Nothing to Fear But Fear Itself: Fear of Fear, Fear of Greed and Gender Effects in Two-Person Asymmetric Social Dilemmas

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Abstract
This article extends Simpson's (2003) research on sex differences in social dilemmas. To test the hypotheses that men defect in response to greed and women to fear, Simpson created Fear and Greed Dilemmas, but experiments using these games supported the greed hypothesis only. In this article I focus on why the fear hypothesis failed and suggest that fear was actually absent in the Fear Dilemma. To retest Simpson's hypotheses, I propose a new asymmetric game, the Fear-of-Greed Dilemma. The asymmetry is important for two reasons. First, it creates the risk of exploitation that Simpson's Fear Dilemma lacked. Second, it exposes a critical limitation in Rapoport's (1964) K-index and suggests a re-specification. Laboratory studies supported the fear hypothesis and found mediating effects of expectations about partners on sex differences in cooperation.

> "There is nothing to fear but fear itself."
> – President Franklin D. Roosevelt

Simpson (2003) offers a new and compelling answer to a question that has puzzled a generation of social psychologists: why have social dilemma experiments failed to obtain clear and consistent sex differences in cooperation? According to Simpson, scholars of moral development (Gilligan 1982), gender roles (Eagly 1987), and evolutionary psychology (Daly and Wilson 1988; Campbell 1999) have argued that women are generally less motivated by greed, competition and other selfish interests than are men. Yet, past experiments have found mixed support for sex differences in cooperation (Colman 1999:149-151; Ledyard 1995). Some studies obtained greater cooperation from women (Dawes et al. 1977; Bonacich 1972), others from men (Sell and Wilson 1991; Brown-Kruse and Hummels 1993), and still others found no sex difference (Caldwell 1976; Goehring and Kahan 1976).

Simpson (2003) argues that the lack of consistent results for gender effects on cooperation in social dilemmas is due, in part, to the use of the Prisoner's Dilemma (henceforth PD) paradigm in many of these studies. PD describes a situation in which a choice between "cooperation" and "defection" creates incentives for individual actors to withhold contribution in a task that requires collective effort. As discussed below, defection in PD may be motivated by greed (i.e., the temptation to cheat and exploit others) or fear (i.e., the risk of exploitation by cheaters) or both. The problem, Simpson hypothesized, is that men are more likely than women to defect in response to greed incentives, while women are more likely than men to defect in response to fear incentives. Thus, men and women may be

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equally motivated to defect in PD, but for different reasons. Simpson tested these hypotheses using two new variants of PD – the Fear Dilemma and the Greed Dilemma – that isolated the fear and the greed incentives in separate games. The results from laboratory studies found clear support for the greed hypothesis but not the fear hypothesis.

Why did the fear hypothesis fail? The present study advances a methodological explanation to account for Simpson's results and proposes a new asymmetric game to retest the fear hypothesis. This game is important for two reasons. First, it suggests an alternative specification of fear incentive that better corresponds to the logic of the fear hypothesis. Second, it highlights a crucial limitation of Rapoport's (1967) K-index of cooperation, which purportedly measures the total incentive to defect in a dyadic mixed-motive situation. In turn, I propose a reformulation of the K-index and derive an additional hypothesis that suggests a causal account of sex differences in cooperation based on expectations about partners. Finally, I discuss results from laboratory studies that tested my hypotheses. In striking contrast to Simpson's original study, the new results now support the fear hypothesis.

The Prisoner's Dilemma and the Problem of Human Cooperation

Social dilemmas are situations in which the selfish interests of individuals are at odds with their collective interests (Dawes 1980; Raub 1988). Across social sciences and beyond, PD has become the paradigm example of social dilemmas (Rapoport and Chammah 1965; Axelrod 1984; Coleman 1990), and understandably so, for it simultaneously captures two of the most fundamental obstacles to human cooperation: greed and fear. To see why, consider the formal structure of PD.

PD is a two-person game with a binary choice between "cooperation" and "defection," yielding four possible payoff outcomes. Formally, it is characterized by the ordinality of payoffs to each player such that $T > R > P > S$, where T [temptation] is the payoff for exploiting the other, R [reward] is the payoff for mutual cooperation, S [the sucker] is the payoff for suffering exploitation, and P [punishment] is the payoff for mutual defection. Since $R > P$, mutual cooperation is Pareto or "collectively" superior to mutual defection, but individually, players are rational to defect, either in response to the greed incentive (defined as $T\text{-}R > 0$) or the fear incentive (defined as $P\text{-}S > 0$) or both. Greed tempts players to defect on cooperators for the maximum individual payoff at the expense of their partners. Fear motivates players to defect on defectors and therefore avoid exploitation.[1] Together, these two problems account for a wide range of social issues and provide a coherent framework for studing the limits and the possibilities of human cooperation.

