# 22. Social dilemmas in the sharing economy*

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## INTRODUCTION

Trust is often considered crucial in the sharing economy (e.g., Botsman and Rogers 2010; Frenken and Schor 2017; Puschmann and Alt 2016): for "stranger sharing" (Schor 2014), actors need to engage in interactions with partners who might very well take advantage of them (e.g., Bardhi and Eckhardt 2012). This ubiquitous emphasis on trust suggests a general acknowledgement of the risk of opportunistic behavior in sharing economy exchanges. In turn, this suggests that sharing economy exchanges, not unlike traditional market exchanges, include aspects of strategic interaction in that participants' actions are interdependent, and they may take each other's actions into account when making decisions. I propose that social dilemma research, rooted in game theory and rational choice theory, offers a rich and flexible theoretical framework for addressing such strategic interdependencies. Studying the sharing economy from this perspective allows for the development of theoretical models that indeed include trust as an important feature of many interactions, but also highlights other strategic considerations that look similar to trust problems but may actually be more fruitfully understood through different models.

For the sake of consistency of the chapter in terms of applications and examples, I follow the definition of the sharing economy by Frenken et al. (2015) who emphasize the utilization of idle capacity. Importantly, this implies that platforms facilitating services (for example, TaskRabbit or Uber) are excluded for now, even if many of the arguments provided here—with appropriate modifications—could also be applied to such platforms.

A social dilemma is, roughly, a situation in which a tension exists between individual rationality on the one hand, and collective rationality on the other (also see Kollock 1998; Rapoport 1974; Raub et al. 2015 for more formal definitions). Social dilemmas are central to the study of cooperation among goal-directed actors across a variety of disciplines in the social sciences, including economics, sociology, and political science. While the Prisoner's Dilemma (Rapoport and Chammah 1965) is by far the best-known example of a social dilemma, the closely related Trust Game (Camerer and Weigelt 1988; Coleman 1990) appears implicitly or explicitly in many accounts of the sharing economy, underlying the ubiquitous notion that trust is the prevailing logic of the sharing economy. Likewise, common pool problems or public good problems are frequently associated with the sharing economy (Bradley and Pargman 2017). In this chapter, I discuss the applicability of these well-known models to the sharing economy, but also discuss a number of lesser-known approaches from the social dilemmas literature, including the helping game and the theory of social exchange systems (Ekeh 1974).

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The fact that many accounts of social dilemmas, being rooted in game theory, assume actors to be both rational and selfish, may seem contradictory to the very notion of sharing (e.g., Belk 2010). However, neither of these assumptions are strictly necessary for a fruitful analysis of social dilemma situations. First, while typical analyses do require that actors are at least goal-directed (that is, motivated by incentives), it is often not necessary or desirable to make heroic assumptions about forward-looking behavior or complete information. Indeed, arguments on bounded rationality (Rubinstein 1998) are by now part of the standard repertoire of social dilemmas research (e.g., Macy and Flache 2002). Second, game theory per se does not assume selfishness. While "pay-offs" as modeled in games represent actors' utilities (that is, their motives), these utilities do not necessarily exclusively represent actors' own material or monetary pay-offs; it is perfectly feasible to include other actors' outcomes in utility functions (Fehr and Gintis 2007).

## TWO-PERSON SOCIAL DILEMMAS

### Prisoner's Dilemma

The best-known example of a social dilemma is the Prisoner's Dilemma (PD; Rapoport and Chammah 1965), in which two players face incentives to take advantage of one another, although mutual cooperation would make them both better off. The PD is two-sided, in that the two actors face the same dilemma and act simultaneously. Many platforms, such as Airbnb, Couchsurfing and BlaBlaCar, in principle have this two-sided nature, as both actors may face incentives for opportunistic behavior, and the PD is indeed sometimes used as a model for sharing economy interactions (e.g., Botsman and Rogers 2010, 143). However, contrary to a common misunderstanding, trust is not an issue in the PD: both actors face incentives to take advantage of the other actor, *regardless* of the action of the other actor. This implies that beliefs about the expected action of the other actor play no role in actors' decision-making: it is not the case that they would be willing to cooperate on the condition that the other also cooperates.

