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Highlights

- We examine if the power of a label-based focal point in coordination games is affected by gain or loss framing.
- Loss framing reduces the power of the focal point.
- Loss framing reduces the positive effect of high stakes on the power of the focal point.

Coordination and Focality Under Gain-Loss Framing: Experimental Evidence*

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Abstract

Are people better at coordinating on a focal point when the game is framed as coordinating on a division of losses rather than gains? In an experimental coordination game, we vary the payoff framing (gain vs loss) and stake size (low vs high) to examine this question. We find that loss framing reduces coordination on the focal point, with the strongest effect observed in high stakes games.
Keywords: Coordination games; focal point; framing; losses versus gains.

JEL Classification: C70; C72; C92.

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1. Introduction

A defining feature of coordination games is the multiplicity of equilibria, which creates an equilibrium selection problem for decision makers as they try to avoid coordination failure (Camerer, 2003; Devetag and Ortmann, 2007).

How do players coordinate on an equilibrium? An important hypothesis, first proposed in Schelling (1960), is that players can coordinate on a *focal point*,[1] even if this is based on purely contextual, payoff irrelevant features, e.g. strategy labels (Sugden and Zamarron, 2006).[2]

In this paper we use an economics experiment to investigate if the power of a label-based focal point in a symmetric coordination game is affected by what we refer to as the *gain-loss frame*, namely whether payoffs are presented as gains (positive amounts) or as losses (negative amounts). We use a coordination game with two choices labeled A and B, and we assume that the strategy label A is the focal point.[3] Our experimental treatments vary the framing of the decision (gains vs. losses) across environments where stake size is also manipulated between low and high payoffs. Across treatments that vary the gain-loss frame, we keep net monetary payoffs identical, enabling us to precisely identify if there is an effect of gain-loss framing on behavior.

The existing literature has found that behavior in coordination games is sensitive to changes in the level of the game's *real* payoffs (Cachon and Camerer, 1996; Feltovich, 2011; Feltovich et al., 2012).[4] We augment the literature by asking: Can a change in the *frame*, namely framing all payoffs as losses rather than gains, but keeping all net payoffs unaffected, also affect behavior in coordination games? A finding that there is an effect of framing would violate the axiom of rational decision making known as *description invariance* (Tversky and Kahneman, 1986), according to which behavior under two different but normatively identical representations of the decision problem should be the same. This has been found to fail in many individual choice settings and some interactive situations (Neale and Bazerman, 1985; Druckman, 2001; Payne et

[1] The hypothesis that focal points increase coordination has been generally confirmed for symmetric coordination games, where players have identical preferences and payoffs and are indifferent about exactly how they coordinate as long they manage to coordinate on something (Mehta et al., 1994; Camerer, 2003). Relatedly, Parravano and Poulsen (2015) demonstrate that the power of focal points increases with increases in payoff stake size. In contrast, the power of focal points is substantially reduced in games with asymmetric coordination payoffs, where players prefer coordination on different actions (Crawford et al., 2008; Van Elten and Penczynski, 2015; Isoni et al., 2013; Isoni et al., 2014; Parravano and Poulsen, 2015; Poulsen et al., 2016).

[2] In this paper 'focal point' refers to label-based focal points, unless otherwise mentioned. Focality can of course also be based on properties of the game's payoffs, such as equality or efficiency; see for example Galeotti et al. (2016), Bett et al. (2016), and Van Huyck et al. (1992).

[3] There are a number of reasons why A is considered focal: letter A comes before B in the alphabet, or the use of A in phrases such as the A plan, the A team, an A grade, and the A list.

[4] See also Rydval and Ortmann (2005). There is a large experimental literature on other framing effects: Bazerman et al. (1985), Carnevale and Pruitt (1992), Dreu et al. (1994), Andreoni (1995), Cookson (2000), Cubitt et al. (2011), and Dufwenberg et al. (2011), Ellingsen et al. (2012), Dreber (2013).

al., 1992).[5] Our paper can be seen as extending this investigation to coordination settings.[6]

Our ex-ante hypothesis was that a shift from a gain to a loss frame would have a positive effect on the power of the focal point and coordination. First, a loss frame might make subjects more keen to achieve coordination due to loss aversion (Kahneman and Tversky, 1979; Tversky and Kahneman, 1986). Loss framing might also make subjects better able to understand and appreciate the role of the focal point as a means to ensure coordination - strengthening team reasoning (Faillo et al., 2017; Sugden, 1993; Bardsley et al., 2010; Bacharach, 2006) where players in a coordination game reason and act as a team to consider how coordination is best achieved.[7]

Our main finding – and contrary to our expectation – is that switching from a gain to a loss frame tends to *reduce* coordination, with the strongest reduction observed under high stakes. Our findings suggest that description invariance does not hold in symmetric coordination games and any effect of going from a gain to a loss frame will never increase coordination rates.