Greedy Men, Fearful Women: Simpson's (2003) Hypotheses

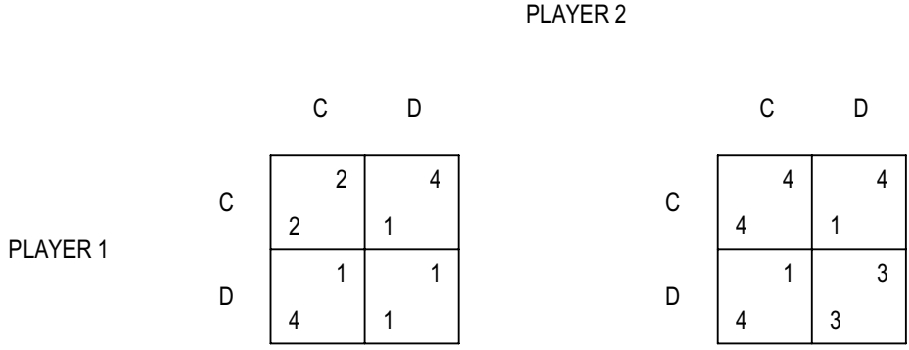
Although most real-life social dilemmas involve some amount of both fear and greed, PD is not always the appropriate model for studying cooperation in the laboratory, however, because it conflates their possible effects. Fear and greed both motivate players in PD to withhold cooperation, but for different reasons. PD presents a rigorous test of social cooperation because it requires players to overcome both greed and fear. At the same time, it also obscures the reason why people fail to cooperate.

According to Simpson (2003), it is precisely because fear and greed are confounded in PD that experiments using PD might fail to capture sex differences in cooperation. Citing theories of social roles (Eagly 1987), moral development (Gilligan 1982), and evolutionary psychology (Daly and Wilson 1988; Campbell 1999), Simpson contends that men and women respond

to different incentives for defection. For example, he notes that the "male role" in social role theory emphasizes risk-taking and competition and is more closely aligned with greed incentives. Similarly, the theory argues that, as much as women might prefer mutual cooperation, they are also socialized to minimize conflicts – that is, to avoid aggression to and from others. From this perspective, women do not offer unconditional cooperation. Far from it, women may be as likely to defect as men – but they are more likely to defect in response to fear incentives rather than to greed incentives.

Simpson thus hypothesized that men (compared to women) are more motivated to defect in response to the greed incentive and women to the fear incentive (relative to men). As discussed, however, the problem for experimenters is that greed and fear are confounded in PD. To address this issue, Simpson decomposed PD into two constituent games, the Fear Dilemma and the Greed Dilemma. Both of these games were derived from PD by removing the greed and the fear components separately. In the Fear Dilemma, the temptation to exploit one's partner was eliminated by equating R to T, such that $T = R > P > S$, while in the Greed Dilemma, the fear of exploitation was removed by setting P equal to S, such that $T > R > P = S$. In effect, it no longer paid off any more for the focal actor to resist free-riding in the Fear Dilemma or any less to get "suckered" than to avoid exploitation by defecting in the Greed Dilemma.

Figure 1. Simpson's Greed and Fear Dilemmas



Simpson tested his fear and greed hypotheses in laboratory studies using the Fear Dilemma and the Greed Dilemma. The results supported the greed hypothesis: men were less likely than women to cooperate in the Greed Dilemma and were less likely to cooperate as the relative size of the greed incentive increased from the Fear Dilemma (which has no greed incentive) to PD (which has equal and moderate levels of greed and fear incentives) to the Greed Dilemma (which has a high level of greed incentive). In comparison, the results were incongruent with the fear hypothesis. In the Fear Dilemma, women were as likely to cooperate as men, and they were equally likely to cooperate in the Fear Dilemma as in the Greed Dilemma. Indeed, they were least likely to cooperate in PD.

No Fear

Simpson's results raise curious questions. First, why did the fear hypothesis fail? That is, why did female participants cooperate so much in the Fear Dilemma? Not only was there no

significant sex difference in the Fear Dilemma, contrary to the fear hypothesis, but women cooperated as much in the Fear Dilemma as they did in the Greed Dilemma. One possible answer is that women do not respond any more than men to fear.[2] For example, Simpson cites Byrnes et al. (1999) to suggest that sex differences with respect to risk or fear may be declining in the United States. This explanation is plausible but insufficient, because dismissing the fear hypothesis altogether fails to explain another incongruence in Simpson's results: why did female participants cooperate less in PD than in the Fear Dilemma, which has a larger fear incentive than PD, or in the Greed Dilemma, which has a larger greed incentive than PD? That is, if women do not respond to either fear or greed, why did more women defect in PD than in the other games? Perhaps cooperation is less likely for women when fear and greed coexist. Not only does this explanation lack clear theoretical justification, but Simpson rules out this possibility by ensuring the same K-index for all games. The K-index (Rapoport 1967) measures the overall incentive to defect in a two-person dilemma by calculating the relative size of greed and fear incentives. Thus, by Simpson's account, no game rewarded defection or cooperation more than the others.