Consider online peer-to-peer markets, such as eBay. There are typically two actors, the seller and the buyer, who do not meet in person but trade via mail and wire transfers. To model their interaction in terms of a PD, we define two actions for each actor. After the seller and buyer have agreed on a price for an item, the seller has two options: to send the item to the buyer as agreed, or to keep the item (or send an item of lower quality than agreed). The buyer also has two options: to pay the agreed price for the item, or not. Obviously, the most attractive outcome for the seller is to receive the money while keeping the item, while for the buyer the best outcome is receiving the item for free. This combination of possible strategies would indeed lead to a PD (Figure 22.1), with the standard prediction that both actors would take advantage of each other, even though they would both prefer the cooperative outcome (Kollock 1999b).

Although this representation of a typical eBay interaction captures the main risks involved for both players and satisfies our intuition that online exchanges are essentially cooperation problems, the resulting model is less satisfying in other respects. Most importantly, it ignores that in most online exchange markets, social conventions have emerged that require buyers to make the first move and pay up front, after which the

| | | Actor 2 | |
|---|---|---|---|
| | | Cooperate | Defect |
| **Actor 1** | Cooperate | *R, R* | *S, T* |
| | Defect | *T, S* | *P, P* |

| | | Actor 2 | |
|---|---|---|---|
| | | Cooperate | Defect |
| **Actor 1** | Cooperate | *3, 3* | *0, 5* |
| | Defect | *5, 0* | *1, 1* |

*Note:* Cells represent pay-offs to the actors in the form (Actor 1, Actor 2) resulting from combinations of their respective choices.

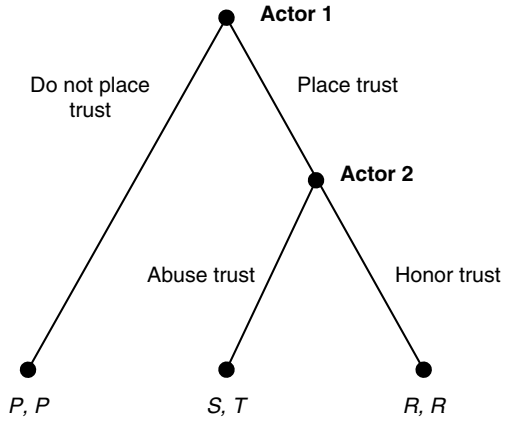
*Figure 22.1 Prisoner's Dilemma with generic pay-offs (left:* T > R > P > S*) and numerical pay-offs (right)*

seller ships the item. This makes opportunistic behavior by the buyer impossible, and thus shifts all the risk of the exchange to the buyer. Similar arguments apply to some types of sharing economy interactions, such as hospitality exchanges on platforms like Airbnb or Couchsurfing. These too involve risks for both actors: for the guest, the obvious safety risk of spending the night in a stranger's house; and for the host, the risk of theft or damage to property (and possibly also a safety risk). Yet, here also the fit is suboptimal, for example because it does not allow for what is intuitively the most likely outcome of an Airbnb encounter: that the guest will never enter the host's house at all. Additionally, as in the eBay case, hospitality interactions are often structured such that much of the risk is shifted to one party (for example, if the accommodation is a separate apartment, the risk for the guest will be much smaller) to the extent that the interaction is no longer a two-sided problem. If this is the case, a one-side dilemma remains such as the Trust Game.

**The Trust Game and the Investment Game**

The Trust Game (Camerer and Weigelt 1988) can be understood as a sequential and one-sided version of the PD in which one actor (the trustor) moves first, deciding whether or not to trust the second actor (the trustee). If the trustor does place trust in the trustee, the trustee decides whether or not to take advantage of the trustor (see Figure 22.2). As with the PD, the standard game-theoretical prediction for this game is a pessimistic one. Anticipating that the trustee will abuse trust if given the opportunity, the trustor will not trust the trustee; which is suboptimal for both. In contrast to the PD, the problem has a one-sided nature, in that only the trustee has an incentive to take advantage of the trustor. Another difference with the PD is that, in the Trust Game, the trustor would be willing to choose the cooperative option (to place trust) if and only if they believed the likelihood that the trustee would abuse trust were sufficiently low (this belief is what is also commonly understood as "trust"). The Trust Game has been widely used to model economic transactions that suffer from information asymmetry (Akerlof 1970), also with many recent applications to online markets (e.g., Przepiorka 2013; Resnick and Zeckhauser 2002; Tadelis 2016), and indeed features explicitly or implicitly in many accounts of the sharing economy.

