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Für Anna und Lina

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Introduction

One of the basic assumptions of standard economic theory is that individuals' behavior is solely guided by the quest for the highest possible material outcome. However, there is ample evidence of additional factors influencing individuals' behavior as well. Besides individual-specific factors, also external factors and the corresponding interactions between both kinds of factors have been shown to affect decision making in various contexts (e.g., Andreoni 1989, Hoffman et al. 1994, Liberman et al. 1994, Park 2000, Fehr & Gächter 2002, Falk & Fischbacher 2006, Kube et al. 2012, Falk & Szech 2013). As the selected studies indicate, social preferences like altruism, fairness or reciprocity belong to the major individual-specific factors, while both the design of institutions and the framing of situations constitute prominent external factors.

In three self-contained essays, this thesis aims at empirically exploring potential deviations from the standard economic model that, due to at least one of the factors mentioned above, may arise in three frequently occuring environments. Chapter 1 analyzes a situation which consumers are nowadays quite familiar with. Instead of selling their products independently, an increasing number of companies attach public good components to their standard private goods, thus creating a new product category referred to as hybrid bundles. Prominent examples include green electricity or products that go along with a donation to a social cause. Given that consumers could also replicate such a hybrid bundle by acquiring its components separately, Chapter 1 investigates with the help of laboratory experiments whether and how individuals' valuation of both components is affected by the presentation format.

Chapter 2 deals with job promotions within firms. In contrast to the majority of the existing literature, this chapter takes into account that promotions are usually not viewed as an end in themselves but rather as the start of a new phase of interaction between promoted and non-promoted individuals, which is subject to the

new hierarchy. Based on this extended notion of promotions, this chapter evaluates both empirically and theoretically whether employee behavior during and after the tournament is affected by the design of a firm's promotion scheme. To this aim, the two most important promotion schemes of vertical and lateral promotions are compared.

Chapter 3 investigates leadership in social dilemmas. With the help of laboratory experiments it tests whether leadership behavior and leadership effectiveness are affected by the institutional framing. The framing is accomplished by exposing individuals to a social dilemma either in the form of a give-some or a take-some game. The corresponding analyses do not only provide insights with respect to the behavior of leaders but also with respect to the contribution plans of followers, which had been neglected in the literature so far.

The three chapters are summarized in the following in more detail. Chapter 1 explores whether individual valuations of private and public goods are affected by the format in which they are presented.[1] More precisely, given that an increasing number of companies try to make their feeling of social responsibility visible by attaching public good components to their products, we analyze whether these bundles of private and public goods affect individuals' valuations. According to standard economic theory, a consumer's willingness to pay (WTP) for a combination of two goods should stay unaffected by bundling since it does not change the goods' inherent characteristics (see, e.g., Adams & Yellen 1976, Jehiel et al. 2007). By contrast, we identify several channels that may also cause a different valuation. In light of this tension, we are the first to use laboratory experiments to empirically test for a possible effect of hybrid bundling. To this aim, we elicit subjects' WTP for a private and a public good with an adaptation of the Becker, DeGroot & Marschak method (1964) and vary between treatments whether both goods are offered separately or in the form of a bundle. To further assess whether a potential effect of bundling depends on the nature of the goods bundled, we conduct two additional control treatments in which the public good is replaced with a comparable private good.

Our data document superadditivity for hybrid bundles, i.e., the WTP for the hybrid bundle exceeds the WTP for the separately offered private and public good.

[1] This chapter is joint work with Gert Pönitzsch (Frackenpohl & Pönitzsch 2013).

By contrast, we find no superadditivity if two private goods are bundled. These findings seem to be driven by spillovers from the public to the private good and by an extended warm glow from self-signalling. More generally, the superadditivity in the evaluation of hybrid bundles shows that, depending on the nature of the goods, individuals may indeed react to the way in which products are presented. Markets may therefore play a strong role in the provision of public goods, which should in particular encourage charitable organizations to seek cooperations with the private sector. At the same time, the data also provide an explanation for the increasing use of measures of Corporate Social Responsibility (CSR), as CSR may create benefits for firms by inducing a different perception and use of their products.

Chapter 2 studies a largely neglected aspect of promotion tournaments in firms, which consists in the fact that they typically do not occur in isolation but are followed by interaction between promoted and non-promoted individuals.[2] Acknowledging the relevance of this multi-stage nature of promotions, I investigate both empirically and theoretically whether the design of job promotions is able to affect employee behavior in at least one of the corresponding stages. I therefore compare the two most important promotion schemes within firms, i.e., vertical and lateral promotions. The main difference between these promotion schemes consists in whether or not individuals compete against the same person they are later required to cooperate with. Under vertical promotions opponents continue to interact with each other after the tournament according to the newly established hierarchy. By contrast, under lateral promotions a promoted individual always encounters a non-promoted individual she has not faced in the previous tournament. In the laboratory, I implement both promotion schemes as a tournament with binary sabotage, which is followed by a gift-exchange game in which tournament winners take the role of the principal and tournament losers that of the agent. Although standard economic theory would not predict any behavioral differences between both treatments, the opposite may hold true in the presence of social preferences since in particular reciprocal preferences may be more relevant under vertical promotions (see, e.g., Grund & Sliwka 2005).

In line with a model of action-based reciprocity (see, e.g., Cox et al. 2007), I find significant treatment differences with respect to tournament behavior. In particular,

[2]This chapter is based on sole-authored work.

subjects refrain more often from sabotage under the vertical promotion scheme. By contrast, subjects' behavior in the subsequent gift-exchange game is similar. An additional control treatment, which consists of the gift-exchange stage only, reveals that competitive experience seems to have no effect on cooperation. These findings demonstrate that job promotions may affect employee behavior and in particular mitigate sabotage, which usually constitutes a major drawback of tournaments (e.g., Chen 2005, Harbring et al. 2007, Falk et al. 2008). My results suggest that it may be attractive for firms and other organizations to rely on vertical instead of lateral promotions when designing career paths.

Chapter 3 focuses on leadership in social dilemmas, a topic that recently has attracted much interest among researchers.[3] Given that previous work has investigated leadership mainly in positively framed social dilemmas (e.g., Gächter & Renner 2004, Güth et al. 2007, Haigner & Wakolbinger 2010, Rivas & Sutter 2011), we are the first to empirically analyze behavior in social dilemmas with first-moving leaders in a unified framework. More precisely, we compare subjects' behavior in a give-some and a take-some game with leadership. An additional novel feature of our work consists in the implementation of the strategy method in this environment to cleanly elicit followers' behavior at the individual level and compare it between frames. With the help of these two features we analyze whether leadership behavior and in particular leadership effectiveness are affected by the institutional frame.

Our data confirm that leaders' behavior, followers' reactions and the effectiveness of the leadership institution are strongly influenced by the institutional frame. With the help of the strategy method we even find evidence for the malleability of followers' cooperation types. Compared to the take-frame, significantly more followers act like conditional cooperators and significantly less followers act like free riders in the give-frame. Leaders seem to anticipate this difference in followers' behavior and contribute less themselves in the take-frame, leading to considerably higher social efficiency in the give-frame. These findings suggest that, in particular when a leadership mechanism is in place, policy makers might want to set the institutional frame such that it addresses the positive aspects of behavior ("Do something good!") rather than focuses on the negative ones ("Do not do something bad!").

[3]This chapter is joint work with Adrian Hillenbrand and Sebastian Kube.

Chapter 1

Bundling Public with Private Goods

1.1 Introduction

Public goods, such as clean air, education, and culture, constitute an important ingredient of social welfare. Their provision by regional authorities is, however, often hindered by asymmetric information with respect to the valuation of the public goods. Charities evolved to fill this breach but typically have problems raising funds. Therefore, increasing the voluntary provision of public goods remains a crucial task.

This chapter introduces a new mechanism that may increase private contributions to public goods. More precisely, we show in this chapter that bundling a public good with a private good induces superadditivity. That means, offering a private good and a public good as a bundle, i.e., as a single product, may increase consumers' valuation for the combination of both goods relative to the case in which they are offered separately. An illustrative example for such a bundle is a carbon neutral flight, as it combines a flight, a private good, with a carbon offset, which constitutes a contribution to the public good of climate change mitigation.[1] Other examples in which a private good is bundled with a public good or, equivalently, features public good characteristics, include ecotourism, sustainably fished seafood, or green electricity.

[1]Since contributions to public goods fulfill the defining characteristics of a public good (i.e., non-excludability and non-rivalry), we use the terms 'contribution to a public good' and 'public good' interchangeably.