I suggest an alternative methodological explanation, one that does not dispense with the fear hypothesis. Let us assume that Simpson's reasoning for sex differences in cooperation is correct and that women are more responsive to fear than are men. I argue that no sex difference was obtained with respect to fear, because fear was actually absent in Simpson's Fear Dilemma. Simpson created the Fear Dilemma by removing greed from PD. However, in removing greed, he also removed fear. The reason is simple: if the partner has no temptation to cheat, there is nothing to fear. In Simpson's Fear Dilemma, both players make decisions with respect to fear, and more importantly, neither player has an incentive to exploit the other player. Consequently, although defection weakly dominates cooperation and mutual defection is a Nash equilibrium,[3] cooperation remains a very reasonable strategy in the Fear Dilemma in terms of payoff maximization (as well as fairness), since mutual cooperation is a Pareto optimal Nash equilibrium.

What Simpson called the Fear Dilemma, then, was actually a "Fear of Fear" Dilemma because the motivation for both players was only fear. Accordingly, fewer women than expected defected in Simpson's Fear Dilemma because Player 2 (i.e., the simulated actor playing against Player 1, the participant) had no explicit incentive to exploit them. By the same account, female cooperation was lower in PD than in the Fear Dilemma because exploitation did pay off in PD for Player 2.

It is true that fear breeds fear in some situations. But more often, fear of fear is just a false alarm, as Franklin D. Roosevelt proclaimed. Instead of the Fear Dilemma, then, a more direct test of Simpson's fear hypothesis – that women defect in order to avoid exploitation – is to situate players in a game against partners motivated by greed rather than by fear alone, a game I call the "Fear of Greed" Dilemma.

The Fear of Greed Dilemma

The Fear of Greed Dilemma (hereafter FGD) is shown in Figure 2. The payoff schedule for Player 1 is based on the Fear Dilemma ($T = R > P > S$), but the payoff schedule for Player 2 is based on the Greed Dilemma ($T > R > P = S$). This asymmetry is important for two reasons. Methodologically, it is this asymmetry of the fear and greed incentives that creates the risk of exploitation that was critically absent in Simpson's Fear Dilemma. Theoretically, the asymmetry exposes a serious limitation in Rapoport's K-index: in calculating the overall incentive for the focal player to cooperate, it fails to take into account the payoffs to Player 2 player. Instead, it assumes that defection is motivated exclusively by one's own payoffs.

Figure 2. The Fear of Greed Dilemma

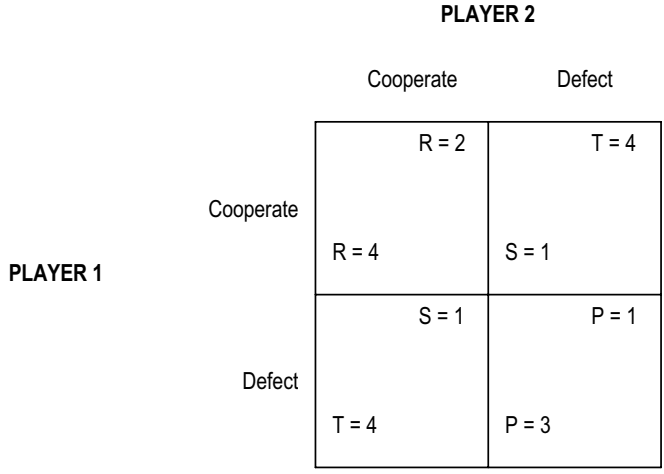
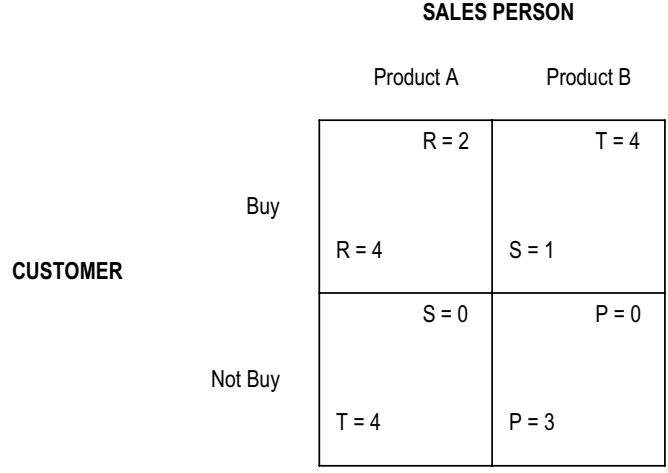


Figure 3. The Customer and the Sales Person in the "Lemons" Market



A game is a social dilemma if there is at least one Pareto deficient Nash equilibrium (Raub 1988).[4] In FGD, the two Nash equilibria – defect-cooperate and defect-defect – are both Pareto inferior to mutual cooperation. Unlike in the Fear Game, mutual cooperation in FGD is not stable, however, because Player 2 is now better off defecting against Player 1's cooperation. The dilemma for Player 1, in turn, is whether to seek mutual cooperation for the most Pareto optimal outcome at the risk of exploitation by Player 2. It is this dilemma that creates the fear of greed incentive, which in turn constitutes the focus of my analysis.[5]