Consider the case of hospitality services, such as Airbnb. Although this can be analyzed as a two-sided dilemma, it seems reasonable to assume that the largest share of the risk lies on the side of the host, while the host has few incentives or opportunities to take advantage of the guest. After all, options for the host are somewhat limited: the characteristics




*Note:* Pay-offs to the actors resulting from possible combinations of their respective choices are represented at the bottom in the form (Actor 1, Actor 2).

*Figure 22.2 Decision tree for the Trust Game (with* T > R > P > S*)*

of the accommodation are more or less fixed, and after a host puts the accommodation on offer there is little the host could do that would take advantage of the guest. This is particularly true for cases where the host is not present during the stay, as seems increasingly common on Airbnb. The host, on the other hand, runs the risk that the guest does not behave well and trashes the apartment. In such cases, the exchange resembles a Trust Game, in which the possible actions are as follows: after the guest requests a reservation of the accommodation for a certain period, the host faces the decision to accept or reject the reservation, which respectively corresponds to "placing trust" or "withhold trust" in the Trust Game. Subsequently the guest, upon arrival, may either take good care of the accommodation, or alternatively behave carelessly and damage the property, disturb the neighbors, or even behave intentionally maliciously and, for example, engage in theft. While certainly not all guests, or indeed even relatively few, will actually have preferences to behave opportunistically, it seems reasonable to assume that at least some guests do have such preferences, and this sense the host faces a trust problem, which could be modeled as a Trust Game with incomplete information (Camerer and Weigelt 1988).

In some instances actors have the possibility to act in a more fine-grained rather than binary manner, as in the Trust Game. This would be the case, for example, if the trustor has the option to use various levels of costly safeguards such as contracts or insurance to reduce risk. Such cases may be analyzed as Investment Games (Berg et al. 1995), essentially a continuous version of the Trust Game, in which the first mover decides on the degree to which she places trust in the trustee, upon which the trustee decides on a degree of honoring or abusing trust. Engaging in the interaction without any safeguards, thereby maximizing risk but minimizing transaction costs, would be analogous to maximal investment in the investment game. Another application would be the case were trustors may choose between different interactions that are more or less risky, such as in peer-to-peer ride sharing where a driver may choose the length of the ride they are willing to share. As in the trust game, the game-theoretical prediction for the investment game is that

the trustor, anticipating that the trustee will return nothing (that is, abuses trust) invests nothing (that is, does not trust).

## N-PERSON SOCIAL DILEMMAS

Most of the examples so far involve exchanges in which one actor transfers some resource to another actor and receives some benefit in return, such as in hospitality exchanges where the host is paid by the guest in exchange for lodging. Many sharing economy interactions, however, involve the pooling and redistribution of resources among more than two actors, or actors sharing a resource without immediate (material) compensation. Such non-dyadic exchanges constitute various types of N-person dilemmas, discussed next.

### Public Good Problems and Common Pool Resources

In a public goods game, actors choose whether to contribute part of their resources to the production of a common resource (the public good). The sum of all contributions is then multiplied by a factor $m > 1$ and redistributed equally among all actors, irrespective of their individual contributions. Due to this latter feature, the dominant strategy is to free-ride on the contributions of others and not contribute anything. Thus, the standard game-theoretic prediction is that the public good will not be produced. Classic examples include national defense and, somewhat closer to the topic at hand, open source software development (Kollock 1999a).

Common goods games are similar to public goods games, but there the problem is use rather than production (Kollock 1998). Typical examples include overfishing, where fishermen face individual incentives to maximize their catch, but as a result the fish stock is depleted to an extent that it can no longer regenerate. While the two dilemmas are conceptually similar, result in the same suboptimal outcome, and are often discussed interchangeably (e.g., Ostrom 2006), a key theoretical difference is that common goods are rivalrous in that use of the resource by one actor diminishes the possible use by other actors, while public goods are not (see Gardner et al. 1990 for a more formal treatment). At the same time, they share the feature of non-excludability, in that it is impossible, or at least very difficult, to prevent actors from using the resource.