Standard consumer theory assumes that bundling two goods does not affect consumers' valuations for the bundle's parts (e.g., Adams & Yellen 1976, Jehiel et al. 2007, Armstrong & Vickers 2010). However, several behavioral concepts suggest that a decision maker may exhibit a different valuation for two goods if they are bundled. For example, the presentation of two goods as a bundle can decrease the salience of the bundled goods and lead to lower valuations for the combination of both goods (e.g., Rottenstreich & Tversky 1997, Bernasconi et al. 2009). Bundling may also affect the way in which consumers aggregate information about the bundled goods' attributes and therefore influence their valuations (Tversky & Kahneman 1974, Anderson 1981).

The literature on the evaluation of bundles has so far focused exclusively on bundles of either only private or only public goods. The key contribution of this chapter is to show, based on different behavioral concepts and experimental data, that bundles of public and private goods are special in the way they are evaluated. More precisely, we argue that a consumer's evaluation of such a bundle, which we call *hybrid bundle*, is subject to specific behavioral channels that are absent for bundles of only private or only public goods.[2]

One of those channels are spillovers from one good to another. It is well established that cues like the brand name can affect the perception of a good's quality (see the review of Lee et al. 2006). However, also items bundled to a good may either directly hint at the value of the good (Popkowski Leszczyc et al. 2008) or reveal information about the selling firm's trustworthiness in providing good quality and caring about customer needs (Siegel & Vitaliano 2007). Since public goods are positively connoted, they are likely to induce positive inferences about the associated private good in a hybrid bundle. For example, many people conjecture that fair trade food is organic, although the label "Fair Trade" only guarantees compliance with requirements on working conditions and employee remuneration. Consumers have also been shown to like the taste of a milk shake better if it is labelled as organic (Linder 2011).

Also consumers' desire for a positive self-image (e.g., Brekke et al. 2003, Bénabou

[2]Other research suggested the term 'impure public good' for a combination of public and private goods. However, this term is also used for goods that exhibit either excludability or rivalry in consumption. To avoid confusion, we instead use the term 'hybrid bundle' to capture that a pure public good, whose consumption is non-excludable and non-rival, is combined with a private good, whose consumption is excludable and rival.

& Tirole 2006) can affect their valuations. If a public good is bundled with a durable private good, the use of the latter can remind the consumer of the good deed she performed. The warm glow stemming from the good deed (Andreoni 1989, 1990) can in this way be extended to the duration of use of the private good. A sophisticated consumer anticipates the additional future utility that the hybrid bundle generates and thus exhibits a higher valuation for the bundle. More concretely, a driver of a hybrid car may experience warm glow whenever using the car. The purchase of a carbon offset, in contrast, does not feature the advantage of continuously reminding the consumer of her character.

These and other channels that we discuss in this chapter predict that bundling public and private goods increases the valuation for the combination of the two goods. Nonetheless, it remains an empirical question whether hybrid bundling affects consumer valuations strongly enough to be of economic relevance. Since clean data that allow for a test of superadditivity in hybrid bundles can hardly be obtained in the field, we investigate this question in the controlled environment of a laboratory experiment.

In a between-subjects design, we analyze the effect of hybrid bundling on individuals' valuations. In the spirit of the method introduced by Becker, DeGroot & Marschak (1964), subjects receive an endowment and make a series of purchase decisions in which they face different prices for the two goods. At the end of the experiment one of the choice situations is randomly drawn to be payoff relevant. From subjects' choices we obtain their willingness to pay (WTP) for the offered goods. In the SEPARATE treatment, both a private good (a cup) and a public good (a €2 donation to charity) can be purchased *separately*, while in the BUNDLE treatment the public good is only available in the form of a *bundle* with the private good. Two control treatments, in which the public good is replaced by a private good (a €2 voucher for an online store), further examine whether the effect of bundling on subjects' WTP depends on the nature (public vs. private) of the bundled goods.

We find that subjects exhibit a significantly higher valuation for the hybrid bundle than for the combination of both goods when sold separately. Individuals' willingness to pay for the hybrid bundle, on average, exceeds that for the separately offered goods by more than 60%, revealing a strong superadditivity evoked by hybrid bundling.

Moreover, we do not observe superadditivity when bundling two private goods. Thus, the nature of the bundled goods seems to play a decisive role for the effect of bundling on valuations.

The strong increase in the WTP documented in our experiment suggests sizeable economic effects of hybrid bundling. In particular, our data indicate that bundling can help to increase the provision of public goods. Some charities already use private goods to encourage donations. For example, the World Wide Fund for Nature (WWF) promotes animal adoptions with an 'adoption kit' that contains a stuffed animal. Similarly, the Lance Armstrong Foundation uses the profits from the sale of Livestrong apparel in the fight against cancer.

Our results also provide a potential explanation for the recent increase in Corporate Social Responsibility (CSR) measures, since companies linking social activities to the sales of their products effectively offer hybrid bundles.[3] For example, the Danone group promised to provide 10 liters of drinking water in African countries for each liter of Volvic mineral water sold. Similarly, IKEA ties a $1 donation to purchases of child related products in its annual Christmas campaigns. Our data suggest that firms may benefit from CSR because it induces a different perception and use of their products, allowing firms to pass on the costs of the public good and to still increase sales.[4]

The superadditivity in the evaluation of hybrid bundles, conceptualized and empirically documented in this chapter, is a useful building block for the explanation of these phenomena. It is worth noting that, in principle, all market participants may gain from hybrid bundling and the resulting superadditivity. How consumers' augmented valuation is split up between consumers on the one hand and firms and the social cause on the other hand is ultimately determined by the market structure.

The rest of this chapter is organized as follows: In Section 1.2, we describe the design of our experiment. The main behavioral predictions are derived in Section 1.3. Section 1.4 reports the results of our experiment. Further channels that may affect

[3]The European Commission defines CSR as a "concept whereby companies integrate social and environmental concerns in their business operations [...] on a voluntary basis" (European Commission 2001).

[4]Other explanations of firms' engagement in public good provision rely on complementarity between private and non-marketed public goods (Heal 2003) as well as on firms' altruism and their desire to avoid pressure from interest groups (Baron 2001).

consumers' valuation for a hybrid bundle in the field are discussed in Section 1.5. The chapter concludes with a discussion of our findings and suggestions for future research in Section 1.6.

1.2 Experimental Design

Central to our experiment is the comparison of subjects' willingness to pay for a public and a private good when both goods are sold either as a bundle or separately. We elicit subjects' WTPs by offering the goods at varying prices and observing subjects' purchase decisions. To control for effects of bundling that are independent of the type of the bundled goods, we perform the same analysis also with two private goods.

In this section, we first present the goods used in the experiment and sketch the basic structure of the conducted treatments. Subsequently we discuss the treatments and the elicitation of subjects' WTPs in more detail. We conclude this section with a description of the experimental procedures.

1.2.1 Goods

In the main condition (PUBLIC), subjects are offered a private and a public good. We use a cup as the private good because the benefits of possessing the cup mainly accrue to the cup holder. As the public good, we use a donation of €2 to a nationally renowned charity providing help for children in need. The services provided by the charity, such as improved health care and education, generate non-excludable and non-rival benefits to the society and thus fulfill the characteristics of a public good.[5] Upon purchase of the donation, the experimenters donate €2 to the charity, while subjects pay the respective purchase price. Thus, the objective value of the public good is fixed, while its price can be altered.

In the control condition (PRIVATE), we consider bundling of two private goods. As the first private good we use the same cup as in the PUBLIC condition. The second private good is a voucher for an online store denominated at €2. This choice

[5]The notion that services provided by charities constitute public goods is also applied in, e.g., Andreoni (1990), Glazer & Konrad (1996) and Elfenbein et al. (2012).

of goods keeps the level and the salience of the goods' objective values constant across conditions.

1.2.2 Treatments

The experiment consists of two conditions, PUBLIC and PRIVATE, that differ in the available goods. In each condition, two treatments capture the effect of bundling in a between-subjects design. While the two goods are available separately in the SEPARATE treatments, the donation or voucher is bundled with the cup in the BUNDLE treatments. For an increased comparability between treatments, the cup is available as a distinct product in the BUNDLE treatment as well. The resulting 2x2 design is depicted in Table 2.3.

Table 1.1: Treatments

Treatment	1st good on offer	2nd good on offer	Observations[6]
PUBLIC-SEPARATE	cup	donation	44
PUBLIC-BUNDLE	cup	cup with donation	32
PRIVATE-SEPARATE	cup	voucher	37
PRIVATE-BUNDLE	cup	cup with voucher	42

1.2.3 Elicitation of Valuations

For each condition, our aim is to compare participants' willingness to pay for the combination of two goods between the SEPARATE and the BUNDLE treatment. The standard approach for an incentive compatible elicitation of a WTP goes back to Becker, DeGroot & Marschak (1964). We adapt this method so that it can determine individual valuations for two goods at a time.[7] Participants receive an endowment of €10 and make purchase decisions in various choice situations, all featuring different prices for the two goods on offer. At the end of the experiment, one of these situations is randomly drawn to determine a subject's payment. The respective purchase

[6]The sample is unbalanced because of no-shows and subjects that failed to answer the post-experimental control questions correctly (see Section 1.2.4 and Appendix A.2).