Consider a concrete example of FGD. In a lemons market (Akerlof 1970), the sales representative (Player 2) decides whether to show the customer (Player1) Product A of decent

quality (i.e., Player 2 cooperates) or Product B of much lower quality for the price (i.e., Player 2 defects). If the customer appears willing to purchase whichever is shown to him (i.e., Player 1 cooperates), the temptation for the sales representative is to show him Product A for higher profit ($T > R$). On the other hand, the store earns nothing if the customer decides not to buy either product (i.e., Player 1 defects), or $P = S = 0$. The best outcome for the customer is to buy Product A – or buy nothing if he is indifferent as to buying a good product and not spending money, such that R T.6 At minimum, he is better off not buying anything than paying too much for a lousy product, or $P > S$.

As this example illustrates, FGDs arise when Player 2 in an exchange does not know whether Player 1 trusts Player 2, or analogously, when Player 1 can back out of an exchange. Put differently, FGD represents a non-sequential variant of the Trust Game (Dasgupta 1988). The Trust Game is a sequential decision-making situation in which the first-mover decides whether or not to place trust in a partner, who in turn decides whether or not to honor the trust. Like in FGD, the problem for one player (trustor) is fear, while the problem for the other (trustee) is greed. But the interaction in the conventional trust games differs from the above example of the lemons market in that the trustee has complete information about the strategic choice of the trustor. Thus, FGD can be regarded as a trust game with simultaneous moves and highlights the sequentiality of decisions as a potentially important feature of trust situations that has only recently begun to receive critical attention (Molm, Takahashi and Petersen 2000; Snijders and Gideon 1999).[7]

Predictions

Sex Differences in Cooperation

The main purpose of the present study is to retest Simpson's fear and greed hypotheses using FGD, an asymmetric game that restores the fear that is missing in Simpson's symmetric Fear Dilemma. The baseline prediction is to replicate Simpson's results for the Fear Dilemma and the Greed Dilemma.

> *Hypothesis 1a: Men and women are equally likely to cooperate in the Fear Dilemma.*

> *Hypothesis 1b: More men than women will defect in the Greed Dilemma.*

With respect to Simpson's fear hypothesis, I predict more women than men to defect in response to a fear incentive only when a threat of exploitation is also present. That is,

> *Hypothesis 1c: More women than men will defect in FGD.*

To be sure, these sex differences can obtain if either men or women varied sufficiently in their responses to fear or greed.[8] To substantiate the claims that men are more likely than women to defect in response to greed incentives, women more likely than men to defect in response to fear-of-greed incentives, and neither is more likely than the other to defect in response to fear incentives alone, it will be necessary to consider within-subject comparisons also – that is, how the same men and women might behave differently in different games.

Hypothesis 2a: *Women defect more in FGD than in the Fear Dilemma or the Greed Dilemma.*

Hypothesis 2b: *Men defect more in the Greed Dilemma than in FGD or the Fear Dilemma.*

A Cognitive Basis of Sex Differences

In addition to retesting the fear hypothesis, another goal of the present study is to further inform Simpson's hypotheses by exploring a possible mechanism underlying male and female responses to fear and greed incentives. Granting that risk-aversion and moral value orientations may be important determinants of sex differences in social behavior as Simpson suggests, it is still not clear how they account for the ways in which men and women come to play identical games differently. More to the point, what does defecting "in response to" or "out of" fear and greed entail for men and women?

One plausible explanation is that men and women hold different expectations about Player 2. Consider the possibility that women respond more strongly to fear incentives than men because they are more likely than men to expect others to misbehave or take advantage of them – that is, women are more distrustful than men (Chaudhuri and Gangadharan 2002). To illustrate, let π denote the probability with which Player 1 expects Player 2 to defect. Substantively, π is Player 1's subjective fear of exploitation. More formally, it is a function of Player 2's incentive to defect, $T_{Player2} - R_{Player2}$, discounted by Player 1's sensitivity to fear of exploitation, $\sigma \in [0,1]$, which in turn may be a function of Player 1's sex. Normalizing the greed incentive for T-S as suggested by Ahn et al. (2001),

$$\pi = \sigma \left(\frac{T_{Player2} - R_{Player2}}{T_{Player2} - S_{Player2}}\right)^{9}$$

For $T_{Player2} > R_{Player2}$, the prediction is that $\pi_{male} < \pi_{female}$ because women are more sensitive to risks of exploitation, i.e., σ (male) $< \sigma$ (female).[10] This informs the final hypothesis:

Hypothesis 3: *Women are more likely than men to expect Player 2 to defect in the Fear of Greed Dilemma and the Greed Dilemma but not in the Fear Dilemma.*

