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Indirect Reciprocity in the Sharing Economy

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Abstract: The rapid growth of the sharing economy and its many societal benefits highlight the importance of understanding how these marketplaces sustain themselves. The reason for contributing to the sharing communities with homes, cars and other valuable assets appear less clear in platforms where monetary incentives are smaller. Further, many sharing economy marketplaces are characterised by a higher level of risk due to valuable assets, meetings with strangers and the fact that the risk is borne by the peers in the platforms instead of what is usually the firm. In this paper, we investigate whether positive indirect reciprocity, meaning that people respond to other's good behaviour by behaving good themselves, is affected by risk in a sharing situation. We conduct an experiment where we investigate differences in the level of sharing in the presence of history - how other individuals have behaved - and risk. The results show that making the history of other's good behaviour known has no effect on the level of sharing in the non-risk setting, but it increases the level of sharing in a setting that involves risk significantly. This implicates that indirect reciprocity is higher when people are subject to more risk compared to traditional marketplaces. By this, we contribute to a more comprehensive understanding of what behavioural mechanisms facilitate sharing in the risky setting of the sharing economy, which is important in order for decision makers to enable sustainable sharing communities. Specifically, transparency and ratings in the platforms should be encouraged.

Keywords: Sharing Economy, Indirect Reciprocity, Sharing, Risk

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1 Introduction

People have always been sharing with each other throughout the history, but the emergence of new technologies, the Internet, the social web, and new platforms has enabled us to more easily share our assets with people outside of our closest circle (Belk, 2014). Belk (2007) defines sharing as "the act and process of distributing what is ours to others for their use and/or the act and process of receiving or taking something from others for our use". Through sharing, we can use less of scarce resources and create synergies in the economy while also bonding with others to create a sense of community in society (Belk, 2007). The rapidly growing phenomenon of sharing with people outside the family is often referred to as "the sharing economy", characterised by peer-to-peer sharing through digital platforms (European Commission, 2016a). By this, the sharing and collaboration that has always existed in societies is happening at a larger scale, which in turn builds up reinvented versions of sharing that create value, a community as well as a thriving economy (Botsman and Rogers, 2010).

One well-known platform is Airbnb; a marketplace where private individuals can list their apartments or spare guestrooms for rent, while enabling guests to get to know a new city from a local (Guttentag, 2015). Couchsurfing is a community of 14 million people globally, where people can find others willing to share their home with them, all to promote new meetings and experiences (Rosen et al, 2011). The two platforms differ in that Airbnb hosts sublet their space for payment, whereas in Couchsurfing people share their homes with others for free.

The economic importance of the sharing economy is growing quickly, and global revenues from the five main sectors[1] of the sharing economy is projected to increase from approximately USD 15 billion in 2015, to around USD 335 billion in 2025 (PwC, 2015). Furthermore, it can create efficiency gains as well as potential solutions to sustainability issues (European Commission, 2016a).

With the growing importance of the sharing economy and its many highlighted benefits follows an interest in understanding which behavioural mechanisms motivate sharing between strangers in this particular context. Several reasons behind why people participate in the sharing economy have been found in previous research. Hamari et al. (2015) find evidence that participation in "collaborative consumption" is motivated by enjoyment, sustainability concerns and economic benefits such as saving money and time. Tussyadiah and Pesonen (2015) find that peer-to-peer accommodation is partially motivated by desires for social interactions and unique experiences. However, most sharing economy platforms involve meeting with strangers and valuable assets. This can be regarded as risky (Schor, 2014; Ert et al, 2016; Felländer et al, 2015) and many realise that trust is crucial for these platforms to be sustainable. Botsman and Rogers (2010) state that "the currency of the new economy is trust" and that technology is used to build trust among strangers. According to them, reputation is regarded as a valuable asset that fuels the marketplace.

[1] Travel, car sharing, finance, staffing, and music/video streaming.

Reciprocity, where actions of one individual are rewarded or punished by a second individual, has been applied to the sharing economy context in previous research, stating that it has potential to generate trust and regulate behaviour. Particularly relevant to the sharing economy due to lack of repeated interaction is indirect reciprocity, meaning that a friendly or hostile act from one individual to a second is rewarded or punished by a third individual. Indirect reciprocity is thus linked to reputation or status (Engelmann and Fischbacher, 2009). Whinston et. al, for instance, find that indirect reciprocity serves as a social norm and that it plays an important role in making members contribute in a peer-to-peer music sharing network. However, indirect reciprocity and its relationship with risk has to our knowledge not been explored at all.

In this thesis, we study the sharing economy to understand what mechanisms facilitate sharing in this setting. We limit our definition of the sharing economy to the less commercial platforms where monetary incentives appear less prominent[2], thus, behavioural mechanisms appear as stronger driving forces. Specifically, we investigate whether indirect reciprocity is higher in a risky setting, which is characteristic for sharing economy marketplaces. We conduct an experiment where we use different treatments to investigate differences in sharing in the presence of history - how other individuals in the experiment have behaved - and risk. The results show that introducing a history of someone else having shared has no statistically significant effect on the level of sharing in the non-risk setting, but it increases sharing in a risky sharing setting. Thus, we find evidence of the existence of indirect reciprocity in a sharing setting that involves risk. Our work contributes to the existing research by illustrating the relationship between indirect reciprocity and risk, implicating that indirect reciprocity is higher in the sharing economy where people are subject to more risk compared to traditional marketplaces. By this, we add to a more comprehensive understanding of what behavioural mechanisms enforce the sharing economy communities, and consequently what decision makers should bear in mind when attempting to sustain these important marketplaces.

The paper is structured as follows. We will begin with a brief background of the sharing economy, how it is defined and its key characteristics. A summary of previous research within fields relevant for our research topic will then be provided, followed by the research question. The theoretical framework and the hypotheses will then be presented, followed by a description of the experiment and the results. We will conclude by a discussion of our findings and suggestions for future research.

[2]For example: Couchsurfing, Skjutsgruppen, GoMore and Swinga.

2 Background

2.1 The sharing economy

Several attempts have been made to define and understand the sharing economy. According to Botsman (2013), it is "an economic model based on sharing underutilised assets from spaces to skills to stuff for monetary or non-monetary benefits". PwC (2015) defines it as an economy that "allows individuals and groups to make money from underused assets. In this way, physical assets are shared as services". Stephany (2015) views the sharing economy as "the value in underutilised assets and making them accessible online to a community, leading to a reduced need for ownership of those assets". Even though the definitions may differ from each other in some respects, some features are common; the sharing economy changes the way we think about assets as they involve sharing and utilising instead of owning.

The sharing economy is a vital part of the concept collaborative consumption (Botsman and Rogers, 2010). Collaborative consumption is defined as "an economic model based on sharing, swapping, trading or renting products and services enabling access over ownership". Four principles constitute the core of collaborative consumption; critical mass, idling capacity, belief in the commons, and trust between strangers (Botsman and Rogers, 2010). Critical mass implies that there has to be a certain amount of people involved in order for the system to be self-sustaining. The utility a user derives from using a product/service is positively correlated with the number of users using the same product or service, something that is referred to as the network effect (Katz and Sharpiro, 1985). In the case of the sharing economy platforms, a greater amount of users implies more choice and flexibility for the participants, while it might also contribute in marketing the platform and attracting even more users. The second principle of idling capacity simply implies that underutilised assets must be available for sharing to happen (Benkler, 2004; Botsman and Rogers, 2010). Trust in the commons is important as shared resources are likely to be underprovided as rational individuals would free-ride. However, the tragedy of the commons theory, stating that if rational individuals share resources it will lead to a tragedy of all (Hardin, 1968), has received critique. Among the critics is Nobel Prize winner Ostrom, who argues that groups of humans have been able to cooperate for a long time, and that theories such as the tragedy of the commons does not take into account the fact that people may build trust and a community that works towards a common goal (Ostrom, 1990). This further builds onto the fourth principle; that trust is of vital importance for the sharing economy. As peer-to-peer businesses have larger informational asymmetries than traditional marketplaces, and since the sharing economy usually is built around services that involve personal interaction, the risk is higher (Ert et al, 2016). This again goes hand in hand with Ostrom's argument that people need the opportunity to monitor each other. The sharing economy platforms are aiming at creating trust between people participating by building open and transparent portals, with the possibility of rating each other (Felländer et al, 2015).