[7]For a detailed explanation of the restrictions of the standard BDM method in our setting see the end of this section.

decision is then implemented, i.e., the subject receives the purchased goods if she intended to buy any, and the corresponding prices are deducted from her endowment.

In the following we describe the purchase options in the SEPARATE and the BUNDLE treatment in more detail. For simplicity, we focus on the PUBLIC condition, but all explanations hold analogously for the PRIVATE condition. As the choice situation in Table 1.2 illustrates, the SEPARATE treatment replicates the standard environment that consumers generally face: a private and a public good are available separately, and the consumer can decide for each good whether she wants to buy it or not. Hence, in every choice situation a subject has four options: a) buying nothing, b) buying the private and the public good, c) buying only the private good, or d) buying only the public good.

Table 1.2: Choice situation, treatment PUBLIC-SEPARATE

situation	cup	donation
no. 19	price: €0.50 O buy O don't buy	price: €1 O buy O don't buy

In the BUNDLE treatment the public good is offered in a bundle with the private good. In addition, to increase the comparability with the SEPARATE treatment, the private good can also be purchased on its own. Thus, as the choice situation in Table 1.3 illustrates, subjects in the BUNDLE treatment choose between a) buying nothing, b) buying the bundle of the private and the public good, and c) buying only the private good. Also this setting is familiar to subjects since they often choose between similar products, of which one has the additional feature of ensuring contributions to a public good.

Table 1.3: Choice situation, treatment PUBLIC-BUNDLE

situation	cup	cup with donation	nothing
no. 19	price: €0.50 O buy	price: €1.50 O buy	O buy nothing

Our design allows to elicit valuations for the combination of both goods, for the

cup, and for the donation. To elicit these valuations, all choice situations differ with respect to the prices of the offered goods. More precisely, the price of the cup varies in steps of €0.50 between €0 and €3.50, whereas the price of the donation varies in steps of €0.20 between €0 and €2.40. Every possible combination of cup and donation price constitutes one choice situation, yielding a total of 104 situations. The price intervals cover a broad range of possible valuations, but keep the number of required decisions manageable. The choice situations are ordered lexicographically, first with respect to the cup price and second with respect to the donation price. In the BUNDLE treatment, the price of the bundle equals the sum of the cup and the donation price.[8]

From subjects' decisions we derive measures for their valuation for the different goods. In both treatments we use the highest total price at which a subject acquired both goods (i.e., chose option b) as a measure of her WTP for both goods. Likewise, we obtain a measure of the WTP for the cup from the highest cup price at which a subject bought the cup *exclusively* (i.e., chose option c).[9] As a consistent measure of the valuation for the donation, we use the highest premium subjects tolerate to obtain the donation in addition to the cup. Table 1.4 again summarizes these different measures and their elicitation.

Table 1.4: Elicitation of valuations in the PUBLIC condition[10]

Measure	SEPARATE	BUNDLE
WTP for the cup *and* the donation	highest total price at which both goods are bought (option b)	highest price at which the bundle is bought (option b)
WTP for the cup	highest price of the cup at which it is bought exclusively (option c)	
premium for the donation at a given cup price	highest price of the donation at which it is bought along with the cup (option b)	highest surcharge accepted to obtain the bundle instead of the cup alone (option b)

To test for superadditivity induced by hybrid bundling, we compare subjects'

[8] Instructions and screenshots can be found in Appendix A.2 and A.3.

[9] In some cases, subjects in the BUNDLE treatment always preferred a purchase of the bundle to a purchase of the cup alone. Then, we cannot determine the WTP for the cup and set it to zero. The measure of the WTP for the cup is thus likely to be biased downward in the BUNDLE treatment. However, this does not change our findings qualitatively.

[10] All measures are obtained analogously in the PRIVATE condition.

WTP for the *combination of both goods* between the SEPARATE and the BUNDLE treatment. This way, our results are not influenced by complementarity or substitutability between the goods. The valuation for the single goods may provide additional insights into the driving forces behind potential valuation differences.

Having outlined the design of our experiment, we would like to point out some noteworthy aspects of our novel approach of eliciting the WTP for two goods at a time. First of all, it incorporates the most important features of the Becker-DeGroot-Marschak (BDM) method (1964) for the elicitation of WTPs, as for example the random draw of the final price. For our purposes, however, the standard BDM method cannot be applied separately to measure the WTP for two goods. This would require the random draw of two prices, which leaves two options for the timing of their revelation. On the one hand, revealing the drawn prices only *after* choices for both goods have been made leaves the subject uninformed about whether she obtained the first good when deciding about the purchase of the second good. In this case, not only the uncertainty about the remaining endowment but also substitutability or complementarity between the goods could bias the obtained WTPs. On the other hand, revealing the price draw for the first good *before* eliciting the WTP for the second good may render the WTP for the second good uncomparable between subjects. The reason is that, after the price draw for the first good, subjects' remaining endowments for the acquisition of the second good are likely not identical. To overcome this problem, we adapt the standard BDM procedure by using *price combinations* for both goods from which one combination is drawn at the end of the experiment to become payoff relevant.

1.2.4 Procedures

The experiments were conducted in 2011 in the BonnEconLab, using the experiment software BoXS (Seithe 2012). We recruited a total of 182 subjects for the experiment using ORSEE (Greiner 2004). The subject pool consisted of about 6300 subjects, most of them undergraduate students of all majors from the University of Bonn.[11] Upon arrival, subjects were randomly assigned to private cubicles. The instructions

[11] Participants in the experiment were on average 24.0 years old, 41.2% of them were females. Subjects' sociodemographic variables are summarized in Table 1.7 in Appendix A.1.

were read aloud, whereas questions were answered in private.

Before subjects received a detailed explanation of the goods they could purchase in the experiment, they had to correctly answer control questions relating to the modified BDM procedure. We also checked whether subjects understood the payoff consequences of choosing the donation or the voucher. However, performing this test before the experiment would have risked that subjects anchored their WTP at the objective value of these goods. This test was thus performed only at the end of the experiment with a second set of six control questions (see Appendix A.2). Since we are only interested in analyzing the behavior of subjects who understood the fundamentals of the experiment, participants that made more than three mistakes in answering these questions or were unable to provide the correct anwers in a maximum of three trials are excluded from the analysis.[12] Nevertheless, including them yields qualitatively similar results at the 10% significance level.

The number of observations in each treatment is reported in Table 2.3. Each session of the experiment lasted no more than one hour. Subjects received average earnings of €10.77, which include their remaining endowment after the implementation of the randomly drawn choice situation as well as the retail price of the acquired goods.[13]

1.3 Behavioral Predictions

According to standard economic theory, a consumer's willingness to pay for a combination of two goods should stay unaffected by whether she can buy the goods separately or as a bundle. After all, bundling does not alter the goods' inherent characteristics. This holds irrespectively of whether the goods are complements or substitutes.[14] Although complementarity or substitutability between goods can alter the valuation for the combination of the goods, this valuation should not be influenced by bundling.

However, there is reason to expect that hybrid bundling induces valuations that

[12]Based on this criterion, a total of 27 subjects had to be excluded from the analysis, corresponding to 14.8% of all participants.

[13]At the time of the experiment, 1 Euro was worth approximately 1.36 US Dollar.

[14]For an account of affect-based complementarity between public and private goods, see Strahilevitz & Myers (1998).

are not additive but *super*additive. The channels we propose in this chapter suggest that hybrid bundling results in a higher WTP for the combination of the private and the public good than if both goods were offered separately. Our design focuses on two channels, which we discuss below. Additional behavioral channels that may be present in the field are discussed in Section 1.5.

First, consumers with image concerns may use hybrid bundles to *signal social preferences*. Depending on the observability of the purchase and the consumption of the hybrid bundle, this signaling can be directed both to others (e.g., Bénabou & Tirole 2006, Ariely et al. 2009) and to oneself (e.g., Brekke et al. 2003, Bénabou & Tirole 2006). Evidently, driving a hybrid car allows for more signaling than driving a conventional car and purchasing the corresponding carbon offset. The same is true for yoghurt bundled with a donation. Its purchase in the supermarket signals social preferences both to oneself and to other customers, while arranging the same donation in private only allows for self-signaling.