Assuming that Hypothesis 3 is correct, Simpson's results can be explained in terms of conventional "best response" analysis in game theory. According to Hypothesis 3, women are more likely than men to expect Player 2 to defect in the Greed Dilemma. This explains why more men defect in the Greed Dilemma than women, because defection dominates cooperation against a cooperator, but defection and cooperation yield the same payoff against a defector. In the Fear Dilemma, no sex difference in cooperation obtains because there is no greed incentive for Player 2 that informs Player 1's beliefs about Player 2. In PD, no sex difference is obtained because defection dominates cooperation against a cooperator as well as a defector. Finally, in FGD, women are predicted to defect more than men because they are more likely than men to expect Player 2 to defect, and defection dominates cooperation against a defector but not against a cooperator.[11]

Parameterizing the focal player's beliefs also suggests how Rapoport's K-index can be modified to accommodate asymmetric incentives in two-person social dilemmas. The original

K-index, (R-P)/(T-S), is the size of the "cooperator's gain," normalized for T-S, and estimates the probability of cooperation. As Ahn et al. (2001; also Simpson 2003) have shown, K-index is a function of the fear and greed incentives, such that

$$K = \frac{R-P}{T-S} = 1 - \frac{T-R}{T-S} - \frac{P-S}{T-S}$$

Hence, the probability of cooperation is inversely related to the greed and fear incentives. Note, however, that this formulation involves the payoffs to the focal player only and does not take into account the fear of exploitation. I propose the following alternative specification that allows K to vary according to the payoffs to Player 2:

$$K_{alt} = 1 - \frac{T-R}{T-S}(1-\pi) - \frac{P-S}{T-S}\pi,$$

where π is the subjective probability of exploitation as defined above. This simple reformulation applies to games in which T $\geqslant$ R and P $\geqslant$ S for Player 1 and captures the intuition that the degree to which the focal player responds to the greed and fear incentives is conditioned by one's fear of exploitation.

Table 1 shows the K-indices for PD, the Fear Dilemma, the Greed Dilemma and FGD using the new specification for $\sigma = 1$. As Simpson intended, Rapoport's K-index is .33 for all the games. In comparison, the new K-indices vary systematically across the games. It is particularly noteworthy that the K-index for the Fear Dilemma is 1, illustrating the claim that the Fear Dilemma has no real incentive to defect. When fear is crossed with greed in FGD, however, the K-index drops sharply and below that of the other games.

Table 1: Payoffs and Kalt-indices for PD, Fear Dilemma, Greed Dilemma and Fear of Greed Dilemma

	Player 1						Player 2					
	T	R	P	S	T-R	P-S	T	R	P	S	T-R	K_{alt} index
PD	4	3	2	1	1	1	4	3	2	1	1	.67
Fear	4	4	3	1	0	2	4	4	3	1	0	1.00
Greed	4	2	1	1	2	0	4	2	1	1	2	.78
Fear of Greed	4	4	3	1	0	2	4	2	1	1	2	.56

An interesting implication of this model is that greed may be more problematic and perhaps more prevalent than fear in real-life situations because greed underlies fear, but fear does not underlie greed; where there is fear, there is greed, but without greed there is little to fear. Greed alone can induce defection on both sides, but fear in the absence of greed is unlikely to motivate defection by either player.

Study

To test Hypotheses 1-3, laboratory studies were conducted. Particular care was taken to replicate the conditions in Simpson's Study 1. Materials for this study, including the

instructions, were obtained directly from Simpson. The Fear and Greed Dilemmas used in this study were identical to those used by Simpson, while FGD was constructed from Simpson's Fear Dilemma and the Greed Dilemma.

Settings and Procedures

Two laboratory studies at Cornell University tested Hypotheses 1-3. Participants were 53 undergraduates (30 men, 23 women) in Study 1 and 71 undergraduates (27 men, 44 women) in Study 2, recruited via flyers and e-mail lists. Participants received $3 in Study 1 and $4 in Study 2 for taking part in a "Social Decision Making Study" lasting approximately 15 minutes. They were also told that they would receive an additional $3 to $12, depending on their performance against random partners.

Participants were scheduled in groups of two to four. Upon entering the laboratory, they were seated separately in a cubicle with a computer terminal. Online instructions promised their anonymity and explained that they would play exchange games with other randomly chosen participants from surrounding terminals or adjoining rooms. No other information was given about partner players. As in Simpson, partner players were actually simulated, unbeknownst to participants. After detailed instructions and practice sessions to ensure participants' understanding of the procedures, three games (Fear Dilemma, Greed Dilemma, and FGD) were counterbalanced and presented to randomized groups. To minimize learning effects, participants did not receive any feedback about the outcome of their decisions during the experiment. Similarly, to minimize priming or biasing, partners were identified neutrally as the "Other" and the strategy choices as "Choice A" and "Choice B." Study 2 was identical to Study 1, except participants in Study 2 were asked to respond to a set of questions before each game. Specifically, before deciding to cooperate or defect, participants were asked to predict whether the Other is more likely to cooperate or defect ("Although you do not know the Other, if you were to guess, would you predict the Other to choose Choice A or B?") and to what extent the Other's strategic choice was motivated by a willingness to earn points or to be cooperative ("To what extent do you think the Other is motivated to earn points [is cooperative]?") and to what degree they were worried about the Other taking advantage of them. ("To what extent do you think the Other will take advantage of you?") In post-experimental debriefing interviews, participants indicated that they understood the directions clearly. Two participants in Study 2 expressed strong suspicion regarding their simulated partners and were precluded from data analysis.