Several features distinguish the sharing economy marketplaces from more traditional ones, such as heterogenous output and a higher level of personal interaction between buyers and sellers (Proserpio et al, 2016). A higher risk level also differentiate the sharing economy from other types of markets, public goods and communities. In the sharing economy, the risk is borne by the peers instead of what is usually the firm (Felländer et al, 2015). Furthermore, when people contribute to a sharing economy platform, it is often with valuable assets such as a car or an apartment, meaning a larger loss if anything would happen to it. This is in contrast to for instance an online community where the user might share only knowledge. In addition, since the assets are personal they might also have an affectional value, implying that sharing involves a higher risk also in that sense. In many instances, transactions also involve meeting with strangers, which can be considered risky.

2.1.1 The significance of the sharing economy

The sharing economy is of large economic importance. As previously stated, PwC (2015) has projected the global revenues of the five main sectors[3] of the sharing economy to increase from around USD 15 billion in 2015, to around USD 335 billion in 2025. The European Commission has stated that the sharing economy is a future source of growth and employment within the union if the sector is encouraged and supported. Its revenue within the union in 2015 almost doubled from the year before and is further expected to continue to accelerate (European Commission, 2016a). The sharing economy is well-known by the public in both the U.S. and the EU; most respondents in surveys have heard about the platforms available (PwC, 2015; TNS Political and Social, 2016).

Furthermore, the sharing economy creates market efficiency gains through both reduced information asymmetry and network effects. Reduced information asymmetry enables a better matching of demand and supply. The network effects foster allocative efficiency, meaning that the goods available are optimally distributed according to the preferences of people involved (European Commission, 2016b). For the individual consumer, the sharing economy implies a larger choice set through the extended supply of services. The larger distribution of prices enables customers to spend less and/or increase utilisation of goods and services (European Commission, 2016b). Guttentag (2015) shows that hosts at AirBnB can price competitively while also providing benefits that cannot be found in a hotel, such as local advice and amenities like laundry and kitchen facilities. The sharing economy also offers benefits in terms of sustainability. By sharing, the utilisation of idle assets is increased and savings in terms of scarce resources such as fuel can be made. According to the European Commission (2016a), the sharing economy can contribute to the sustainability of the union and imply a step towards the circular economy.

However, it has been debated whether the sharing economy is indeed a positive development in all aspects. The issue of poor conditions for workers as they

[3]Travel, car sharing, finance, staffing, and music/video streaming.

are more freelancers than employers has been addressed (De Groen and Maselli, 2016) as well as if the sharing economy platforms outcompete traditional markets and hence replace jobs. However, the European Commission argues that the benefits in terms of jobs is larger than damages (European Commission, 2016a).

To conclude, the importance of the sharing economy is growing and the economic benefits are many, even though frameworks and legislation has to be developed given that some of the new services fall outside of the normal legislation (Larsson, 2016). This emphasises the importance of understanding which mechanisms further sustainable sharing communities, which motivates this paper.

2.1.2 The different actors of the sharing economy

Key actors in the sharing economy are the platforms that facilitate the exchange between peers, the individuals offering goods or services, and the customers that are demanding the goods or services provided (Sundararajan, 2014).

2.1.3 Limit of scope

Belk (2014) argues that the sharing economy, and what has been called "collaborative consumption", is not always sharing, but instead pseudo-sharing. However, some platforms such as Couchsurfing are argued to be a true instance of sharing, as no monetary exchange between the peers is taking place. In this paper, we will focus on the less commercial part of the sharing economy; what Belk refers to as true sharing, where monetary incentives are less prominent than in purely commercial sharing economy marketplaces. This is due to the fact that behavioural mechanisms appear as stronger driving forces in these platforms.

2.2 Previous research

Economic research has shown that people often seem to care about other things than just their own self and maximising their own profit (Charness and Rabin, 2002). Preferences such as altruism, fairness preferences or inequality aversion (Levitt and List, 2007), warm-glow giving (Andreoni, 1990) and reciprocity (Levitt and List, 2007) have been documented in previous research. Public good games are examples of where individuals seem to not only maximise their own profit but also behave in accordance with the preferences mentioned above.

This thesis studies sharing economy platforms that closely resemble public goods and aims to investigate indirect reciprocity in a risky context. The literature review will therefore be divided into three parts: public goods, reciprocity and risk.

2.2.1 Public goods

Samuelson (1954) was the first to mention collective consumption goods as a good that is non-rival, meaning that it can be used by another individual with no extra cost. Economists have today developed the concept further. They name a good that is both nonrival and non-excludable; meaning that no one can be excluded from consuming the good once produced, a public good (Holcombe, 1997). The issue with public goods is that they are likely to be underprovided, given the clear free-riding problem at hand formulated in the free-rider hypothesis. Free-riding implies that an individual does not contribute to the public good, but is not excluded from utilising the good due to non-excludability (Ames and Marwell, 1981). The free-riding hypothesis states that no rational individual acting in his or her self-interest will contribute to a public good, as there will always be an incentive to deviate. One can, however, define a strong free-rider hypothesis stating that no one will contribute, as well as a weak one just stating that the contribution will be less than Pareto optimal (Brubaker, 1975). Experience from various laboratory experiments show that the strong free-rider hypothesis often does not hold, and that full free-riding is not visible until many rounds of games (Anderson et al, 1998).

Sharing economy platforms can be seen as quasi-public goods. When comparing a less commercial sharing economy platform to a pure public good, there are some differences but many similarities. Using Couchsurfing as an example, the good is rival - if someone borrows a couch it hinders someone else from borrowing it at the same time - but up to a certain point there is a lot of capacity in a network, just as in a public park. Furthermore, a platform can exclude people by hindering them to access the platform, however, most platforms today are open for registration for everyone and for free, and are hence non-excludable even though exclusion would be possible. An individual can also refuse to enter a transaction with a specific person; exclusion is thereby possible on a transaction level. Hence, a sharing platform has characteristics of a quasi-public good if enough people contribute in the first place in order to create the non-rival feeling. Similar to public goods, this implies that it should be suboptimal for participants in a less commercial sharing economy platform to contribute, or in this case, share (Antoniadis et al, 2004).

As in the case for social preferences in general, there are different behavioural explanations for why outcomes in public good experiments deviate from the Nash equilibria, such as altruism, inequity aversion, warm-glow and reciprocity (Fischbacher et al, 2001). Sugden (1984) argues that reciprocity is one reason for why people contribute in a public goods setting. He defines the "principle of reciprocity" as that you must not always contribute to public goods, but if others are contributing, you must not free-ride. Research shows that there are people that seem to follow this principle, called conditional cooperators; where an individual's willingness to contribute to a public good is positively correlated to other individuals' contributions.

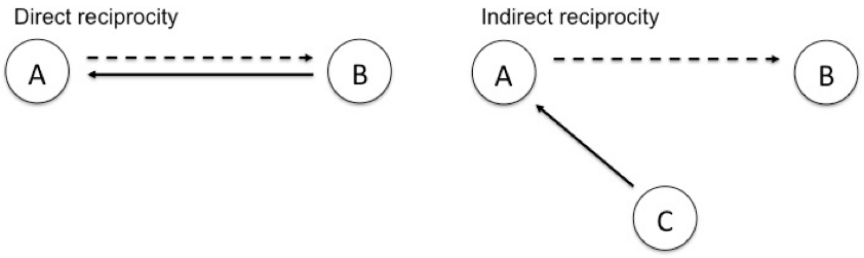
2.2.2 Reciprocity

Fehr & Gächter (2000) argue that reciprocity is one reason for why people deviate from behaving purely out of self interest. Reciprocity implies that people behave as a response to how others have behaved before, making behaviour contingent on the history of other's behaviour. Hence, people will be more friendly if someone has been friendly towards them, but instead hostile if someone has been hostile towards them, leading people to "reward" and "punish" the behaviour of others. They find evidence that people tend to reward and punish others even if it is costly for them and does not lead to any present or future reward. They further demonstrate that reciprocity can have a powerful effect when contracts are incomplete and that it enables cooperation.