The signaling of favorable personality traits ought to have a particularly strong influence on the evaluation of a hybrid bundle if the private good component is durable. In this case, the use of the hybrid bundle can *extend the warm glow* that is generated by the public good component (see Andreoni 1989, 1990 for the concept of warm glow). We expect a prolongation of warm glow based on consumers' limited attention and imperfect recall. Whenever the consumer uses the private good, an association with the good deed is triggered. This yields a lasting improvement of both the consumers' public image and her self-image. To illustrate this point, think of a consumer donating to a charity. If this donation is bundled with a wristband, wearing the wristband allows to easily recall and signal favorable personality traits. In the same vein, we expect subjects to experience an extended warm glow from self-signaling when they use the hybrid bundle from our experiment. A decision maker who anticipates this additional utility will therefore display a higher WTP for the bundle.

Second, bundling a public good with a private good may induce *spillovers on the perception of the private good*. For bundles of private goods, Popkowski Leszczyc et al. (2008) have already documented such spillovers between goods. They show that a consumer who is uncertain about the value of a bundle tends to infer its value from

a component she is certain about. However, such spillovers need not be restricted to value inferences, but may extend to other attributes of different salience. Early work on the assessment of subordinates has shown, for example, that the rating of salient physical qualities affects the rating of intellectual qualities (Thorndike 1920). Recent work on the rating of goods has identified similar interdependencies. For example, an organic label can affect the liking of the taste of a milk shake (Linder 2011). Hybrid bundling may induce similar effects. In particular, public goods could trigger positive connotations in the consumer that affect the rating of the attached private good.

It has also been suggested that consumers draw inferences about firms when their trustworthiness in providing quality is unobservable. For example, Siegel & Vitaliano (2007) hypothesize that consumers use CSR activity to infer attributes of a firm's products as well as its honesty and reliability. In support of this hypothesis, they find for U.S. data that companies are more likely to engage in CSR the harder it is for consumers to evaluate their products before purchase. Likewise, Elfenbein et al. (2012) show that directing a certain percentage of auction proceeds to charity serves as a substitute for reputation in online auctions. With respect to our experiment, we conjecture that the public good conveys positive connotations to the cup if both are sold as a hybrid bundle.

Since both the signaling and the spillover channel can only be active in the PUBLIC condition but not in the PRIVATE condition, we obtain the following hypothesis.

Hypothesis. *The willingness to pay for the combination of both goods is higher in the* PUBLIC-BUNDLE *treatment than in the* PUBLIC-SEPARATE *treatment. There is no increase in the valuation for both goods from the* PRIVATE-SEPARATE *to the* PRIVATE-BUNDLE *treatment.*

While both outlined channels should increase the WTP for the combination of the goods in the PUBLIC condition, each channel affects the valuations of the individual goods differently. More precisely, in the presence of spillovers, the perception of the cup is altered and its WTP should increase. In contrast, the channel of signaling should leave the WTP for the cup unchanged but increase the premium for the public good.

1.4 Results

We start this section by analyzing subjects' purchase decisions with respect to a private and a public good which are either offered in the form of a bundle or separately. To ascertain that the described behavior is specific to the type of the bundled goods, we subsequently contrast the results for hybrid bundles to those for bundles of two private goods. The main focus of our analysis lies on the willingness to pay for *both* goods, which is the highest sum of prices at which both goods are bought, i.e., option b) is chosen (see Section 1.2.3).

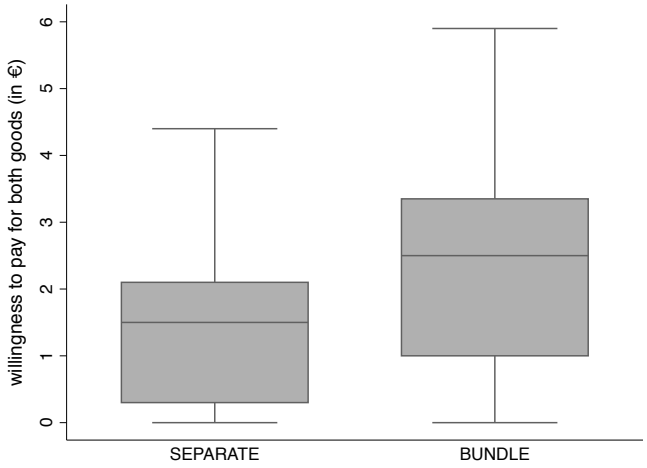
In line with our initial hypothesis, offering the public and the private good as a hybrid bundle indeed increases subjects' WTP for the combination of both goods. Not only the effect itself but also its size is striking: the average WTP for both goods increases from €1.54 in the SEPARATE treatment to €2.48 in the BUNDLE treatment (Wilcoxon rank-sum test, $p < 0.008$).[15] This corresponds to an increase of more than 60%. The boxplot in Figure 1.1 depicts the distribution of the willingness to pay for both goods. It reveals that the observed superadditivity is not only driven by a minority of subjects but rather constitutes a general behavioral pattern. In particular, the median WTP in the BUNDLE treatment exceeds the upper quartile of the WTP in the SEPARATE treatment.[16] Merely being offered a private and a public good in a bundle instead of separately hence considerably alters individuals' valuations. The size of the effect suggests that bundling public and private goods entails significant consequences for market demand.

Having established that hybrid bundling induces superadditivity, it is further instructive to analyze the WTP for the private good when it is bought exclusively. The average WTP increases from €0.67 in the SEPARATE treatment to €1.39 in the BUNDLE treatment (Wilcoxon rank-sum test, $p = 0.010$), which corresponds to an important share of the increase in the WTP for the combination of both goods. Thus, the presence of the hybrid bundle not only changes the price subjects are willing to pay for both goods, but also seems to alter the perception of the cup itself. This suggests that spillovers constitute a relevant channel for the observed superadditivity.

[15] Unless specified otherwise, all tests reported in this chapter are two-sided.

[16] The median of a distribution is depicted by the vertical line in the box, whereas the limits of the box indicate the upper and the lower quartile.

Figure 1.1: Willingness to pay for both goods, PUBLIC condition

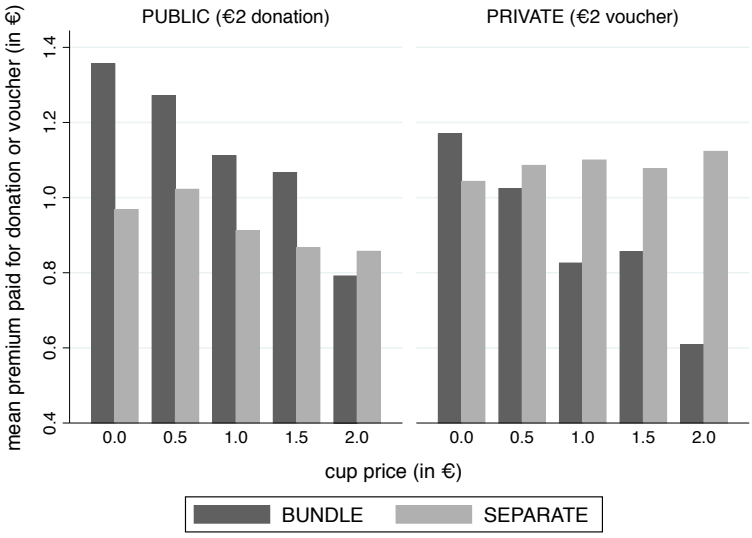


When inspecting subjects' valuation for the public good, we have to keep in mind that, in the BUNDLE treatment, the donation can only be ensured if the cup is bought, i.e., by choosing option b). For a comparable assessment of subjects' valuations across treatments, we may hence only focus on situations in which subjects buy the cup. For these situations, we compare the *premium* that participants are willing to pay for the donation at a specific cup price. A premium corresponds to the maximum additional price that is paid on top of the cup price to ensure the donation. At this donation price a subject still buys both goods (option b), whereas she no longer does so at higher donation prices (option a, c, or d). We restrict the analysis to cup prices of up to €2. Only two subjects in the PUBLIC-SEPARATE treatment exhibit a higher valuation for the cup, rendering choices for cup prices above €2 uncomparable across treatments. Note that this focus imposes no major restrictions since the retail price of the cup of €1.65 is contained in the analyzed price range. We are left with a total of 65 choice situations and a minimum of six observations for every cup price in each treatment.

The left-hand part of Figure 1.2 depicts the premiums that subjects pay for the donation in the SEPARATE and the BUNDLE treatment.[17] For a cup price of €0, subjects on average pay more to obtain the donation in addition to the cup if both goods are offered in a bundle (Wilcoxon rank-sum test, $p = 0.078$). Furthermore, the mean premium for the public good gradually decreases with higher cup prices in the

[17]Note that higher cup prices make purchases of the cup less likely, resulting in a decreasing number of observations along the categorical axis.