Results

Initial analysis revealed no significant effect of game order. As in Simpson (2003), there was no sex difference in the distribution of economics majors. Finally, data on cooperation were pooled because no significant differences in cooperation rates were found between the two studies.

Table 2 reports summary statistics and the results of z-tests of proportion. The figures closely replicate Simpson's findings and support Hypotheses 1a and 1b. No sex difference was obtained in the Fear Dilemma ($z = .55$, $p = .58$), while more females than males cooperated in the Greed Dilemma ($z = -2.78$, $p > .01$). More importantly, consistent with Hypothesis 1c, a sex difference was obtained in FGD: 25 percent of females and 42 percent of males cooperated ($z = 1.99$, $p = .046$). Hypotheses 2a and 2b were also confirmed: Fewer female participants cooperated in FGD than in the Fear Dilemma or the

Table 2: Summary Statistics and Z-tests of Proportion

	Fear		Greed		Fear of Greed	
	Men	Women	Men	Women	Men	Women
Proportion (%) of cooperators (M = 56, W = 66)	62.50	57.58	26.79[a]	51.52[a]	42.86[d]	25.58[d]
	(6.52)	(6.13)	(5.97)	(6.20)	(6.67)	(5.42)
"I predict the Other to choose Choice A [cooperate]." (M = 26, W = 43)	.54	.44	.42[b]	.23[b]	.42[e]	.29[e]
	(.51)	(.50)	(.50)	(.43)	(.50)	(.39)
"I perceive the Other to be motivated to earn points." (M = 26, W = 43)	2.54	2.84	2.58	2.86	2.73	2.67
	(1.07)	(1.07)	(.21)	(1.01)	(1.08)	(.92)
"I perceive the Other to be cooperative." (M = 26, W = 43)	2.54	2.44	2.73[c]	2.26[c]	2.65	2.61
	(.86)	(.98)	(1.22)	(.85)	(1.13)	(.96)
"The Other is likely to take advantage of me." (M = 26, W = 43)	2.50	2.70	2.62	2.70	2.31[f]	3.05[f]
	(.99)	(1.10)	(.80)	(.89)	(.97)	(.90)

[ad]$p < .05$ [bcef]$p < 0.1$ (two-tailed)
Standard errors are in parentheses.

Greed Dilemma ($z = -4.02$, $p < .01$), and fewer male participants cooperated in the Greed Dilemma than in FGD and the Fear Dilemma ($z = 3.34$, $p < .01$). The difference in male cooperation between the Greed Dilemma and FGD was marginally significant ($z = -1.59$, $p = .08$) in the one-tailed test.

Hypothesis 3 also found some support. In both the Greed Dilemma ($z = 1.67$, $p = .09$) and FGD ($z = 2.14$, $p = .03$), but not in the Fear Dilemma ($z = .78$, $p = .44$), more women than men expected the Other to defect. Moreover, fewer women than men regarded the Other as cooperative in the Greed Dilemma ($t = 1.91$, $p = .06$), and more women than men in FGD indicated that their strategic decisions were influenced by fear of exploitation ($t = 3.21$, $p < .01$).

Finally, logistic regression analyses found patterns suggesting mediation effects of beliefs about partner players. As shown in Table 3, the effect of participant sex falls below statistical significance in both the Greed Dilemma and FGD when expectations about whether the partner is likely to cooperate or defect is included. Concerns about being taken advantage of have a similar effect in FGD. Altogether, these results provide validation for the expectations model of sex differences in cooperation. Not only did male and female participants differ in expectations about the other in dyadic social dilemma situations, as predicted, but these expectations directly shaped their divergent responses to structural incentives. Conversely, controlling for these expectations accounts for significant portions of the sex differences in cooperation.

Discussion

In all, the results lend support to Simpson's fear hypothesis, but with an important qualification: it is fear of greed, not fear of fear, that motivates more women than men to

Table 3: Logistic Regression Coefficients and Standard Errors for the Effects of Sex and Perception of Partner on Cooperation

	Fear Dilemma				
Participant is female	1.02	1.30	1.04	1.03	1.05
	(-.51)	(-.75)	(-.53)	(-.52)	(-.53)
"I predict the Other to choose Choice A [cooperate]."		8.21**			
		(-4.74)			
"I perceive the Other to be motivated to earn points."			.95		
			(-.22)		
"I perceive the Other to be cooperative."				1.14	
				(-.30)	
"The Other is likely to take advantage of me."					.85
					(-.23)
Log likelihood	-46.95	-39.09	-46.92	-46.82	-46.71
Chi-Square	.01	15.71	.06	.25	.47
Pseudo R^2	.001	.17	.001	.003	.005