Reciprocity has been applied to platform communities in previous research several times. Fradkin et al. (2015) analyses potential bias in the online review system on AirBnB. The find evidence of reciprocal behaviour when participants are reviewing each other, implying that the second reviewer gives the first reviewer a good or a bad rating depending on what rating he or she got from the first reviewer. Geiger and Germelmann (2015) examine reciprocity within the context of Couchsurfing. They investigate the relationship between reciprocity and sharing and how the perception of reciprocity can generate different outcomes by analysing host's perceptions of how much they give and receive from their guests. Proserpio et al. (2016) show that reciprocity is more prevalent in the sharing economy context compared to traditional platforms and that it can generate trust among members and regulate their behaviour. Specifically, they use the platform AirBnB to show that reciprocal "types" have higher ratings in general, and they show that higher ratings increase demand and consequently prices. Reciprocity may also relate more directly to trust. Nguyen et al. (2010) find evidence of reciprocal trust within an online review user community, meaning that a person will return trust to someone who has initiated trust towards them. In this manner, a trust-returning behaviour appears in the network. Thereby, initiating a transaction with someone in the risky setting of the sharing economy might be perceived as a sign of trust.

The literature also distinguishes between direct and indirect reciprocity (Nowak and Sigmund, 2005). Direct reciprocity is the more commonly known type, where actions of one individual are rewarded or punished by the recipient. Indirect reciprocity on the other hand implies that friendly or hostile acts from one individual to another are rewarded or punished by a third individual. To enable indirect reciprocity, there has to be information of how someone has treated others in the past. Indirect reciprocity is thus linked to reputation or status (Engelmann and Fischbacher, 2009) and can help to sustain a high level of cooperation (Milinski et al, 2002). Reputation can be defined as a public opinion, stemming from a collective evalutation of an act or a good (Wang and Vassileva, 2007). By this, reputation could be built up from history, knowledge of several past actions.

Figure 1: Illustrating direct and indirect reciprocity



Distinguishing between direct and indirect reciprocity is particularly relevant in the sharing economy context since it is common that individuals do not have repeated interactions with each other and thus can not reciprocate in a direct manner. Whinston et al. analyse indirect reciprocity in a peer-to-peer music sharing network. They find that indirect reciprocity serves as a social norm that is enforced by the network contributors, and that an individual's likelihood of contribution changes with other network members' contribution levels. By this, indirect reciprocity can be important for sustaining private contributions to a social network. Faraj and Johnson (2011) analyse network exchange patterns in online communities and find that both direct and indirect reciprocity are common tendencies in networks. Zvilichovsky et al. (2014) analyse reciprocity in a crowdfunding platform. They conclude that a project owner with a history of backing other projects receive more backings both from those they have previously backed and the community, implicating the existence of both direct and indirect reciprocity.

2.2.3 Risk and decisions

Modeling of choices under risk is widespread in previous research. Bernoulli (1954) introduced expected utility theory, where individuals assign subjective utilities to outcomes, thus making decisions in line with expected utility rather than expected monetary value. Expected utility theory has, however, received critique for being insufficient in explaining actual behaviour (Starmer, 2000) in that people do not make consistent choices according to well-defined preferences. Tversky and Kahneman (1979) develops prospect theory where risky choices are dependent on prospects, showing that people tend to overweight certain outcomes compared to outcomes that are only probable. There is also some previous research on how overall behaviour changes due to risk in a group or public good setting. Gangadharan and Nemes (2009) investigate how people contribute to public and private goods under different types of risk and uncertainty, where people substitute contribution to a risky public good to a non-risky private good. They also find indications that information of other's cooperation works as a norm on how to behave under uncertainty.

However, there is a lack of research that relates risk to reciprocal behaviour in a group or network setting. The relationship between risk and reciprocity has been explored in Africa, where reciprocity has been found to mitigate risks in buffering resource fluctuations (Cashdan, 1985) and that it works as a mean of insurance. Blumenstock et al. (2011) document how people in Rwanda are able to share risk when facing idiosyncratic economic shocks. They show that money transfer patterns are consistent with a reciprocal risk sharing model such that transfers are in part determined by past reciprocity. Thereby, in some contexts, reciprocity can work as a risk sharing mechanism. However, how and if risk affects reciprocity, more specifically indirect reciprocity in a network setting that involves sharing has to our knowledge not been explored at all.

2.3 Research question

In order for a sharing community to be sustainable and well-functioning, a large enough group of people need to contribute to the community by sharing their assets. As earlier stated, a sharing community has similar features to a public good, given that one can use resources without contributing. Economic theory predicts that people will free-ride on a public good, hence, rational individuals should want to use the sharing network, but not contribute. However, there is empirical evidence that people do contribute, with indirect reciprocity as a partial explanation in some contexts. Although the reasons for contributing with assets in the sharing economy might be many and diverse, such as a desire for social connection, it is interesting to see if indirect reciprocity also matter in facilitating sharing. As previously stated, the sharing economy is distinguishing with the higher level of risk; people who have contributed to the asset pool have thus accepted more risk. To our knowledge, no previous research has so far examined the role of indirect reciprocity in a more risky sharing setting.

In this paper, it is relevant to distinguish between positive and negative indirect reciprocity. Negative indirect reciprocity could affect contribution levels by that a platform user changes his or her behaviour if they see that someone else has not shared their own asset but only "free-ride" in the platform. However, in this thesis we investigate specifically if someone would share if others have shared before, and we will hence focus on positive indirect reciprocity. Thus, the research question of this thesis is:

To what extent does risk affect positive indirect reciprocity in sharing?

3 Theoretical framework

There are various formal models of social preferences developed by economic researchers aiming to give insights into why people behave in seemingly non-rational ways. Several authors have discussed interdependent preferences in terms of utility models (Pollak, 1976; Sobel, 2004). These utility functions consist of the utility derived from the own payoff and that from other people's payoff. Charness and Rabin (2002) build a conceptual model of social preferences in a two-person game, where they incorporate reciprocity as a parameter that influences the weight a person puts on his own payoff in relation to the other's payoff. We will make use of these models and adapt them to our specific scenario; the sharing economy.

In a setting such as the sharing economy, a person chooses between sharing and not sharing. The person that makes the sharing decision will from now on be called person A, and the person that A is sharing or not sharing with will be called person B. Assuming utility maximisation, a person will choose to share only if the expected utility from sharing is larger than the expected utility from not sharing. This is thus a binary choice where $Y = 1$ implies share and $Y = 0$ implies do not share:

$$Y = \begin{cases} 1 & \text{if } \mathrm{U}_{A,\,\text{Share}} > \mathrm{U}_{A,\,\text{Do not Share}} \\ 0 & \text{otherwise} \end{cases}$$

The utility from not sharing is simply the value of the asset and being able to use it.

$$U_{A,\,Do\,not\,share} \quad = \quad X_A$$

where X_A is A's personal value of the asset if it is not shared. This value represents any value that a person attaches to the asset, thus incorporating monetary value, affectional value, convenience value and any other value aspect.

The utility from sharing compared to not sharing consists of three parts. The first part represents the value of the asset, reduced by the other persons usage. The second part is the utility person A gets from person B's utilisation of the asset, and is thus a measure of other-regarding preferences. The third part is a function of preferences that relate to the sharing experience in itself, such as enjoyment of meeting new people.

$$U_{A,\,Share} \quad = \quad \underbrace{\delta X_A(1-\gamma R)}_{1} + \underbrace{X_B(1+\theta q)}_{2} + \underbrace{S(f)}_{3}$$

Each part will now be explained in turn.

The first expression in the utility function represents the utility person A derives from owning the asset that he/she shares. X_A is person A's value of the asset. δ is a parameter between 0 and 1, taking into account that person A's utility from the asset is likely to decrease due to person B's utilisation of the asset. The term γR incorporates how the risk that comes with sharing the asset affects the utility. R is the level of risk that sharing involves, such that if there for instance is a 5% risk of losing the asset by sharing it, R will be 0.05. The parameter γ represents person A's sensitivity to risk; in other words the subjective reaction to the risk. If γ is above 1, the effect of risk on utility is amplified, while it will decrease the effect of risk on utility if it is below 1.

The second expression reflects the utility person A's derives from person B's usage of the asset. The parameter X_B represents person A's valuation of person B's utilisation of the asset, thus measuring person A's level of other-regarding preferences. The expression θq measures how person B's previous actions towards others affect person A's utility from person B's asset utilisation. It is thus a measure a of indirect reciprocity. q is a binary variable that is equal to 1 if person A knows that person B has behaved well before, and 0 if person B's previous behaviour is unknown. A positive θ thereby implies that person A's utility from B's asset use increases if person B has behaved well before.