Figure 1.2: Mean premium paid for the second good, given cup purchase



Bundle treatment (Spearman's rank correlation test, $p = 0.032$), while it is more invariant in the Separate treatment (Spearman's rank correlation test, $p = 0.663$). This suggests that subjects evaluate the cup and the donation independently if and only if both goods are offered separately. Given this pattern, the mean premium for the donation is no longer significantly different between treatments for strictly positive cup prices (Wilcoxon rank-sum test for each cup price, $p > 0.370$). The described pattern also stands out in a random-effects interval regression (see Table 1.6 in Appendix A.1), a random-effects tobit regression, and a simple OLS regression.

An alternative measure of a subject's valuation for the public good is the *relative frequency* of public good purchases, i.e., the percentage of choice situations in which the subject buys the donation. In contrast to the premium, this measure has the advantage of including all observations. In particular, it also contains subjects' choices in which they do not buy the cup. A caveat of this measure, however, is that it is biased towards higher purchases of the donation in the Separate treatment. The reason is that acquiring the donation in the Bundle treatment requires to also buy the cup and is therefore weakly more expensive than in the Separate treatment. The left column of Table 1.5 provides data on the fraction of situations in which the donation is bought.[18] Subjects in the Separate treatment buy the

[18]In accordance with the analysis above, we again include choice situations with cup prices up to €2.

donation in 41.8% of the choice situations, whereas subjects in the BUNDLE treatment buy the donation in 42.6% of the situations. Hence, bundling the donation with the cup does not lead to less purchases of the donation (Wilcoxon rank-sum test, $p = 0.466$, one-sided). This is particularly striking since donation purchases in the BUNDLE treatment require the joint purchase of the cup. In total, the data suggest that offering the donation in the bundle also increases subjects' valuation for the donation. This hints at self-signaling as a further relevant channel for the emergence of superadditivity in hybrid bundles.

Table 1.5: Relative purchase frequencies of the second good

Treatment	PUBLIC	PRIVATE
SEPARATE	41.8%	44.1%
BUNDLE	42.6%	30.4%

We now turn to the PRIVATE control condition in which the donation is replaced by a voucher. Conducting the same analysis as above reveals considerable differences to the PUBLIC condition. In the PUBLIC condition, we found a substantial increase in the willingness to pay for the combination of a private and a public good if both are bundled. In the PRIVATE condition, however, this effect is not present. Subjects' WTP for the combination of the cup and the voucher does not significantly differ between the SEPARATE and the BUNDLE treatment. On average, participants pay up to €2.15 when facing the two private goods separately and up to €2.20 for the bundle of both goods (Wilcoxon rank-sum test, $p = 0.953$).

We also find that the WTP for the basic private good, i.e., the cup, is not affected when it is bundled with another private good. Subjects' average WTP for the cup amounts to €1.20 in the SEPARATE treatment, whereas it is €1.26 in the BUNDLE treatment (Wilcoxon rank-sum test, $p = 0.972$). At the same time, the right-hand part of Figure 1.2 reveals that, contrary to the case of an attached public good, subjects' valuation for the voucher is not augmented if it is offered in a bundle with the cup. The premiums are comparable between the BUNDLE and the SEPARATE treatment for low cup prices (Wilcoxon rank-sum test, $p > 0.418$ for cup prices $\leq$ €0.5). However, for cup prices exceeding €0.50 subjects are less willing to spend

money on the voucher when it is bundled (Wilcoxon rank-sum test, $p = 0.100$, $p = 0.284$, $p = 0.030$ for cup prices of €1, €1.50 and €2, respectively). The reason is that, as in the PUBLIC condition, the tolerated premium in the BUNDLE treatment again decreases with the cup price, but this time it is not subject to a general upward shift. Again, this observation is supported by a random-effects interval regression (reported in Table 1.6 in Appendix A.1), a random-effects tobit regression, and a simple OLS regression.

Further evidence on the evaluation of the voucher comes from an examination of its purchase frequencies. As reported in the right column of Table 1.5, the voucher is bought in 44.1% of the choice situations in the SEPARATE treatment, while it is bought in only 30.4% of the situations in the BUNDLE treatment. Hence, bundling the voucher with the cup leads to less purchases of the voucher (Wilcoxon rank-sum test, $p = 0.007$, one-sided). This is not surprising per se, since subjects in the BUNDLE treatment have to buy the cup along with the voucher. However, this result is in stark contrast to the PUBLIC condition, in which purchases of the public good stay unaffected by bundling.

It should generally be noted, however, that we cannot compare the willingness to pay for the cup and the bundle across the PUBLIC and the PRIVATE condition. Not only are the offered goods different, but also the level of awareness of the public good, even though constant *within* each condition, is distinct *across* conditions. Subjects in the PUBLIC condition are explicitly made aware of public good issues by being provided with the opportunity to spend money on a public good within the experiment. This in turn leads to different perceived opportunity costs of purchasing the cup between the PUBLIC and the PRIVATE condition. In the post-experimental questionnaire, nine out of 44 participants in the PUBLIC-SEPARATE treatment stated that they considered the donation as more meaningful than the cup. This suggests that the opportunity costs of acquiring the cup were relatively high in the PUBLIC condition, which induced a lower demand for it in this condition.[19] We did not observe similar statements in the PRIVATE condition.

Despite random assignment of subjects to treatments, a concern could be that

[19]That the awareness of opportunity costs alters purchase decisions has been demonstrated by Frederick et al. (2009).

our results are due to sampling. In the post-experimental questionnaire, we therefore elicited variables that might affect the general spending patterns of subjects (see Table 1.7 in Appendix A.1). All non-parametric results of this chapter are supported in regressions controlling for these sociodemographic and personality variables.

Summarizing and interpreting our results, we can state the following: Bundling a public and a private good significantly increases the willingness to pay for the combination of both goods. No such effect is observed if two private goods are bundled. We conclude that it is the combination of a *public* and a *private* good that plays a decisive role for the documented superadditivity.

1.5 Further Channels

The results of our experiment are in line with the two behavioral channels of signaling and spillovers. However, these channels are not necessary for creating superadditivity, since the field offers a wider range of channels than our experiment. The following discussion of additional channels indicates that many hybrid bundles may induce superadditivity, though the relevance of each channel will depend on the specific bundle and context in question. We first describe channels that are predominantly active for hybrid bundles. Subsequently, we turn to channels which affect the valuation of all types of bundles and discuss why all channels proposed in this section are inactive in our experiment.

1.5.1 Hybrid Bundles

First, by attaching a public good to a private good, the willingness to pay for the public good might increase because the presence of the hybrid bundle in the market can raise consumers' *awareness of the public good*. Awareness of the externalities of one's actions and a strong feeling of personal responsibility, in turn, have been shown to prompt decision makers to partly internalize these externalities and act less selfishly (e.g., Mazar et al. 2008, Hamman et al. 2010).

Second, offering a bundle entails a *suggestion* to the consumer and thereby shapes consumers' purchase decisions, similar to a default. Seeing the bundle, the consumer may conjecture that the retailer expects consumers to be interested in buying it.

This implicit suggestion by the retailer creates an additional purchase incentive. The suggestive power entailed by the presentation of options has been shown for investment and savings behavior as well as for organ donations (e.g., Benartzi & Thaler 2001, Madrian & Shea 2001, McKenzie et al. 2006). A sufficient condition for such effects is a decision maker's uncertainty over her preferences (Kamenica 2008). Companies' product lines may also alter consumers' beliefs about the consumption of others. If a hybrid bundle is offered, these altered beliefs may create a social norm to contribute to the public good and thereby trigger conditionally cooperative behavior (e.g., Cialdini et al. 1990, Traxler & Winter 2012). Such an effect on demand is generally not induced by bundles of private goods.[20] Therefore, the suggestive power of hybrid bundles should be stronger than that of bundles of private goods. The induced demand is in turn reflected in a higher WTP for the hybrid bundle than for the separate goods before the bundle's introduction.

1.5.2 Bundles in General

It has been shown that consumers make mistakes in *information aggregation* when evaluating bundles of private goods. According to experiments by Gaeth et al. (1991) and Yadav (1994), information aggregation is performed by averaging over the separate categorial evaluations of a bundle's components. In this process, the individual evaluations obtain *weights that do not reflect the components' values*. This can both be a consequence of simple averaging (Anderson 1981) or an anchoring and adjustment heuristic (Tversky & Kahneman 1974). Due to this biased information aggregation, attaching a high-quality but low-value good (such as a rather small donation to charity) to another good may disproportionally increase the quality rating of the two goods and hence the overall WTP.

Furthermore, based on prospect theory (Kahneman & Tversky 1979), Thaler (1985) argues that consumers have a *preference to integrate losses*. Thus, the presentation of a single price for multiple items, i.e., bundling, can increase the demand for these items. This argument is supported in experiments on bundles of private goods (e.g., Drumwright 1992, Johnson et al. 1999).

[20] An exception may be bundles of private goods with network effects, since they may induce similar interdependencies in decision makers' utility.