	Greed Dilemma				
Participant is female	2.59*	2.34	2.41*	4.44**	2.57*
	(-1.36)	(-1.26)	(-1.28)	(-2.79)	(-1.35)
"I predict the Other to choose Choice A [cooperate]."		.32**			
		(-.18)			
"I perceive the Other to be motivated to earn points."			1.41		
			(-.35)		
"I perceive the Other to be cooperative."				2.13**	
				(-.64)	
"The Other is likely to take advantage of me."					1.09
					(-.32)
Log likelihood	-45.75	-43.64	-44.81	-42.1	-45.70
Chi-Square	3.45	7.66	5.33	10.74	3.54
Pseudo R^2	.04	.08	.06	.11	.04

	Fear of Greed Dilemma				
Participant is female	.45*	.65	.42*	.42*	.68
	(-.18)	(-.41)	(-.22)	(-.22)	(-.41)
"I predict the Other to choose Choice A [cooperate]."		10.31**			
		(-6.59)			
"I perceive the Other to be motivated to earn points."			1.18		
			(-.32)		
"I perceive the Other to be cooperative."				1.13	
				(-.30)	
"The Other is likely to take advantage of me."					.46**
					(-.15)
Log likelihood	-71.62	-33.60	-40.85	-40.93	-37.66
Chi-Square	4.00	17.60	3.10	2.95	9.48
Pseudo R^2	.03	.21	.04	.04	.11

*p < .1 **p < .05 ***p < .01 (two-tailed).
Standard errors are in parentheses.

defect in social dilemmas. What women fear in social dilemmas is not the possibility of a suboptimal payoff per se but the threat of exploitation. On the other hand, women seem to be as willing as men are to offer cooperation, even when the mutual defection payoff exceeds the sucker payoff, so long as the other player has no obvious incentive to defect.

Study 2 yielded credible evidence that the male-female responses to fear and greed incentives were conditioned by different expectations that Player 2, given an incentive to exploit, is likely to defect. In both the Greed Dilemma and FGD, female participants were more likely to expect the partner to defect, regard the partner as non-cooperative, or to make strategic choices in response to the fear of exploitation. Finally, regression analysis showed that these differences in beliefs mediated the behavioral responses to fear and greed responses.

Much of past research has implicitly assumed that cooperation in social dilemmas is determined by innate sex differences. Together with Simpson's results, the findings here extend the alternative position that sex differences are much more sensitive to situational variables than often believed (Eagly 1987). In contrast to the stereotypic view of women as altruistic cooperators and men as selfish defectors, men and women seem ready to cooperate as well as defect in social dilemmas, depending on the distribution of the external incentives that condition their expectations about others.

That said, the case for fear and greed incentives should not be overstated. First, it must be emphasized that the sex differences are to be understood in relative terms. Men and women both respond to fear and greed – only, to different degrees. Cooperation was never complete or completely absent for either men or women, but varied systematically across games. I also advise that fear and greed incentives, however ubiquitous, are hardly the only situational factors in social dilemmas. Indeed, following Simpson, this study used only matrix representations of the social dilemmas. One implication is that participants chose between simple binary choices in a contextually minimal setting that was largely divorced from more realistic decision-making situations. Although the purpose of laboratory studies is to ensure stricter tests of the internal validity of theories as well as more direct replication and comparison across studies, their results may not necessarily generalize to more varied conditions in the real-world. Future studies might benefit from including tasks with greater mundane realism, such as physical tasks or problem solving.[12]

Second, the present study exclusively used games with simultaneous choices between players. An important question is how and to what extent the present findings about fear and greed might inform decision-making in sequential trust games.[13] Future studies might benefit from considering the implications of sequentiality on the effects of greed and fear incentives.

Third, while the present study considered dyadic games only, several previous studies (e.g., Rapoport and Eshed-Levy 1989; Dawes et al. 1988) have compared greed and fear in N-person public goods games and found greater effects of greed than fear in inhibiting cooperation. An important topic for future research is to investigate whether and how incentive asymmetries in two-person situations might generalize, structurally and psychologically, to N-person situations with different group size and structure.

Previous work on two-person social dilemmas has focused almost exclusively on symmetric games (Wit et al. 1992). In many cases, however, asymmetric games are not only more realistic but also theoretically more informative. While PD provides a stringent test of social cooperation, it also obscures the actual motives for defecting. By ensuring more exact control of the structure of incentives underlying mixed-motive decisions, experimental research using asymmetric games promises to help us better understand exactly why cooperation might fail.

Notes

1. In this game-theoretic context, the terms "greed" and "fear" refer not to internal motives or emotions, as in their common usage, but to external incentives in risky and uncertain exchanges.