One interpretation of these results is that the loss frame affects reasoning in a way that makes people less able to recognize the focal point or less confident that the other player will choose the focal point; and our analysis of the post-experiment survey data supports this interpretation as loss framing increased the frequency of random decisions, and reduced the discussion of A as a focal point.

The rest of the paper is organized as follows. Section 2 outlines the experiment design. We describe and analyse the data in Section 3 and Section 4 concludes. The Appendix contains the experiment instructions.

2. Experimental Design

The 2×2 factorial design consists of four treatments that vary the size and framing of payoffs. The data presented for the gain frame treatments were collected in an earlier set of experiments and the findings were reported in Parravano and Poulsen (2015).

In all treatments each player had two actions, labeled A and B. If the players coordinate by both choosing A or both choosing B, each receives a coordination payoff, which exceeds what they receive if they fail to coordinate.

[5] Some bargaining studies have found an effect of loss versus gains frame. Bazerman (1983) and Neale and Bazerman (1985) observe that negotiators with a gain frame were more willing to concede, and earned more money than negotiators with a loss frame. See also Bazerman et al. (1985).

[6] We emphasize that we do not have real losses in our experiment. All net payoffs are positive. It is only the game payoffs that are framed as gains or as losses. We explain the method used in the Experimental Design section.

[7] Note that other theories about how people deal with losses in games, such as loss avoidance (cf. the papers described), do not apply to our games, since in the loss-framed games there is no safe strategy that is sure to not yield any losses. Thus, there are different theories about framing that make different predictions for our games. Of course, it is possible that both operate to some extent, and indeed that they could cancel out. Our paper was not intended to test these theories, but rather to exploratively generate data from plausible gain-loss framed coordination games with label based focal points.

The Gain Frame In the Gain (+) frame, all coordination payoffs are strictly positive and symmetric. In the case of coordination failure, each player receives zero. Treatments varied the stake size between low and high payoffs, where high payoffs were obtained by multiplying all low payoffs by three.

The games with gain framing are shown below. Payoffs are in British Pounds (£).

		A	B
Low	A	$5, 5$	$0, 0$
(L+)	B	$0, 0$	$5, 5$

High	A	$15, 15$	$0, 0$
(H+)	B	$0, 0$	$15, 15$

The Loss Frame To examine the effect of a loss frame, the above games were transformed into games with negative payoffs, but in such a way that all final payoffs were the same as the gain frame. This was done by giving subjects a cash voucher that losses were taken from. The value of this voucher was £10 for Low stakes and £30 for High stakes. The losses for each game are presented below.

		A	B
Low	A	$-5, -5$	$-10, -10$
L− (endowment £10)	B	$-10, -10$	$-5, -5$

High	A	$-15, -15$	$-30, -30$
H− (endowment £30)	B	$-30, -30$	$-15, -15$

Consider any two games that differ only in the frame (+ vs −), and consider some action profile. In these games net final earnings (game payoffs and any fixed payment) are the same and thus strategically identical and theoretically result in the same equilibria.[8]

Subjects were randomly assigned to a private cubicle and communication was not allowed. Each subject was given a brown envelope that contained two slips of paper, one labeled 'A' and the other 'B' (for an example see Figure 2.1). Each slip indicated the payoffs that the subject would receive if both subjects chose the same slip. Subjects were also instructed of their payoffs in the event that they did not coordinate. In the gain frame, they were told that their earnings would be zero; in the loss frame they were told that they would lose the entire endowment amount.

All subjects were instructed of their player role (person 1 or person 2) and that they would be randomly and anonymously matched with another player of the opposite role participating

[8] In these games, (A, A) and (B, B) are the two pure strategy equilibria which exist in addition to a unique mixed strategy equilibrium.