Moreover, the purchase of two goods in the form of a bundle also reduces the *pain of paying* and the *transaction costs* that go along with every purchase. The former implies that consumers prefer to reduce the number of monetary transactions (Prelec & Loewenstein 1998, Rick et al. 2008). The latter, transaction costs, are well accepted to be part of every purchase. Bundling does not only change the number of transactions for the purchase of multiple products but can also reduce the search costs related to their acquisition. For example, consumers often have to find suitable complementary products for goods they wish to purchase (e.g., a zoom lens for a camera). Similar search costs are present for public goods. For example, donations can be directed to multiple organizations which differ in their scope and efficacy. By suggesting particular organizations or projects, a firm selling a bundle reduces these costs.

All channels explained above drive an increase in the valuation for bundles. Nonetheless, there also exists a behavioral channel which supports subadditivity. More precisely, unpacking a good into its parts can increase the parts' salience and thereby raise the valuation for the sum of its components. This has been termed the 'unpacking effect'. For instance, Rottenstreich & Tversky (1997) find that subjective probabilities of uncertain events increase when the events are decomposed into disjoint components. Subadditivity in valuations has also been documented for events described in different detail (Johnson et al. 1993, Van Boven & Epley 2003) and for the demand of either unpacked private goods (Bateman et al. 1997) or unpacked public goods (Bernasconi et al. 2009). Thus, if bundling decreases the *salience of product characteristics*, bundles may also be valued less than the sum of their parts.

1.5.3 Discussion

None of the channels presented in this section drives the results of our experiment. We explain in the following how these channels are precluded by the experimental design.

Both the SEPARATE and the BUNDLE treatment provide the opportunity to make a contribution to the public good, effectively inducing the same level of awareness of the public good. Moreover, in contrast to firms' product lines, the goods offered

in the experiment are evidently not a response to market demand. Hence, subjects in both treatments learn the same about the desirability of the public good and the purchase behavior of others. The hybrid bundle thus neither entails suggestive power nor does it increase the awareness of the public good in the experiment.

Also channels affecting bundles in general are either inactive or controlled for by the PRIVATE treatments. Since the offered goods have comparable objective values (€1.65 for the cup vs. €2 for the donation and the voucher), subjects are unlikely to make substantial mistakes if they assign equal weights to the goods in their information aggregation. Furthermore, the experiment keeps both the degree of detail in the description of the goods and the individual goods' salience constant across treatments to exclude valuation differences due to unpacking. Finally, also the channels of loss integration, pain of paying, and transaction costs would affect the WTP for bundles in the PUBLIC and the PRIVATE condition similarly and are thus controlled for.

1.6 Conclusion

In this chapter, we analyze the effect of hybrid bundling on individuals' willingness to pay. Using a controlled laboratory experiment, we elicit subjects' WTP for a private and a public good, varying across subjects whether the public good is sold separately or in a bundle with the private good. We find that the WTP for both goods is about 60% higher when they are sold as a bundle. In contrast, we observe no such effect when two private goods are bundled.

We lay out two behavioral channels that support our results. The first one, self-signaling, stems from an extension of warm glow to the whole usage period of the underlying private good. The second one, spillovers, originates from positive connotations of public goods (e.g., Bjørner et al. 2004, Elfenbein et al. 2012) that carry over to the attached private good. The field offers additional channels that we discuss in Section 1.5. Hence, the superadditivity documented by our experiment should be present for a wide range of hybrid bundles in natural environments.

The higher valuation that subjects attribute to both the public and the private good when bundled indicates that markets may play a stronger role in the provi-

sion of public goods than is commonly acknowledged. Both charitable organizations and the private sector may gain from offering hybrid bundles. Such cooperations increasingly evolve and raise significant contributions to public goods. The UNICEF-Volvic program for providing drinking water in rural Africa elicited $2.5 million in the U.S. and Canada from 2008 to 2009. This corresponds to more than 1.6% of all private-sector donations to UNICEF in these countries. Fostering these cooperations can circumvent political concerns related to tax-based funding as well as the problem of assessing peoples' valuation for specific public goods.

Our results also suggest that hybrid bundling bears the potential to improve a company's sales. The findings thus serve as an explanation for the widening application of Corporate Social Responsibility (CSR) measures by firms, as companies that link social activities to the sales of their products effectively bundle private with public goods. However, since firms' CSR campaigns often go along with altered levels of advertisement and a reshaped image of the company (Baron 2001), the net effect of hybrid bundling on consumers' WTP so far remained unexplored. Our lab experiment abstracts from this image channel and provides clean evidence on how hybrid bundling affects consumers' valuations for the bundled products. The degree to which the WTP increase serves the firm, the good cause, and the consumer is ultimately determined by the market structure.

This chapter constitutes a first step towards understanding the valuation for public goods in markets and documents that the evaluations of public and private goods are interdependent. We therefore see this chapter also as a starting point for future research. For example, it seems important to further evaluate the relevance of the discussed channels in mediating superadditivity. Particular interest should lie on the extent to which self-signaling is responsible for the increase in valuations. If a favorable identity or a desired level of warm glow is maintained more easily through the use of hybrid bundles, prosocial activity in other environments might be crowded out. Thus, if this effect turns out to be dominating in the field, total voluntary contributions can decrease when hybrid bundles are available. A similar point is made by Engelmann et al. (2012) who show experimentally that a hybrid bundle with only token contributions to a public good may crowd out total charitable giving by creating moral wiggle room.

Furthermore, to determine the share of the WTP increase that is due to spillovers, it will be important to distinguish a truly increased appreciation of the private good when observing a hybrid bundle from a preference for consistency (Falk & Zimmermann 2011). Such a preference may induce a discrepancy between stated and true valuations. In our case, this could result in high stated valuations for the private good if the hybrid bundle is valued highly.

This chapter also opens the discussion of public good evaluation in a broader context. According to our results, hybrid bundling increases the private gains from the provision of the bundled public good. Thus, hybrid bundling could divert voluntary contributions away from public goods with higher social return. An extension of this chapter in which a second, more efficient public good is introduced could deliver insights into this problem. Subsequent studies may also wish to adopt a dynamic perspective and focus on repeated decisions. Given the current state of knowledge about the interdependencies of public and private good evaluations, this field promises to be interesting for future research.

A Appendix

A.1 Tables

Table 1.6: Premium paid for the second good

Dependent variable: Premium paid for the donation/voucher	(1) PUBLIC	(2) PRIVATE
cup price	−0.166***	−0.088**
	(0.064)	(0.038)
BUNDLE	0.365*	0.129
	(0.198)	(0.135)
BUNDLE × cup price	−0.186**	−0.236***
	(0.091)	(0.072)
Individual controls	Yes	Yes
Observations	240	265
Groups	76	77
χ^2	49.21	39.57

Notes: This table shows marginal effects from random-effects interval regressions (bootstrapped standard errors are given in parentheses). The dependent variable is the premium a subject is willing to pay for the donation or the voucher, respectively. The variable "cup price" indicates the price at which the cup is offered in each considered situation. The variable "BUNDLE" is a dummy variable indicating treatment BUNDLE. "BUNDLE × cup price" is the corresponding interaction between treatment and cup price. Individual controls include gender, age, financial situation, and Big Five personality traits. Significance levels are denoted as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 1.7: Sociodemographic variables, summary statistics

	Public-Separate	Public-Bundle	Private-Separate	Private-Bundle
Demographics				
Female	0.64	0.53	0.68	0.50
	(0.49)	(0.51)	(0.47)	(0.51)
Age	23.32	24.00	23.73	24.19
	(3.25)	(3.07)	(3.60)	(6.61)
Liquidity	0.89	0.81	0.84	0.79
	(0.32)	(0.40)	(0.37)	(0.42)
Big Five				
Openness	0.52	0.60	0.55	0.42
	(1.03)	(1.03)	(0.94)	(1.08)
Conscientiousness	−0.82	−0.68	−0.76	−0.82
	(1.17)	(1.03)	(0.98)	(1.25)
Extraversion	−0.27	0.25	0.09	0.07
	(1.02)	(1.07)	(1.17)	(1.30)
Agreeableness	−0.77	−0.56	−0.48	−0.34
	(1.02)	(0.87)	(1.11)	(0.96)
Neuroticism	−0.10	−0.15	−0.06	−0.01
	(1.14)	(1.06)	(1.11)	(1.03)
Observations	44	32	37	42

Notes: This table shows means over all observations in the respective treatments. Standard deviations are given in parentheses.

A.2 Instructions

In the following, we provide the instructions for treatment PUBLIC-BUNDLE. The instructions for the other treatments were adapted appropriately and are available from the authors upon request.

Information on the experiment

You are now participating in an economic experiment, during which you will receive money and have the opportunity to buy goods. The payoff that you receive from this experiment depends on your personal decisions.