2. In fact, theories of evolutionary psychology (Daly and Wilson 1988; Campbell 1999) and social roles (Eagly 1987: 70-2) typically highlight women's fear of physical harm, but are less explicit about how and to what extent women respond to threats of non-physical harm. Recent studies (Byrnes et al. 1999; Eckel and Grossman 2002) have found compelling evidence, however, that women are typically more risk-averse than men in non-physical situations (e.g., social decision making or gambling tasks) also.

3. Strategy A weakly dominates Strategy B if, for whichever strategy the other player chooses, As payoff is equal to or greater than Bs. A Nash equilibrium is a stable strategy combination from which neither player would be rational to deviate unilaterally.

4. Pareto deficient Nash equilibrium is a cell from which neither player is better off deviating unilaterally even though there is at least one other cell that offers an equal or better payoff to each player, and therefore presents an undesirable "trap" for rational actors.

5. A fear of greed incentive does not necessarily require asymmetry, however. PD is a symmetrical game with fear of greed because both players face fear and greed. Nor is an asymmetry of payoffs sufficient to create fear of greed. The Fear Dilemma in Figure 1, for example, remains a Fear Dilemma even if the payoffs to Player 2 are doubled, because the payoffs to each player still conform to the ordinal relationship that defines the game. What is important in FGD, and hence the focus of my analysis, is not the cardinal asymmetry of the payoffs but their ordinal asymmetry in which Player 1's fear is conditioned by Player 2's greed. Previous research has considered cardinal asymmetries of payoffs in dyadic social dilemmas (e.g., Van Dijk and Wilke 2000; Wade-Benzoni et al. 2002), but much less attention has been given to social dilemmas with incentive asymmetries, in which different payoffs to the players create different payoff ordinalities (and hence different games) for each player.

6. While $R > T$ implies Stag Hunt rather than FGD, both games lack greed incentives and are therefore included as illustrations of this example.

7. More generally, FGD is characterized by an imbalance of dependence and power between actors, that is, when the focal player is dependent on the partner. Heckathorn (1996) showed that the incentive structure of social dilemmas varies systematically with the degree of interdependence between the players (where interdependence is defined as the marginal effect of contribution on the production of collective good). PD, characterized by moderate levels of interdependence, is transformed into Stag Hunt at higher levels of interdependence, such that $R > T > P > S$ (that is, $R > T$ instead of $T > R$ in PD) and into Chicken at lower levels of interdependence, such that $T > R > S > P$ (that is, $S > P$ instead of $P > S$ in PD). As these payoff ordinalities imply, Stag Hunt is a game of negotiation that rewards mutual cooperation ("I will cooperate only if you do."), whereas Chicken is a game of coordination that punishes over-cooperation. ("Too many cooks spoil the broth.") Note that the Fear Dilemma is a degenerate case of Stag Hunt, in which $T = R$ instead of $R > T$. Likewise, the Greed Dilemma is a degenerate case of Chicken, in

which P = S instead of S > P. In this paradigm, FGD broadly describes an exchange relationship between an actor playing Stag Hunt and another playing Chicken.

8. Thus, for example, Hypothesis 1c will be supported – but not the claim that women defect in response to fear-of-greed incentives – if women's cooperation did not vary across the games while male cooperation was particularly high in FGD.

9. Note that π precludes Player 2's fear. The justification is precisely the claim that fear of fear does not motivate defection or that the threat of exploitation is sufficient to explain Player 1's defection.

10. For $T_{Player2} < R_{Player2}$, that is, if there is no greed incentive for Player 2, assume $\pi = 0$.

11. Invoking differential expectations to explain cooperation in social dilemmas is not new. Frank (1988) argues that emotions are reliable cues that signal honesty and trustworthiness to potential exchange partners. More recently, Orbell and Dawes (1991, 1993) proposed an account of cooperation based on sending signals, or projection, rather than reading signals. Their "cooperator's advantage" is that, by projecting their own choice of play in a mixed population of cooperators and defectors, cooperators are more likely to select themselves into mutually beneficial exchanges. My argument is different: instead of making assumptions about cognitive demands and implications of signaling or projection, I suggest that sex differences in expectations are based on different levels of trust conditioned by the structure of the exchange dilemma. Put differently, my analytical focus is on the effect of game structure rather than the psychology of the players per se.

12. One particularly interesting variation of the present study is to manipulate partner identity. For example, Kerr and MacCoun (1985) created greed and fear conditions in two-person PD situations and found moderating effects of partner sex: both men and women responded less to greed against female partners while they responded more to fear against male partners. The authors reported the findings as evidence of sex role expectations. In a recent study, however, Kollock (1998b) showed systematic effects of group identity on payoff transformation by varying the membership of the partner. More research is needed to understand how expectations about others interact with or inform payoff transformation.

13. Using this game, Croson and Buchan (1999) found no sex difference with respect to risk-taking (but see Chaudhuri and Gangadharan 2002). However, participants in their study made continuous rather than binary decisions – that is, how much rather than whether to trust – which may be influenced by greed or fear or both, thus confounding the interpretation of the results with respect to the fear and greed hypotheses.

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