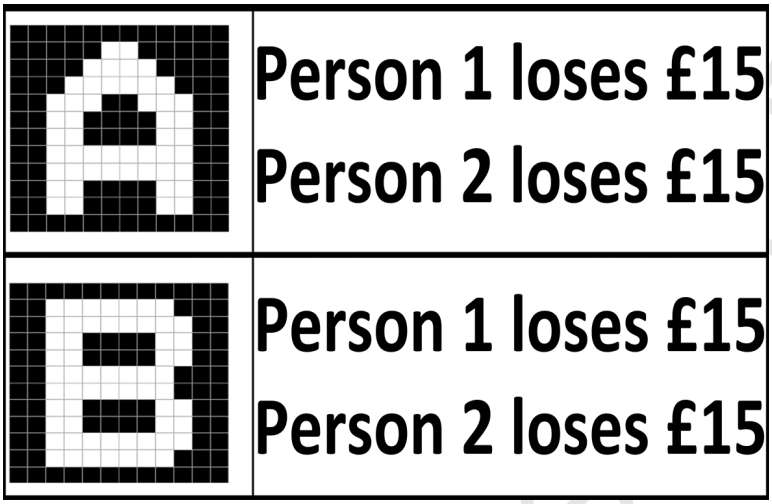

Figure 2.1: Objects presented to subjects in the H− treatment

in the same session. They were then asked to open the brown envelope, select one of the two slips of paper (A or B), and put the selected slip of paper in the white envelope. The white envelopes were collected and payoffs were calculated. During this calculation, subjects were asked to fill out a post-experiment questionnaire that asked for demographic information as well as their feedback on "how you made your decision and any other aspect you believe is important." Subjects were paid privately at the conclusion of the experiment by their ID, and payoffs included a £2 show-up fee. The only difference in protocol between treatments was in the loss framing treatments, where subjects were also given the cash voucher at the start of the session.

	L $(+/-)$	H $(+/-)$
N Subjects	48/54	48/52

Table 2.1: Number of subjects.

Table 2.1 summarizes the number of subjects, broken down by treatment. The sessions took place at the Centre for Behavioural and Experimental Social Science (CBESS), at the University of East Anglia (Norwich, UK). Each session had at least 10 and a maximum of 16 subjects. The subjects were students at the university and were recruited using hRoot (Bock, Baegte, and Nicklisch, 2014).

3. Experimental Findings

Table 3.1 presents the absolute and relative frequency of A choices (the focal point) across treatments, the empirical expected coordination rates (ECR) and expected payoffs, and the theoret-

		L	H
Gain (+) Frame			
	N (per role)	48 (24)	48 (24)
	N Choose A	19 (79.2%) P1	24 (100%) P1
		21 (87.5%) P2	23 (95.8%) P2
		40 (83.3%) P1& P2	47 (97.9%) P1& P2
ECR		71.6%	95.8%
Expected Payoff		3.59 P1	14.38 P1
		3.59 P2	14.38 P2
Loss (−) Frame			
	N (per role)	54 (27)	52 (26)
	N Choose A	23 (85.2%) P1	22 (84.6%) P1
		20 (74.1%) P2	22 (84.6%) P2
		43 (79.6%) P1& P2	44 (84.6%) P1& P2
ECR		66.9%	73.5%
Expected Payoff		3.35 P1	11.10 P1
		3.35 P2	11.10 P2
MSNE Coordination Rate		50%	50%
MSNE Expected Payoff		2.50	7.50

Table 3.1: The absolute and relative frequency of A choices, the empirical expected coordination rates (ECR), expected payoffs, and the theoretical coordination rate and expected payoffs under MSNE.

ical coordination rate and expected payoffs under the mixed strategy Nash equilibrium.[9]

Finding 1. *Loss framing reduces the power of the focal point.*

Across all treatments, we observe that the proportion of A choices is significantly higher than random and the predicted MSNE rate, 50% (one-sided proportion test, $p < 0.01$). However, the effect of loss framing is evident in both L and H treatments as the observed proportion of A choices decreases. Comparisons in the proportions of A choices between H+ versus H- demonstrate that the negative effect of loss framing is significant (chi2, $p = 0.02$), providing support for finding 1. While a decrease in in the proportion of A choices is also observed under loss framing in the low payoff condition (83.3% to 79.6%), this reduction is not statistically significant (L+ /L- comparison; chi2, $p = 0.63$). An alternative interpretation of this result is that increasing stake size increases the power of the focal point only in the gain frame (L+/H+ comparison; chi2, $p = 0.01$; L-/H- comparison; chi2, $p = 0.50$).