Public- and common goods problems frequently appear in discussions of the sharing economy and collaborative consumption (Botsman and Rogers 2010; Bradley and Pargman 2017; Erickson and Sørensen 2016; Kostakis and Bauwens 2014), and earlier in the more general context of online collaboration (Hess and Ostrom 2003; Kollock 1999a; Kollock and Smith 1996). Indeed, some early examples of collaborative consumption such as public bike sharing (Cohen and Kietzmann 2014), some types of car sharing (Bardhi and Eckhardt 2012), Freecycling (Norbutas and Corten 2018) and collective toolsheds seem to share characteristics of public or common goods, in that they are not dyadic exchanges but aim at the creation of a common pool resource that is open to all. However, as Fremstad (2016) points out, many modern examples of platform-based sharing economy exchanges are excludable, as access to such collective resources can be effectively limited through membership of the platform. In this sense, the resources

available via sharing platforms are perhaps better characterized as club goods (Buchanan 1965), which to some extent provide a solution for the provision of public goods (also see Belk 2017).

**Generalized Exchange Systems**

Some types of exchanges are non-dyadic in that the actor sharing some resource does not receive an immediate return. The hospitality equivalent of such an exchange is Couchsurfing, in which hosts provide lodging without material compensation. Other examples include neighborhood sharing platforms such as the Dutch platform Peerby,[1] the now defunct Neighborgoods or the Swiss Pumpipumpe, but also Facebook groups aiming at "freecycling" (Norbutas and Corten 2018).

From a game-theoretic perspective, such exchanges may be modeled as Dictator Games (Forsythe et al. 1994) in which actors can choose to transfer some of their resources to a second actor, or as Helping Games, in which actors may produce a benefit to a second actor at a cost smaller than the benefit (Nowak and Sigmund 1998). At first sight, these types of interactions do not appear to be social dilemmas: the obvious unique Nash equilibrium in such cases is that the first actor gives nothing to the second actor, and there is no alternative outcome that would be more beneficial to both.

A dilemma emerges, however, when such interactions take place not in isolated dyads but in larger systems, in which actors sometimes play the role of provider and sometimes play the role of receiver, as is the case in the sharing economy examples mentioned above. Then, the outcome in which no actor provides anything to another actor is still an equilibrium, but all actors would be better off[2] if "help" was provided in each dyadic interaction (assuming that actors are equally often in the receiver role). Such systems, known as generalized exchange systems (Ekeh 1974), thus constitute social dilemmas at the macro level (Kollock 1999b; Yamagishi and Cook 1993). Exchanges in these systems are "generalized" in that actors do not receive immediate compensation from their exchange partners, but instead are compensated by receiving some resource from a third actor when they are in need themselves. Typical examples include assisting stranded drivers on remote mountain roads, where one does not receive immediate compensation for helping but instead hopes to be assisted in a similar manner when in need.

While neighborhood lending platforms such as Peerby are exceptionally clear-cut instances of generalized exchange systems, models such as the helping game overlook that lending goods may also include an element of trust, in that the borrower may not return the item in good shape, or at all. This would suggest modeling these types of sharing economy interactions using variations of Trust Games in which the trustor (the provider), in dyadic exchanges, does not gain or even loses some utility in the situation in which trust is placed and honored, in comparison to the situation in which trust is not placed. The Lending Game (recently proposed by Kas et al. 2018) is a first attempt at modeling such exchanges. As compared to the regular trust game, the Lending Game again clearly

[1] At the time of writing in 2019, Peerby had just introduced a rental option, while maintaining the option to borrow without compensation.

[2] Or at least not worse off on average, in the case of the Dictator Game.

highlights that, from a rational point of view, sharing on platforms such as Peerby can only be explained by the fact that these exchanges take place in larger systems; since even if the lender were sure about the trustworthiness of the borrower, lending would still make the lender worse off in isolated encounters.