The third expression in the utility function, $S(f)$, is a function that reflects person A's utility from the sharing experience in itself. This can be positive, such as enjoying meeting new people, but also negative, such as considering it socially uncomfortable to share something with someone they do not know.

4 Hypotheses

We hypothesise that the utility from sharing will change due to risk and knowledge of other's previous behaviour in the sharing setting. The utility from not sharing will stay constant as $U_{A,\,Do\,not\,share} = X_A$. If the utility from sharing increases in relation to the utility from not sharing, the probability of sharing increases. Consequently, more people should be willing to share.

Hypothesis 1

In a sharing setting without previous knowledge of the other person's behaviour and without risk, q and R are zero, hence the utility from sharing can be formulated as the following:

$$U_{A,\,Share} \quad = \quad \delta X_A + X_B + S(f)$$

It is evident both through previous economic experiments and in real life that people do not only strive to maximise their own gain. We thus hypothesise that some people will share:

H1: *When choosing between sharing or not sharing, some people will choose to share.*

This means that for some $U_{A,\,Share} > U_{A,\,Do\,not\,share}$.

Hypothesis 2

In a sharing setting where the other person's previous behaviour is known, the utility from sharing can be formulated as the following:

$$U_{A,\,Share} \quad = \quad \delta X_A + (1 + \theta q) X_B + S(f)$$

In line with previous research, indirect reciprocity can increase contribution levels in some settings. In a sharing context, it is more likely that someone will share if they know that someone has shared to others before. Letting person A know that person B has previously shared should increase the utility derived from sharing. From this the following hypothesis is formulated:

H2: *With a history of others having shared, more people will choose to share than without history.*

This would implicate that $\theta > 0$, which will increase the probability to share.

Hypothesis 3

In a sharing setting where the person who shares takes a risk when sharing, the utility can be formulated as the following:

$$U_{A,\,Share} \quad = \quad \delta X_A(1-\gamma R) + X_B + S(f)$$

If sharing involves a risk of asset loss or damage, the expected value from sharing the asset decreases. This risk should thus affect the utility of sharing negatively. We thereby formulate the following hypothesis:

H3: *In a sharing decision that involves risk, less people will choose to share than if there were no risk.*

This would implicate that $\gamma > 0$, which will reduce the probability to share.

Hypothesis 4

In a sharing setting that involves risk, a positive history does not only imply that someone else has shared, but that this person also has taken a risk when sharing. The previous q is thus replaced with another binary variable q_R to illustrate that someone, in addition to sharing, also has taken a risk when sharing. λ hence represents person A's reaction to the knowledge that person B took a risk when sharing.

$$U_{A,\,Share} \quad = \quad \delta X_A(1-\gamma R) + (1+\lambda q_R)X_B + S(f)$$

Due to indirect reciprocity, sharing should increase if others have shared before also in a risky sharing decision. Similar to the case when the history did not include a risk, q, we hypothesise that the utility from sharing will increase if this risky sharing history is known. From this, the following hypothesis is formulated:

H4: *With a history of others having taken a risk when sharing, in a sharing decision that involves risk, more people will choose to share than without history*

This would implicate that $\lambda > 0$, increasing the probability to share.

Hypothesis 5

Given that the risk makes sharing more costly, it is likely that reciprocity will be higher if the history involves a person having taken a risk when sharing, as opposed to if that person did not take a risk. In other words, the "good act" of someone else having shared will be perceived as stronger if it also involved

risk, possibly triggering more reciprocity. Given this, the following hypothesis is formulated:

H5: *Positive indirect reciprocity will be higher in the risky setting typical of the sharing economy compared to in a non-risk setting*

This would implicate that $\lambda > \theta$.

5 Method

The hypotheses will be tested using an experimental method. Due to the complexities of human behaviour and the large amount of factors that could affect a sharing decision in real life, the experimental method was selected due to the possibility of holding things in the environment constant except for the variable of interest, thus making it possible to identify a causal effect (Levitt and List, 2007).

5.1 Experimental procedure

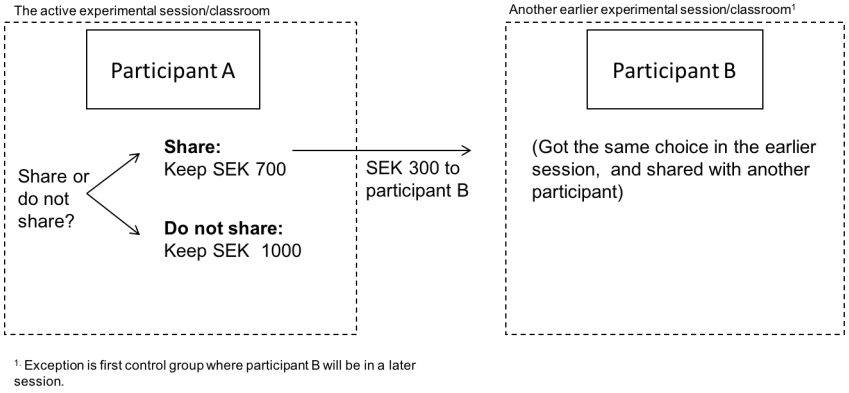
The experiment was conducted at eight high schools in Stockholm during April (see appendix A.1 for full list of schools and dates). A pilot study took place at Huddingegymnasiet the 5th of April in order to test the procedure and make sure it was understandable. All sessions took place in high school classrooms. The experiment was conducted in Swedish and each experimental session took approximately 15 minutes to conduct.

499 subjects participated and were randomly assigned into one control group and three treatment groups. Randomisation was done within schools, however, not on a classroom level, meaning that all subjects in one experimental session and classroom belonged to the same group. All participants were first given the same basic instructions orally. A manuscript was followed to make sure that the same instructions were given to all participants (see Appendix A.2 for translated version). Participants of all treatment groups were told that SEK 1000 would be distributed through a lottery, where one winner out of all participants per week (approximately 200 students) would be drawn. The lottery would take place within one week of the experiments, and the winner would be notified by email. The importance of the decisions was emphasised by explaining that their choices would be realised if they won the lottery.

Anonymity towards the other participants was assured, and subjects were told the email address they stated on the answer sheet would only be used to contact the winner of the lottery.

The participants were then presented with the sharing decision of the SEK 1000 that participants could win through the lottery. For illustrative purposes, the participant making a sharing decision in any of the groups will be called participant A. Each participant in one given experimental session is at that point a participant A. The participant who participant A is sharing with will from now on be called participant B. Participant B is an unspecified participant that has taken part in the experiment earlier, hence not in the same experimental session as participant A. An exception is in the first control group, where participant B will be an undefined participant from a later session. Figure 2 illustrates the dynamics between the participant A and participant B.

Figure 2: Flow diagram over example of Participant A and Participant B and sharing decisions.



In the risk treatments where the outcome was somewhat complicated, the scenario was explained three times and a payoff-tree was drawn on a white-board in order to ensure that all participants had correctly understood the decision. (see appendix A.3 for whiteboard drawing). Participants were also asked to raise their hand in case further clarification was needed. Specific oral instructions were added to each one of the treatment groups, explaining scenarios of the treatment groups.

After this, the answer sheets (see appendix A.4 for original and translated answer sheets) were distributed and subjects were asked to stay quiet and raise their hand in case of questions.

The subjects made their choices and the answer sheets were collected. In treatment II and III, the experiment ended with one of the experimenters drawing one of the five balls (explained further in section 5.3.3.) in front of the class in order to realise the risk outcome.

The winner was drawn, contacted by email and was given the money after agreement. In case the winner had chosen to share, a second winner was drawn and contacted in the same manner. If the winner was from treatment I or III the second lottery was only done between subjects that had chosen to share, in order to not deceive participants.

5.2 Subjects

Subjects were recruited from eight high schools in Stockholm, and were in their 10th, 11th or 12th year of schooling. The high schools were spread out in terms of location, and both schools from central Stockholm and outside of the centre were included. Further both private and public schools are represented. High schools students were chosen from the availability of participants in large numbers.