Examining coordination rates, we observe a similar result. Comparisons of the ECR between L+/L- show no significant differences (chi2, $p = 0.74$) but between the H+/H- condi-

[9]The expected coordination rate gives the probability that a randomly selected pair of subjects achieve coordination on (A,A) or (B,B). This was calculated using the observed frequencies of A and B choices. We also used the recombinant estimation technique (Mullin and Reiley, 2006) to estimate mean coordination rates (which gives a value identical to the reported ECR).

tions, there is a significant reduction in expected coordination (chi2, $p = 0.03$). This implies that loss framing reduces the positive effect of high stakes on the power of the focal point.

3.1. Post-Experiment Survey Analysis

Category (%)	Overall	Choose A	L+	L-	H+	H-	κ
Description of Self Decisions							
1. chose randomly	23.3	83.0	12.5	37.0	14.6	26.9	.75
2. discussion of focal A	36.1	98.6	41.7	29.6	47.9	26.9	.58
3. tried to match partner	21.8	93.2	20.8	24.1	31.3	11.5	.43
4. discussion of focal B	4.5	0	12.5	–	2.1	3.9	.94
Description of Partner Decisions							
5. partner chose randomly	–	–	–	–	–	–	–
6. discussion of partner's focal A	4.0	100	6.3	–	6.3	3.9	.15
7. partner trying to match me	0.5	100	–	–	2.1	–	.21
8. discussion of partner's focal B	–	–	–	–	–	–	–
Other							
9. discussion of losses, making nothing	–	–	–	–	–	–	–
10. discussion of same/equal payoffs, choices	33.7	92.7	41.7	25.9	27.1	40.4	.50
11. partner not smart, people not smart	–	–	–	–	–	–	–
12. expression of frustration with game, bad mood	0.5	100	–	–	–	1.9	.40
13. expression of good mood, interesting game	1.0	50	2.1	1.9	–	–	.57
14. reference to own role or partner role (P1 or P2)	–	–	–	–	–	–	–
15. specific reference to gut reaction	3.5	85.7	2.1	1.9	4.2	5.8	.62

Table 3.2: Percent of subject post-experiment responses by category and treatment; Kappa coefficient of inter-rater agreement: .01-.20 slight, .21-.40 fair, .41-.60 moderate, .61-.80 substantial, >.80 almost perfect

In the post-experiment survey, subjects were asked "how you made your decision and any other aspect you believe is important." Two student research assistants independently coded the response data into 15 categories, identified in Table 3.2. A subject's statement was assigned to a category if both coders agreed to the categorization, and the table reports the frequency of each category. The first column (overall) is across all treatments and the second column reports the percentage of responses within a category that chose A (e.g. the percentage of those that chose A out of those that stated they chose randomly is 83%). Columns 3 - 6 provide relative frequencies within a treatment, out of all responses for that particular treatment. We measure agreement between coders using Cohen's kappa coefficient of inter-rater agreement, which is reported in the last column.[10]

The most commonly coded content was a description of self decisions (74.8%). Within this category, a couple of regularities emerge: first, random choices (category 1) were more likely to occur under loss framing, while discussions of the focality of A (category 2) were more common

[10]Blank categories indicate that the coders did not agree to any response falling within that category.

in the gain treatments. Payoff saliency (category 10) was important in all treatments, but we find no clear treatment effects based on framing or stake size.

4. Conclusion

We experimentally investigate if players coordinate more often under a loss than a gain frame. Our hypothesis was that the prospect of losses might improve the power of the focal point and consequently coordination. We observe that switching from a gain to a loss frame is detrimental to the power of the focal point and coordination rates, particularly when the stakes are high. These findings suggest that the best way to promote coordination is to emphasize the gains from coordination rather than the costs from a failure to coordinate, and contribute to an emerging picture of how payoff structure directly affects focal-point based reasoning.

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