## SOLUTIONS: INSTITUTIONS FOR COOPERATION

Explaining the emergence of cooperation in social dilemmas has been the focus of a sizable literature in fields as diverse as social psychology, political science, economics, sociology, and biology, resulting in various types of solutions. Kollock (1998) distinguishes motivational, strategic, and structural solutions. Motivational solutions rely on psychological causes of cooperation, such as other-regarding preferences (e.g., Fehr and Schmidt 1999) or bounded rationality (e.g., Neyman 1985). Both the strategic and structural approaches prefer to maintain the micro-level assumptions of selfishness and rationality, and instead look for social conditions that may incentivize actors to cooperate (cf. Coleman 1964). While the strategic approach looks for conditions that leave the basic social dilemma intact (for example, repeated interaction), the structural approach introduces modifications to the rules of the stage game (for example, punishment options). These structural mechanisms can also be understood as "institutions" in the sense of "rules of the game" (North 1990) that govern interaction. As sharing economy interactions are typically mediated by online platforms that to a large extent shape the possible actions of participants, the emphasis here is on such institutional solutions.[3]

### Solutions for Two-Person Dilemmas

A prominent type of explanation within the structural approach involves the embeddedness of the social dilemma in ongoing social relations. For the Prisoner's Dilemma, Axelrod (1984) famously showed that if actors play the game repeatedly and can observe each other's behavior, conditional cooperation can be sustained because the long-term benefits of mutual cooperation outweigh the short-term incentive to defect. Similar results hold for the trust game (Kreps 1990) and other dyadic social dilemmas (Friedman 1971). The logic of embeddedness extends also to social networks, where the spread of information via networks about past behavior again allows for conditional cooperation to emerge (Buskens 2002; Raub and Weesie 1990).

Typical for sharing economy interactions, however, is that social embeddedness tends to be low: interactions typically take place outside established social contexts and are probably rarely repeated[4] (that is, "stranger sharing"; Schor 2014). Consequently, sharing economy platforms have implemented a range of mechanisms aimed at promoting cooperation in social dilemmas.

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[3] Naturally, cultural and political contexts may also impact cooperation. Within Kollock's framework, they may be seen as operating through actors' motivations (for example, culturally determined preferences) or by changing the rules of the game (for example, through the law).

[4] Although I am not aware of any empirical research that has assessed the prevalence of repeated interaction in the sharing economy.

Perhaps the best-known example of an institutional mechanism to promote cooperation is the widespread use of reputation systems or rating systems,[5] allowing users to publicly rate their experience with their exchange partners through some type of fixed and often quantified format (for example, the ubiquitous "five stars"), or through a free-form qualitative format (for example, written reviews). Conceptually, reputation systems promote trust and cooperation in much the same way as social embeddedness does: by allowing actors to monitor each other's past behavior, potential defectors are incentivized to cooperate or deterred from entering the market (Bolton et al. 2004b; Przepiorka 2013; Resnick and Zeckhauser 2002; Tadelis 2016). Meanwhile there is ample empirical evidence from lab experiments (Bolton et al. 2004b; Bolton et al. 2004a), field experiments (Resnick and Zeckhauser 2006), and observational studies on online markets (Diekmann et al. 2014; Kollock 1999b; Przepiorka et al. 2017; Resnick and Zeckhauser 2002) that such reputation systems do indeed tend to promote trust, and as such these systems are widely considered to be the key innovation that makes trust in online interactions (including sharing economy interactions) feasible (e.g., Botsman and Rogers 2010).

Nevertheless, from a theoretical perspective, reputation systems are not without problems, which are currently only partly understood. I highlight three issues here. First, the effectiveness of reputation systems relies on the sharing of information by participants, which creates a second-order social dilemma (Heckathorn 1989) in the sense that reputational information itself is a public good. Diekmann et al. (2014) propose that other-regarding preferences and strong reciprocity may explain contributions to reputation systems; which, interestingly, reduces an initially structural solution to a motivational solution. Second, an additional second-order dilemma arises, coined the "informational dilemma" by Bolton et al. (2004a). Without a reputation system, interacting with newcomers generates private information about the trustworthiness of these newcomers that may be worthwhile in the longer run, but in the presence of a reputation system this information is no longer private, and actors instead have an incentive to free-ride on others generating this information, which in theory makes establishing a good reputation harder for newcomers. Third, reputation systems may generate arbitrary inequality through "reputation cascades" (Frey and van de Rijt 2016). Because actors prefer to cooperate with partners who already have established a reputation of trustworthiness, interaction may concentrate on just a few actors who then receive a disproportional share of the benefits from exchange, at the expense of others who might be equally trustworthy.