The recruitment process started with that teachers at high schools in Stockholm were contacted by email. The schools were chosen on a random basis and experiments were booked on a first-come first-served basis, meaning that no choice between certain programs/schools/classes was made.

Classes were randomly assigned to a group.[4] Since the scheduling was done in a random manner without considerations to treatment groups, the sampling is likely to result in randomised groups, and hence unbiased results.

However, slight considerations were taken to the program of study of the students in the different classes. If the randomisation resulted in for example an unmotivated large amount of natural science students in one group in comparison to the whole sample, changes were done in order to ensure a balance between programs in our groups.

Even though a balance in terms of baseline characteristics per group was aimed for at a first stage, several cancelled classes at two schools resulted in that it was difficult to get the balance that was planned for. Certain changes had to be done in order to get enough participants in each group, and this might have resulted in a slight overrepresentation of certain characteristics in some groups. This will further be discussed in section 6.

No student in the visited classes decided not to participate in the experiment, and hence there is no self-selection bias on a student level that could affect the results. However, since participation was decided by the teachers, there is a risk that the teachers in our sample classes differ from the overall population of teachers in that they considered the experimental topic particularly interesting, which could imply that the classes might be currently studying or discussing related topics. This could have implications for external validity.

By using the above mentioned strategies as well as analysing the control variables included in the questionnaire, the risk of the sampling causing differences in the treatments is deemed to be unlikely.

5.3 Experimental design

Subjects were divided into four groups, one control group and three treatment groups. In all groups, one sharing decision per participant was made. If each participant would have made more than one choice, more observations could have been gathered. However, the risk of order effects and anchoring was considered to be too large.

In all four groups, participant A had to decide between sharing SEK 1000 with participant B or not sharing at all. If participant A chose to share and later won the lottery, he/she would receive SEK 700 and participant B SEK 300. If participant A chose not to share and later won the lottery, he/she would receive SEK 1000.

The amount of money at stake was chosen to be sufficiently high so that the participants would make realistic decisions and listen/understand the instructions of the game. 1000 was deemed sufficient for high school students, given

[4]The first scheduled class in the experiment was chosen to be the control group in order to be able to not deceive when moving on to treatment I.

that they usually have a disposable monthly income around that level. The amount to be shared had to correspond to an amount that it is reasonable for a person to give away, but not too low so that it becomes irrelevant. It was set to 30 % of the original amount, thus SEK 300. The amount of risk in sharing in treatment II and III was chosen so as to replicate the risk in the sharing economy, which is a small risk to lose a lot. The risk was chosen to be 20 % of losing all the money that participant A would have received by sharing (SEK 700). Due to budgetary constraints, we paid out SEK 1000 to one of the participants within one week of experiments through a lottery. According to Bolle (1990) using a randomised reward system instead of a deterministic system does not significantly change the way subjects behave, and hence the choice of using a lottery is unlikely to bias the end results.

Control group

In the control group, participants A decided between dividing SEK 1000 between themselves and a participant B in the experiment. Participant A was not told anything about participant B other than that participant B took part in the experiment in another experimental session, and was hence not in the same classroom as participant A.

Treatment I - History

In treatment I, participant A got the same choice as in the control group but were in addition given information of previous behaviour/history of the person they would be sharing with (participant B). Since the effect of interest is that from positive reciprocity, participant A were given the information that they are sharing/not sharing to participant B, who was a participant that had taken part in an earlier experimental session and had earlier gotten the same choice as participant A now had to make, and previously decided to share. Information about participant B was only given on answer sheets, so participants did not know they were all given the same history. A precondition for that this treatment would work without deception was that at least one person in the control group choose to share.

Treatment II - Risk in sharing

In treatment II, participant A got exactly the same information as in the control group except for that a simulated risk in sharing was added. The risk was only present if the subject chose to share, and only affected participant A, not participant B. If participant A chose to share, the was a 20% risk of participant A not receiving his/her share of the SEK 1000 (SEK 700). Hence, in case participant A chose to share the SEK 1000 and he or she later won the lottery, there was an 80% chance that participant A would receive SEK 700, but a 20% risk that participant A would not receive anything at all (SEK 0). Participant B would receive SEK 300 without any risk of losing the money. In case participant

A chose not to share the SEK 1000 and later won the lottery, he would receive SEK 1000 without any risk.

The risk outcome was realised once per experimental session, after the sharing decisions had been made. One of the researchers drew one out of five balls, four white and one red, from a transparent bag inside of the classroom. In case the red ball was drawn, the risk was realised, meaning that if a participant from this session won the lottery and chose to share, he or she would lose her SEK 700. Realising the risk this way aimed to ensure that all participants considered the risk realistic and understandable and not hypothetical.

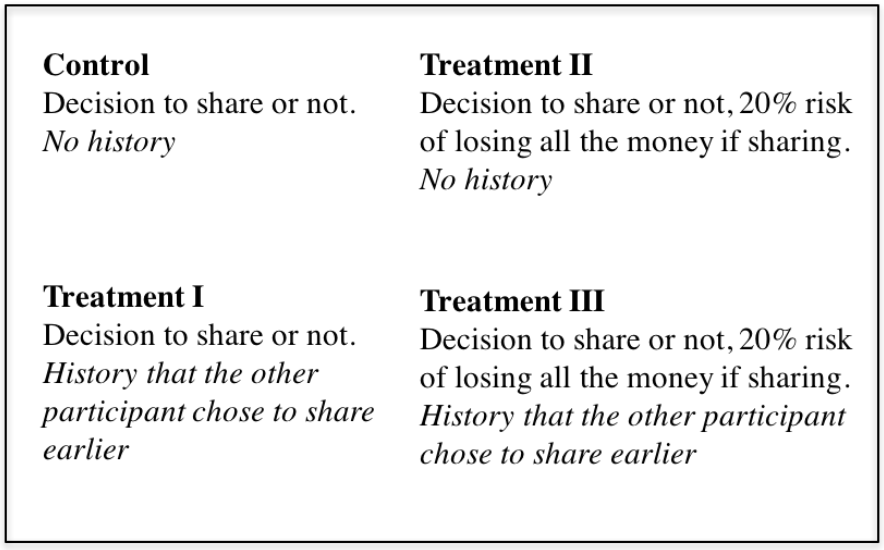
Treatment III - History with a risk in sharing

In treatment III, participant A made the same choice as in the control group. As a combination of treatment I and II, this treatment include both history and risk in sharing. Hence, there was a risk in losing the money by sharing, and the previous choice of participant B was revealed.

As in treatment II, the risk in sharing was explained and the ball was drawn after the choices was made. As in treatment I, participant A was given the information that they will chose to share/not share to participant B, who was a participant that had taken part in an earlier experimental session and had gotten the same choice as participant A now had to make, and previously decided to share. In contrast to treatment I however, this meant that participant B in this case came from Treatment II, meaning that they had chosen to share with an additional risk in sharing.

An overview of the experimental groups is provided in figure 3.

Figure 3: Summary of experimental groups



6 Data

This section will discuss the variables of interest, as well as the sample and their baseline characteristics. Furthermore, the randomisation will be evaluated by testing for differences in baseline characteristics between the groups.

6.1 Descriptive statistics

The sample consists of 499 students from eight schools. The dependent variable is a binary variable taking the value of 1 in case the participant chose to share, and 0 in case the participant chose not to share. Our sample is divided into one control group and three treatment groups. These groups are the independent variables, baseline characteristics used were gender, age and program.

The number of participants per group as well as the division between male and female students are seen in table 1. Overall, females seem to be overrepresented in our sample.

Table 1: Summary statistics of sample

Groups	n	Male	Female
Control	106	38%	62%
Treatment I	113	27%	73%
Treatment II	146	42%	58%
Treatment III	134	43%	57%
Total	499	38%	62%

Subjects came from different programs of study and were randomised to the different groups in the best possible manner given practical constraints discussed in section 5. Table 2 shows the representation of the different programs per groups.

Table 2: Program of study per group

Group	Social Sciences	Natural Sciences	Other
Control	34	70	2
Treatment I	84	29	0
Treatment II	104	25	17
Treatment III	85	35	14
Total	307	159	33

6.2 Baseline differences

As randomisation was done on a cluster level we want to examine the data more closely in terms of the baseline characteristics. In case of any significant differences in baseline characteristics between groups, this should be accounted for when drawing conclusions at a later stage.