The decisions that you take during the experiment will be analyzed in an exclusively anonymous way. This means that your decisions will never be related to your identity. During the experiment any kind of communication is absolutely forbidden. If you have any questions, put a hand out of your booth. The experimenters will then come to your booth and answer your question there, so that the other participants will not be disturbed.

In the following, different situations will be presented to you. In each of these situations you have to decide which one of two available goods (good A and good B) you want to buy at the given prices (or whether you want to buy none of the goods at the given prices). For the purchase of the goods you are provided with an amount of €10 (your initial endowment) in each situation.

Each of the overall 104 choice situations is labeled with a number. One of these situations will be paid out to you afterwards. After the experiment, this situation will be determined by drawing a random number between 1 and 104. Each of the numbers is equally probable. Since, when taking your decision, you of course do not yet know which number will be drawn, you have to think about each of your decisions carefully because each can potentially become relevant for you.
You will receive your payoff directly after this experiment. At this occasion, every

participant will also draw her individual random number.

Your payoff is:

if you bought *good A*	endowment (€10) - price of good A (+ good A)
if you bought *good B*	endowment (€10) - price of good B (+ good B)
if you bought *neither good A nor good B*	endowment (€10)

An example:

Consider the case in which the following situation with the number 37 is presented to you:

situation	good A	good B	nothing
...	...	...	...
no. 37	price: €3.20 O buy	price: €3.60 O buy	O buy nothing
...	...	...	...

This means that you have the choice to either buy only good A at €3.20, only good B at €3.60 or none of both goods. If you do not want to buy any of the goods, you do not incur any costs, i.e., you keep your endowment of €10.

If you want to buy good A at €3.20 in this situation, you have to tick the corresponding box so that the screen looks like this:

situation	good A	good B	nothing
...	...	...	...
	price: €3.20	price: €3.60	
no. 37	X buy	O buy	O buy nothing
...	...	...	...

If you draw the random number 37 afterwards, which corresponds to the situation above, you will accordingly receive good A as well as €6.80 (€10 - €3.20).

If you want to buy good B at €3.60 in this situation, you accordingly have to select 'buy' in the column for good B. If you draw the random number 37 afterwards, you will receive good B as well as €6.40 (€10 - €3.60).

If you do not want to buy any of both goods in this situation, you accordingly have to select 'buy nothing' in the right column. If you draw the random number 37 afterwards, you will receive none of the goods but €10 (€10 - €0) instead.

If you draw a different random number, the decision that you have taken for this other situation becomes payoff relevant.

Before the actual experiment starts, we ask you to answer the control questions that will appear on your screen in a few seconds. In case, doing this, you still have additional questions, please indicate this by raising your hand.

Control Questions I

Case I:

1) Which boxes do you have to tick if - facing prices of €4.90 for good A and of €6.70 for good B in situation a) - you prefer the **purchase of good A** over the purchase of good B as well as over the non-purchase of both goods?

situation	good A	good B	nothing
no. a)	price: €4.90	price: €6.70	
	O buy	O buy	O buy nothing

2) Which payoff would you receive in this case at the end of the experiment (including the initial endowment of €10) if situation a) was randomly drawn?

Good A:	O Yes	O No	
Good B:	O Yes	O No	
Money:	_____	Euro	

Case II:

1) Which boxes do you have to tick if - facing prices of €1.50 for good A and of €4.10 for good B in situation b) - you prefer to buy **none of the goods**?

situation	good A	good B	nothing
no. b)	price: €1.50	price: €4.10	
	O buy	O buy	O buy nothing

2) Which payoff would you receive in this case at the end of the experiment (including the initial endowment of €10) if situation b) was randomly drawn?

Good A:	O Yes	O No	
Good B:	O Yes	O No	
Money:	_____	Euro	

Case III:

1) Which boxes do you have to tick if you face prices of €3.30 for good A and of €4.00 for good B in situation c), but are willing to pay **at most €3.10 for good A** and **at most €4.30 for good B** in this situation?

situation	good A	good B	nothing
no. c)	price: €3.30 O buy	price: €4.00 O buy	O buy nothing

2) Which payoff would you receive in this case at the end of the experiment (including the initial endowment of €10) if situation c) was randomly drawn?

Good A:	O Yes	O No
Good B:	O Yes	O No
Money:	_____ Euro	

Case IV:

1) Which boxes do you have to tick if you face prices of €1.70 for good A and of €5.20 for good B in situation d), but are willing to pay **at most €3.10 for good A** and **at most €4.30 for good B** in this situation?

situation	good A	good B	nothing
no. d)	price: €1.70 O buy	price: €5.20 O buy	O buy nothing

2) Which payoff would you receive in this case at the end of the experiment (including the initial endowment of €10) if situation d) was randomly drawn?

Good A:	O Yes	O No
Good B:	O Yes	O No
Money:	_____ Euro	

Further information on the experiment

In this experiment you can buy goods whose values are likely to be subjectively different. In this respect, there do not exist any wrong or correct purchase decisions for you as a participant. You can acquire the following goods:

Good A:

The first available good is a 'blackboard cup' (see the picture below). With the included chalk it can alwavs be daubed or labeled anew.

Good B:

The second available good is an identical 'blackboard cup' which, however, goes along with a donation of €2 to "Kindernothilfe". The experimenters donate this amount for you if you buy this second good. The donation amount of €2 is independent of the purchase price, i.e., you only have to pay the respective purchase price, while the donation of €2 is performed by the experimenters. ("Kindernothilfe" supports destitute children in 28 countries of the world. The corresponding donation receipt can be inspected immediately after you have received your payoff.)

In the following, we ask you - as described above - to decide in each of the presented situations whether you want to buy

- either the 'blackboard cup'
- or the 'blackboard cup' that goes along with the €2 donation
- or none of the goods

at the given prices.

Control Questions II

Please answer the following additional questions by filling in the blanks.

Case 1:

Suppose the **cup** is offered at a **price of €1** and the **cup with donation** at a **price of €1.70**. Furthermore, suppose that you **buy the cup with donation** in this situation and that you indeed draw this situation.

How many Euros do the experimenters donate to "Kindernothilfe"?

Answer: _____ Euro

How many Euros do you have to pay *additionally* so that - instead of only receiving the cup - you also effect the donation?

Answer: _____ Euro

How many Euros do you have to pay altogether (i.e., for the cup with donation)?

Answer: _____ Euro

Case 2:

Suppose that the **cup** is offered at a **price of €1.50** and the **cup with donation** at a **price of €3.70**. Furthermore, suppose that you **buy the cup with donation** in this situation and that you indeed draw this situation.

How many Euros do the experimenters donate to "Kindernothilfe"?

Answer: _____ Euro

How many Euros do you have to pay *additionally* so that - instead of only receiving the cup - you also effect the donation?

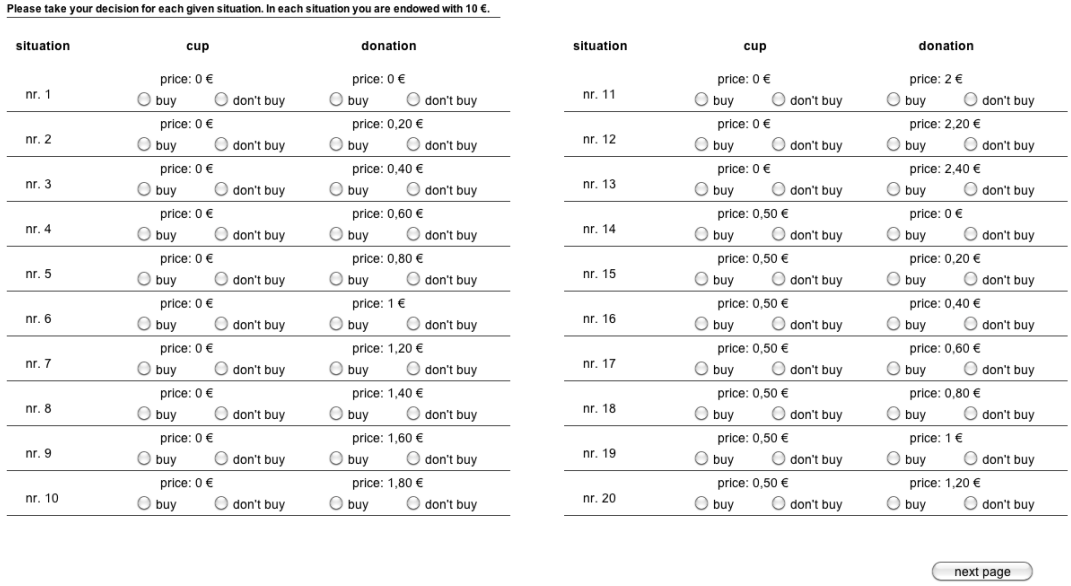
Answer: _____ Euro

How many Euros do you have to pay altogether (i.e., for the cup with donation)?