**Solutions for N-Person Dilemmas**

The large and to a great extent experimental literature on public goods suggests that, in the presence of sufficiently many conditional cooperators, cooperation in public goods can be achieved via various mechanisms, most prominently the possibility of costly punishment (e.g., Fehr and Gintis 2007). Other mechanisms are feasible too, however (see Chaudhuri 2011 for a review), and the most relevant of these for the sharing economy may be assortative mixing: when actors have possibilities to choose who they want to play

[5] For brevity, I ignore here other widely applied solutions such as insurances and payment systems. Nevertheless, both can be understood in terms of social dilemmas: for example, in trust games, insurances modify the trustor's pay-offs, while payment systems limit the trustee's actions.

the public goods game with, production of the public good becomes more likely (Ahn et al. 2009; Page et al. 2005). This speaks to the earlier observation that many public goods problems in the sharing economy, being excludable, more resemble club goods than pure public goods; but also raises the question of whether sharing economy exchanges of this type can be scaled to large groups if they indeed rely on (self-)selection of participants of a certain type.

Similarly, a large body of literature exists on the conditions under which common pool resources can be sustained, including the seminal work by Ostrom (1990), who formulated eight "design principles" for institutions aimed at sustaining common pool resources. The principles rely strongly on clear group boundaries and participation and self-determination of the actors using the common pool resource in creating and implementing such institutions. While these principles may to some extent apply to online communities (Kollock 1999a; Kollock and Smith 1996), whether they apply to sharing economy platforms is questionable (Bradley and Pargman 2017): these platforms often have a clear separation between the platform which creates and enforces the rules, and users who have little influence on these rules.

Research on generalized exchange systems often focuses on exchanges in fixed structures (that is, "network-generalized exchange"; Ekeh 1974; Yamagishi and Cook 1993), which is less relevant to sharing economy interactions, where actors are typically free to choose who they exchange with. Takahashi (2000) studies such "pure generalized exchange" from the perspective of evolutionary game theory, and concludes that generalized reciprocity can emerge if actors can select recipients based on recipients' previous behavior, which suggests that some mechanisms must be present to make this information available. Other research points at the importance of group solidarity (Molm et al. 2007) or social learning (Tsvetkova and Macy 2014), but with few exceptions (Norbutas and Corten 2018; Willer et al. 2012) these ideas have not been systematically studied in sharing economy settings.

## CONCLUSION

I hope this short chapter has demonstrated that social dilemma research has much to offer to the study of the sharing economy. In particular, I hope to have shown that the social dilemma perspective highlights strategic complexities of sharing economy interactions that are sometimes obscured by a rather loose usage of concepts such as "trust" or "commons." For example, we have seen that exchanges with direct compensation create different types of dilemmas compared to exchanges without such compensation, and that N-person dilemmas can be expected to follow different logics compared to two-person dilemmas, and may require different solutions. Also, I also hope to have shown that by framing sharing economy interactions in terms of social dilemmas, a wealth of theoretical and empirical literature becomes available that may help to explain sharing economy phenomena, as well as inform future research. Conversely, the emergence of the sharing economy provides new opportunities to study social dilemmas in field contexts (including field experiments), due to its combination of, on the one hand, a wide variety in platforms and thereby institutional contexts, and on the other hand the fact that, due to its online nature, behavior is often recorded in detail.

I end with some possible avenues for such research. First, the sharing economy provides many new opportunities to study the important topic of reputation systems, and to address the issues surrounding such systems as summarized above. Second, the widespread and sometimes remarkable level of cooperation observed in the sharing economy begs the question of whether these levels are due to the implementation of adequate institutions by sharing platforms, or to self-selection by participants with certain social preferences. An answer to this question will have important implications for the growth potential of the sharing economy. Third, the success of the sharing economy raises new questions regarding the "governance of the commons" (Ostrom 1990), given that sharing economy platforms that seem to share features of common pool resources at the same time violate Ostrom's celebrated design principles (Bradley and Pargman 2017). Fourth, the sharing economy involves new types of social dilemmas that so far have rarely been studied, such as the mixture of generalized exchange and trust that can be observed in neighborhood sharing platforms (Kas et al. 2018). Finally, the emergence of large-scale "pure" generalized exchange systems provides new opportunities to test both novel and existing hypotheses from the classic tradition of social exchange theory.

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