Program of study

Table 2 shows a overrepresentation of some programs in certain groups, for instance, *natural sciences* is overrepresented in the control group while the share from *social sciences* is higher in the treatment groups. In order to test if these differences had any impact on sharing decisions, OLS regression analysis was conducted with sharing as a dependent variable, with dummies for treatments as well as program of study. Results show that only the category *other* has a statistically significantly negative effect on sharing (see appendix A.5 for OLS output). This group represents 2 media students from one school, and 31 social care students from another school. In order to examine the effect on sharing more closely, each treatment group was analysed separately, and we can see that the category *other* only has a significantly negative effect on sharing in treatment III, but not in other groups (see appendix A.5). Results from the category *other* are hence not consistent across groups, and is therefore unlikely to bias the results in a systematic way. Therefore, there are no indications that this would create any bias in the final results.

Age

Analysing differences in age and gender between the four groups necessitates testing for differences in ordinal data between groups. Given this, a Kruskal-Wallis equality-of-populations rank test was used to identify in which of the two variables, if any, significant differences exist.

Table 3: Age and gender differences between control and treatments group

	Total	Control	TI	TII	TIII	Kruskal-Wallis p-value
Gender (1 = male, 0= female)	0.380	0.377	0.274	0.417	0.431	0.0519*
Age	17.150	16.768	16.628	17.704	17.290	0.0001***

**p<0.01, ** p<0.05, *p<0.1*

Table 3 shows that the groups differ significantly in terms of age. In order to understand which specific groups differ from each other, t-tests were conducted (see appendix A.6). T-test analysis shows that the mean age of participants is significantly different between most of the groups. However, it is worth noting that the maximum difference in the average age between groups is around one year (Treatment I and Treatment II), which is a rather small age difference and is unlikely to affect any sharing decision. In order to ensure that age differences had no impact on results, OLS analysis of sharing with age as an control was conducted (See appendix A.7 for OLS output). Results shows no significant effect of age on sharing, and hence any age differences between the groups is unlikely to create any bias in terms of final results. We can hence conclude that there are no indications of that the age differences create bias in terms of sharing.

Gender

Overall, the large difference in gender comes from the difference between Treatment I and Treatment III, where there are significantly less men in treatment I (See appendix A.8). In order to ensure that this had no effect on final results, further analysis was conducted. OLS analysis on sharing with control for gender shows that gender has no significant effect on sharing, and hence the differences between proportion of men in treatment I and III is unlikely to bias the final results (See appendix A.8 for OLS output).

In conclusion, there are some differences in terms of baseline characteristics between the groups even though measures were taken to minimise them. This is most likely due to the randomisation being done at a cluster level, implying that the classes differ from each other. However, from further analysis we can conclude that there is no reason to believe that these differences would bias the results. Hence, the results discussed in the upcoming section can be believed to stem from differences in behaviour due to the treatments, and not from differences in baseline characteristics.

7 Results

Out of 499 observations, 169 people chose to share, which is 33.87%. Figure 3 illustrates the proportion of people that chose to share per group, and table 4 gives detailed descriptive results per group.

Figure 3: Proportion that chose to share per group. Error bars show 95% confidence intervals.

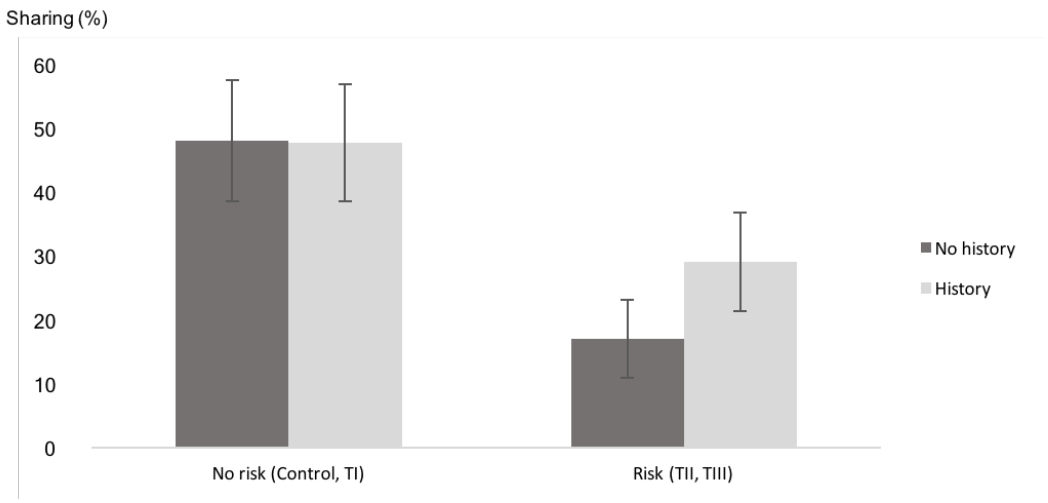


Table 4: Descriptive results

Groups	n	n sharing	Proportion sharing
Control	106	51	0.481
Treatment I	113	54	0.478
Treatment II	146	25	0.171
Treatment III	134	39	0.291

Hypothesis 1

Hypothesis 1 stated that when choosing between sharing or not sharing, some people will choose to share. 48% of participants in the control group decided to share, indicating that for some, the utility of sharing was higher than the utility of not sharing. Hence, evidence supports H1.

Hypothesis 2

Hypothesis 2 stated that with a history of others having shared, more people will choose to share than without history. H2 is tested by comparing the proportion that chose to share in treatment I with that in the control group using a two-sample test of proportions. The difference between the groups is 0.3 percentage points and statistically insignificant (one-sided z-test[5]; z = -0.0482, p = 0.962). This indicates that history does not affect the level of sharing in the non-risk setting, thus indirect reciprocity does not appear to be present. Thereby, we reject H2.

Hypothesis 3

Hypothesis 3 stated that in a sharing decision that includes risk, less people will choose to share than if there were no risk. Introducing a risk in sharing decreases the proportion who share by 31 percentage points, which is significant at a 99% confidence level (one-sided z-test; z = 5.2916, p = 0.000). Hence, evidence supports H3.

Hypothesis 4

Hypothesis 4 stated that with a history of others having taken a risk when sharing, in a sharing decision that involves risk, more people will choose to share than without history. To test H4 we conduct a one-sided test comparing if the level of sharing in treatment III is higher than that in treatment II. The results show that the proportion who shared is 12 percentage points higher in treatment III than in treatment II, which is statistically significant at a 99% confidence level (one-sided z-test; z = 2.385, p = 0.0085). Thus, by making the history that someone else has shared despite risk known, more people decide to share. This is evidence of indirect reciprocity in a risk-setting, which is in support of H4.

[5] As H2 - H5 are all one-sided, one-sided z-tests will be used.

Hypothesis 5

Hypothesis 5 stated that positive indirect reciprocity will be higher in the risky setting typical of the sharing economy compared to in a non-risk setting. To see if the history matters more in a risky setting compared to in a non-risk setting, we do a difference-in-difference test of whether treatment II and III differ more than the control group and treatment I. The results show that the difference is significant at a 90% significance level (one-sided z-test, $z = 1.46$, $p = 0.0721$). The results thereby indicate that indirect reciprocity in sharing is higher in the risky setting compared to in the non-risk setting, supporting hypothesis 5.

8 Discussion

The results indicate that there is no indirect reciprocity in the non-risk setting, which contradicts previous research that has provided evidence of indirect reciprocity. In contrast, there are clear and significant evidence of indirect reciprocity in the risk-setting, implying that indirect reciprocity is higher in a risky setting than in a setting that does not involve risk.

8.1 Internal validity

The controlled experiment allows us to ensure high internal validity. Groups were designed to be identical except the specific additional information related to each treatment in order to be able to isolate potential causal effects.

In order to ensure that all participants understood the choice at hand it was explained various times, orally and in writing, but given the complexity of treatment II and treatment III there is still a risk that some participants did not fully understand. However, the large decrease in sharing in the risk treatments speaks against that participants did not understand the risk, and it can neither explain the differences between the history and no history-treatment in the risk-scenario. Furthermore, the pilot study was conducted to test the understanding of the experiment. After this, the procedure was slightly adjusted and additional explanations were added.

