[1]

In the let's-get-*x* games, frames shape beliefs and beliefs influence behavior, ultimately because of what beliefs tell a player about a co-player's choices. However, the link from frames to beliefs to actions need not rely on perceptions of others' behavior. Our next example will show how a frame may influence a player's beliefs and behavior, and yet it is from the outset inconceivable that any other player's behavior could change. Consider a dictator game: Player 1 chooses how to divide a sum of money, say \$1000, between himself and player 2 who has no choice except to *accept* that division. Now assume that player 1 suffers from guilt (an emotional response) if he gives 2 less than he believes 2 expects; player 1 is *guilt averse*.[2] Finally, imagine that one ran an experiment on this game, with the twist of calling it by different names in different treatments. Say that the game was referred to as either

- *The let's-split-a-grand game*, or
- *The German tipping game*.

Imagine that most subjects make the equal split in the first case, that most subjects give away just small change in the second case, and that this happens because the dictator subjects hold different beliefs about what recipients expect to get in the two cases. This illustrates how a frame could influence a player's beliefs, which influence his motivation, which influences his behavior, despite there being no strategic uncertainty about what other players do.

[1] The let's-get-7 and let's-get-9 games are so-called stag-hunt games, amply discussed for the intriguing coordination problem embodied. This matters *e.g.* to theories of equilibrium selection (*e.g.*, Harsanyi and Selten, 1988; Carlsson and van Damme, 1993); examinations of the impact of communication (*e.g.*, Aumann, 1990; Charness, 2000; Clark et al., 2001), and the impact of learning (*e.g.*, Crawford, 1995). We thus add framing to this list of topics.

[2] Guilt aversion is introduced in more detail, including references to relevant previous work, in Section 4.