The experimental sessions were not conducted at the same time and day due to practical constraints. There is a risk that students had spoken with students from earlier experimental sessions, within their school or from schools we had earlier visited. In case there was communication between the classes, potential bias should have affected all experimental groups similarly since the experimental groups were randomly assigned. However there were no indications of students knowing about the experiment in beforehand, and the risk of students talking to students from other programs, and schools far away was considered very small.

Randomisation was deliberately chosen to be done within schools instead of within classrooms, and this created some differences between groups discussed in section 6. The alternative to randomise within classrooms would have allowed the results to be free any type of bias coming from that participants from one group are from the same class, but would not have allowed any specific instructions to be told orally. Furthermore, the realisation of the risk by drawing one out of five balls in treatment II and III would not have been possible. Another alternative would have been to gather all participants from one school, randomise into treatment groups and then separating them into separate rooms. This was not possible due to practical reasons. Given the pilot study and the complexity of some treatments, only randomising within schools and assigning a specific class to one group was considered the best alternative. Given the large number of participants and that all groups had participants from various classes and schools, together with the analysis performed in section 6, any possible class effect is unlikely to impact the results.

8.2 Generalisability of results

There are certain points to discuss in terms of external validity of the experiment. Firstly, the experiment has only been conducted in schools around Stockholm. However, given that our sample consists of schools both from central Stockholm and further outside of the city, participants from both smaller and larger towns have been included. Furthermore, the participants are high school students, which might not be fully representative of the population as a whole. It would therefore be interesting to conduct the experiment with another subject pool.

Furthermore, the participants were not fully anonymous to the experimenters, given that they had to convey their email-address in order to be contactable if winning the lottery. This could result in that subjects act differently than they would if not monitored, which should be kept in mind when generalising the results.

Even if the experiment specifically aims to investigate the effect of risk, which is one characteristic of sharing economy platforms, there are other aspects that cannot fully be replicated in this experiment. For instance, sharing an amount of money is different from sharing an asset, which might induce differences in behaviour. In addition, sharing in the sharing economy often involves a social component; you meet and get to know other people that are active in the platform. It could be that the relationship between risk and indirect reciprocity is affected by other things in the sharing economy that could not be replicated due to the laboratory experimental design. This is worth taking into consideration when generalising our results to the risky setting of the sharing economy.

Another problem with external validity is the difficulty in replicating risk in a laboratory experimental environment. The risk is most likely perceived as lower in our experiment than in a real scenario due to the fact that the "asset" is a rather small amount of money that is not something they already owned, nor has any affectional value. However, this does not decrease the generalisability of the results as it is instead likely that the effect of risk on indirect reciprocity is even stronger in the real sharing economy context than in our experiment due to a stronger perception of risk.

8.3 Implications of results

The absence of indirect reciprocity in the non-risk setting seems to contradict some previous research. However, previous studies that have found evidence of indirect reciprocity, such as Gu et al. (2009) and Zvilichovsky et al. (2014) study data collected directly from platforms. It might be the case that indirect reciprocity is stronger in a real community setting as opposed to a laboratory setting such as in our experiment. Thus, a possible explanation for the lack of evidence of indirect reciprocity in the non-risk setting might be that it is too weak to show in our experiment, although it might be present in real life sharing economy platforms. Further, it might have been visible if we instead would have given the participants the opportunity to choose the amounts to share themselves. This would probably have lead to a larger variation in the data, making it easier to see any potential effect of the history. The outcome might also have been different if we had chosen different amounts to share, or another risk level.

In the risk-scenario, there was a highly significant effect of introducing the history, which provides clear evidence that indirect reciprocity increases the level of sharing. The risk thus seem to amplify indirect reciprocity in the sense that knowing that someone else has taken a risk when sharing is perceived as a stronger "good deed" then without the risk. This implicates that indirect reciprocity is higher in the sharing economy than in other marketplaces due to the higher level of risk. Hence, our findings provide evidence that indirect reciprocity can help sustain contribution of assets in a sharing platform.

Our findings have implications for decision makers and platform designers in the sharing economy. To enable indirect reciprocity, the platforms have to be transparent in terms of other's contribution. Parallels can be drawn between history and reputation, such as platform ratings, since reputation can be regarded a subjective assessment of how others have perceived historical occurrences. By this, platform ratings are most likely important for contribution, implying that the use of ratings should be encouraged. It is possible that also direct reciprocity is amplified by risk. A higher level of direct reciprocity in the sharing economy and its role as a regulation mechanism between the peers is in line with the findings of Proserpio et al. (2016). However, investigating the relationship between risk and direct reciprocity was out of scope for this thesis and would have to be examined further for any conclusion to be drawn.

Our results are not only applicable to the sharing economy context, but also to other group or network settings that involve risk. This could be any setting in which people interact with each other and are dependent on others cooperation, but where contribution entails risk. Hence, decision makers also in these kind of settings should facilitate transparency.

9 Conclusion

In this paper, we study the behavioural mechanisms that facilitate sharing in a setting such as the sharing economy. Specifically, we investigate the presence of indirect reciprocity both in a non-risky and a risky sharing setting. We find that there is no sign of indirect reciprocity in a sharing setting that does not involve risk, while it significantly increases the amount of sharing in a risky sharing setting. This provides evidence that indirect reciprocity is higher in the sharing economy since people are subject to a higher level of risk than in other marketplaces. By this, we contribute to a deeper understanding of what behavioural mechanisms enforce the sharing economy communities that depend on contribution in terms of assets to share. Due to the rapid growth of the sharing economy and its many benefits for society, it is crucial for decision makers to understand what factors facilitate and sustain sharing in order to direct efforts accordingly. Our results emphasise the importance of ensuring and enhancing transparency of past contributions to enable indirect reciprocity. This could also be extended to similar contexts that involve risk. We recommend further research to examine the relationship between risk and reciprocity closer. Specifically, other factors not explored in our experiment could play a moderating role for the relationship between risk and indirect reciprocity. Extending the analysis to a real setting with social interaction and a risk of losing something already owned would provide useful insights into how indirect reciprocity plays a role in sustaining contribution in the sharing economy. It could also be insightful to explore other risky settings than the sharing economy, as well as any potential relationship between risk and direct reciprocity. Lastly, it would be interesting to analyse the implications of risk on negative indirect reciprocity.

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A Appendix

A.1 Experimental sessions

Table A.1.1: Experimental sessions per date, group, school and n of participants.

Date	Group	School	n
5th of April	Pilot	Huddingegymnasiet	40
6th of April	Control	Värmdö gymnasium	27
6th of April	Treatment I	Värmdö gymnasium	27
6th of April	Treatment II	Värmdö gymnasium	25
6th of April	Treatment III	Värmdö gymnasium	28
6th of April	Control	Värmdö gymnasium	29
6th of April	Treatment I	Värmdö gymnasium	29
7th of April	Treatment II	Tibble gymnasium	11
7th of April	Treatment III	Tibble gymnasium	18
18th of April	Control	Rudbeck	21
18th of April	Treatment III	Rudbeck	39
20th of April	Control	Nacka gymnasium	29
20th of April	Treatment I	Nacka gymnasium	30
20th of April	Treatment II	Nacka gymnasium	26
20th of April	Treatment I	Nacka gymnasium	27
21st of April	Treatment II	Väsby Nya gymnasium	15
24th of April	Treatment II	Fredrika Bremergymnasiet	29
25th of April	Treatment III	Tullinge gymnasium	10
25th of April	Treatment III	Tullinge gymnasium	25
25th of April	Treatment II	Tullinge gymnasium	17
25th of April	Treatment II	Tullinge gymnasium	6
25th of April	Treatment III	Tullinge gymnasium	14
26th of April	Treatment II	Thorildsplans Gymnasium	17

A.2 Manuscripts

Translated English version

Hello, we are Åsa and Malin and we are currently doing our master's thesis at the Stockholm School of Economics. You will now participate in an experiment for the essay.

From now on it is very important that you do not talk to each other or out loudly, since it could bias the results of the experiment. If you have any questions further on, please raise your hand and we will come by and explain.

Within one week, we will pay out these (*show the notes*) SEK 1000 to one of this week's participants in the experiment, which is about 200 students, through a lottery. You will receive questionnaires where you will get to make a decision of these SEK 1000, and the decision you make will become real if you win the lottery. The lottery will happen and the money will be paid out, since it is forbidden in economic research to lie to participants.

You will also get to fill in some short questions about your profile, but the answers will only be used for statistical purposes. We also need your email address so we can contact you if you win. Your email will not be used for anything but this. Your choice will not be linked to you as a person and will not be judged, and what you have chosen will not be shared with someone else. Who wins will not be disclosed to anyone other than the winner.

Each of you will choose if you want to share SEK 1000 to a person in one of the other classes in this week's experiment.

If you choose to share and you win the lottery, this person will receive 300 kr, and you will keep SEK 700. If you choose not to share and you win the lottery, you will keep the SEK 1000.

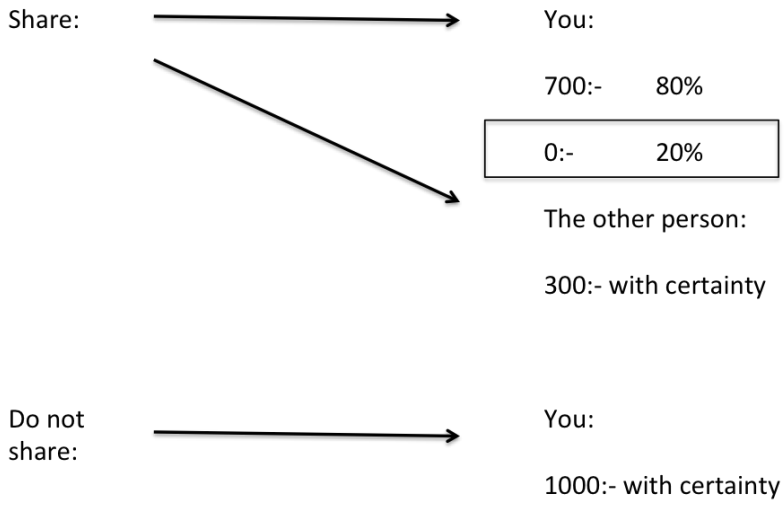
[only for treatment II and III] If you choose to share, there is a 20% risk that you lose all the money you would otherwise have retained (SEK 700). At the end of the experiment, we will draw one of the 5 balls in the bag (*show the transparent bag*). If we draw the red ball, it means that if someone in your class wins the lottery and chose to share, he or she will lose the SEK 700.

[only for treatment I and III] The person you share / do not share with got the same choice as you. The questionnaire contains information about whether this person chose to share or not with someone else in the experiment (not you) if he / she would win the lottery.

We will now hand out the questionnaires. The instructions on the paper are the same as we have told, but read through them again and fill in the details as well as mark your selection. Do not talk to each other, if you have questions raise your hand. When done, turn the paper wo that we can see when everyone is done.

A.3 Whiteboard drawing

Figure A.3.1. Showing whiteboard drawing made when explaining the risk scenario.



A.4 Answer sheets

We will within one week pay out SEK 1000 to one of this week's participants through a lottery.

[In Control]
You can choose to share these SEK 1000 with a person in one of the other classes in this week's experiment. If you choose to share and you win the lottery, this person will receive SEK 300, and you will keep SEK 700. If you choose not to share and you win the lottery, you will keep the SEK 1000.

[In Treatment I]
You can choose to share these SEK 1000 with a person in one of the other classes in this week's experiment. If you choose to share and you win the lottery, this person will receive SEK 300, and you will keep SEK 700. If you choose not to share and you win the lottery, you will keep the SEK 1000.

The person you share / do not share to you got the same choice as you. The person chose to share with a previous participant in the experiment.

[In Treatment II]

We will within one week pay out SEK 1000 to one of this week's participants through a lottery.

You can choose to share $ 1000 to a person in one of the other classes in this week's experiment. If you choose to share and you win the lottery, this person will receive SEK 300, and you will keep SEK 700. However, if you choose to split, there is 20% risk that you lose all the money you would have retained (SEK 700), the one you share with will get the SEK 300 with certainty. If you choose not to share and you win the lottery, you will get to keep the SEK 1000 with certainty.

[In Treatment III]

We will within one week pay out SEK 1000 to one of this week's participants through a lottery.

You can choose to share $ 1000 to a person in one of the other classes in this week's experiment. If you choose to share and you win the lottery, this person will receive SEK 300, and you will keep SEK 700. However, if you choose to split, there is 20% risk that you lose all the money you would have retained (SEK 700), the one you share with will get the SEK 300 with certainty. If you choose not to share and you win the lottery, you will get to keep the SEK 1000 with certainty.

The person you share / do not share to you got the same choice as you. The person chose to share with a previous participant in the experiment.

Continuation answer sheets

At end of all answer sheets:

Do you want to share?

Yes ☐

No ☐

Personal information (only for statistical purposes)

Age:

Gender:

Male ☐

Female ☐

Prefer not to disclose ☐

Program:

Year:

E-mail (will only be used if you win):

Note: Answer sheet only one page in experiment.

A.5 Baseline difference analysis between groups

Table A.5.1: Baseline characteristics and differences between groups.

	Control	Treatment I	Treatment II	Treatment III	II - III	I - III
Gender	0.377	0.274	0.418	0.432	-0.014	-0.158***
	(0.047)	(0.042)	(0.040)	(0.043)	(0.059)	(0.061)
Age	16.768	16.628	17.704***	17.298***	0.407***	-0.670***
	(0.069)	(0.071)	(0.092)	(0.093)	(0.131)	(0.120)

**p<0.01, ** p<0.05, *p<0.1*

Note: Table A.5.1. shows descriptive statistics for the control variables of the groups. Standard errors are shown in parentheses. Asterisks indicate a significant difference in means compared to control, expect for column II-III which shows difference between treatment II and III, and column I-III which shows difference between treatment I and III.

A.6 Program effect on sharing

Table A6.1: Effect of program on sharing

Variable	Effect on sharing
Natural Sciences	-
Social Sciences	-0.046
	(0.048)
Other	-0.269***
	(0.090)

**p<0.01, ** p<0.05, *p<0.1*

Note: Table A6.1 shows output from OLS analysis when regressing sharing on treatment dummies as well as dummies for program. Natural sciences omitted due to collinearity.

Table A6.2: Effect on program on sharing in control group

Variable	Effect on sharing in control group
Natural Sciences	-
Social Sciences	-0.117
	(0.104)
Other	-0.529
	(0.358)

**p<0.01, ** p<0.05, *p<0.1*

Note: Table A6.2 shows output from OLS analysis when regressing sharing in control group with dummies for program. Natural sciences omitted due to collinearity.

Table A6.3: Effect on program on sharing in treatment I

Variable	Effect on sharing in treatment I
Natural Sciences	-
Social Sciences	0.099 (0.108)
Other	-

**p<0.01, ** p<0.05, *p<0.1*

Note: Table A6.3. shows output from OLS analysis when regressing sharing in treatment I with dummies for program. Natural sciences omitted due to collinearity.

Table A6.4: Effect on program on sharing in treatment II

Variable	Effect on sharing in treatment II
Natural Sciences	-
Social Sciences	0.141* (0.082)
Other	-0.08 (0.117)

**p<0.01, ** p<0.05, *p<0.1*

Note: Table A6.4. shows output from OLS analysis when regressing sharing in treatment II with dummies for program. Natural sciences omitted due to collinearity.

Table A6.5: Effect on program on sharing in treatment III

Variable	Effect on sharing in treatment III
Natural Sciences	-
Social Sciences	-0.077 (0.091)
Other	-0.300** (0.142)

**p<0.01, ** p<0.05, *p<0.1*

Note: Table A6.5. shows output from OLS analysis when regressing sharing in treatment III group with dummies for program. Natural sciences omitted due to collinearity.

A.7 Age effect on sharing

Table A7.1: Effect of program on sharing

Variable	Effect on sharing
Age	0.009 (0.022)

**p<0.01, ** p<0.05, *p<0.1*

Note: Table A7.1. shows output from OLS analysis when regressing sharing on treatment dummies as well as age control.

A.8 Gender effect on sharing

Table A8.1:Effect of gender on sharing

Variable	Effect on sharing
Gender (1 = male, 0 = female)	0.040 (0.042)

**p<0.01, ** p<0.05, *p<0.1*

Note: Table A8.1. shows output from OLS analysis when regressing sharing on treatment dummies as well as dummy for gender.