Answer: _____ Euro

A.3 Screenshots

Figure 1.3: Screenshot, treatment Public-Separate



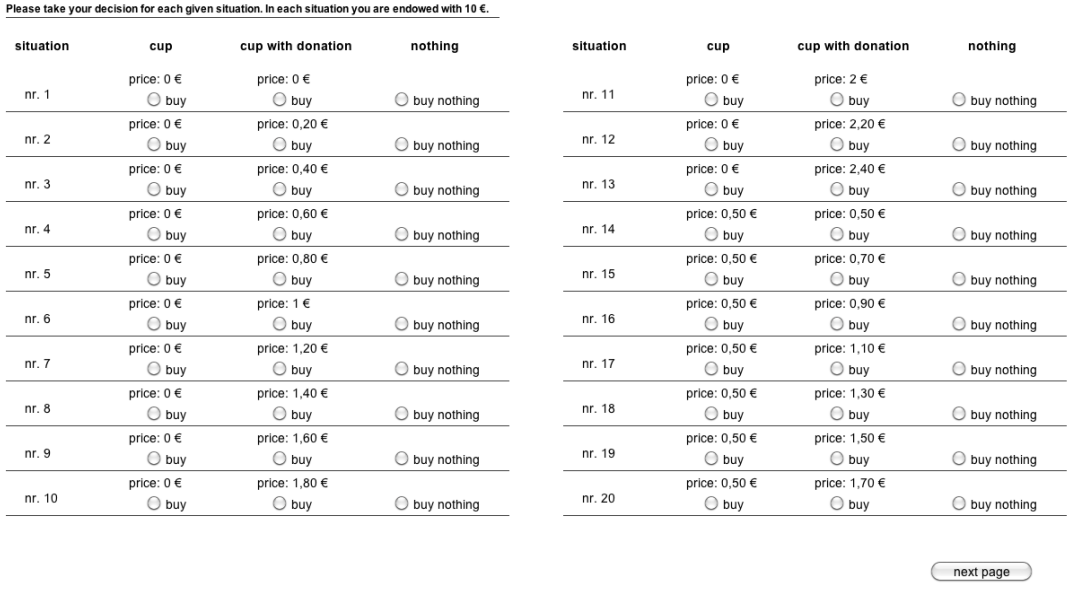
Please take your decision for each given situation. In each situation you are endowed with 10 €.

situation	cup	donation
nr. 1	price: 0 € ○ buy ○ don't buy	price: 0 € ○ buy ○ don't buy
nr. 2	price: 0 € ○ buy ○ don't buy	price: 0,20 € ○ buy ○ don't buy
nr. 3	price: 0 € ○ buy ○ don't buy	price: 0,40 € ○ buy ○ don't buy
nr. 4	price: 0 € ○ buy ○ don't buy	price: 0,60 € ○ buy ○ don't buy
nr. 5	price: 0 € ○ buy ○ don't buy	price: 0,80 € ○ buy ○ don't buy
nr. 6	price: 0 € ○ buy ○ don't buy	price: 1 € ○ buy ○ don't buy
nr. 7	price: 0 € ○ buy ○ don't buy	price: 1,20 € ○ buy ○ don't buy
nr. 8	price: 0 € ○ buy ○ don't buy	price: 1,40 € ○ buy ○ don't buy
nr. 9	price: 0 € ○ buy ○ don't buy	price: 1,60 € ○ buy ○ don't buy
nr. 10	price: 0 € ○ buy ○ don't buy	price: 1,80 € ○ buy ○ don't buy

situation	cup	donation
nr. 11	price: 0 € ○ buy ○ don't buy	price: 2 € ○ buy ○ don't buy
nr. 12	price: 0 € ○ buy ○ don't buy	price: 2,20 € ○ buy ○ don't buy
nr. 13	price: 0 € ○ buy ○ don't buy	price: 2,40 € ○ buy ○ don't buy
nr. 14	price: 0,50 € ○ buy ○ don't buy	price: 0 € ○ buy ○ don't buy
nr. 15	price: 0,50 € ○ buy ○ don't buy	price: 0,20 € ○ buy ○ don't buy
nr. 16	price: 0,50 € ○ buy ○ don't buy	price: 0,40 € ○ buy ○ don't buy
nr. 17	price: 0,50 € ○ buy ○ don't buy	price: 0,60 € ○ buy ○ don't buy
nr. 18	price: 0,50 € ○ buy ○ don't buy	price: 0,80 € ○ buy ○ don't buy
nr. 19	price: 0,50 € ○ buy ○ don't buy	price: 1 € ○ buy ○ don't buy
nr. 20	price: 0,50 € ○ buy ○ don't buy	price: 1,20 € ○ buy ○ don't buy

next page

Figure 1.4: Screenshot, treatment Public-Bundle



Please take your decision for each given situation. In each situation you are endowed with 10 €.

situation	cup	cup with donation	nothing
nr. 1	price: 0 € ○ buy	price: 0 € ○ buy	○ buy nothing
nr. 2	price: 0 € ○ buy	price: 0,20 € ○ buy	○ buy nothing
nr. 3	price: 0 € ○ buy	price: 0,40 € ○ buy	○ buy nothing
nr. 4	price: 0 € ○ buy	price: 0,60 € ○ buy	○ buy nothing
nr. 5	price: 0 € ○ buy	price: 0,80 € ○ buy	○ buy nothing
nr. 6	price: 0 € ○ buy	price: 1 € ○ buy	○ buy nothing
nr. 7	price: 0 € ○ buy	price: 1,20 € ○ buy	○ buy nothing
nr. 8	price: 0 € ○ buy	price: 1,40 € ○ buy	○ buy nothing
nr. 9	price: 0 € ○ buy	price: 1,60 € ○ buy	○ buy nothing
nr. 10	price: 0 € ○ buy	price: 1,80 € ○ buy	○ buy nothing

situation	cup	cup with donation	nothing
nr. 11	price: 0 € ○ buy	price: 2 € ○ buy	○ buy nothing
nr. 12	price: 0 € ○ buy	price: 2,20 € ○ buy	○ buy nothing
nr. 13	price: 0 € ○ buy	price: 2,40 € ○ buy	○ buy nothing
nr. 14	price: 0,50 € ○ buy	price: 0,50 € ○ buy	○ buy nothing
nr. 15	price: 0,50 € ○ buy	price: 0,70 € ○ buy	○ buy nothing
nr. 16	price: 0,50 € ○ buy	price: 0,90 € ○ buy	○ buy nothing
nr. 17	price: 0,50 € ○ buy	price: 1,10 € ○ buy	○ buy nothing
nr. 18	price: 0,50 € ○ buy	price: 1,30 € ○ buy	○ buy nothing
nr. 19	price: 0,50 € ○ buy	price: 1,50 € ○ buy	○ buy nothing
nr. 20	price: 0,50 € ○ buy	price: 1,70 € ○ buy	○ buy nothing

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Chapter 2

Sabotage and Cooperation in Job Promotions

2.1 Introduction

Promotions constitute an important incentive device in firms and other organizations. However, they typically do not occur in isolation but are followed by interaction between promoted and non-promoted individuals. If, for example, the head of a team retires, oftentimes a former team member is designated to take the vacant position, so that future interaction between the competitors for the superior position is almost unavoidable. Naturally, it is in the interest of the firm that this subsequent interaction be as productive, i.e., cooperative, as possible. Likewise, the initial competition between employees should, from the firm's point of view, not be too fierce, in the sense that unproductive sabotage activities should be abstained from. Thus, given that job promotions can be designed in many different ways, the choice of the appropriate promotion scheme may be a crucial factor for attaining these two goals.

In this respect, the present paper evaluates and compares the two most important job promotion schemes within firms, usually referred to as vertical and lateral promotions.[1] To ensure a common understanding of the underlying promotion procedures,

[1] I acknowledge that a firm may also fill vacant positions with candidates from outside the firm. However, since promotion schemes in the sense of predefined career paths shall lie at the heart of this paper, I will not consider external promotions in the following.

I would like to illustrate both promotion schemes with the help of the following example. Consider a firm with a network of sales agents who are organized in several divisions. If one of the positions as division manager becomes vacant, usually a very natural solution consists in appointing a division's best performing sales agent to this job, thus providing sales agents with incentives to compete for promotion. However, vertical and lateral promotions differ with respect to whether the promoted sales agent has previously worked in the same or a different division than the one with the vacancy. More precisely, under the *vertical* promotion scheme, a division's sales agents compete for the position as manager of the *same* division, whereas under *lateral* promotions, a division's best performing agent will become the manager of a *different* division. For a graphical representation of vertical and lateral promotions, see Figure 2.1 in Section 2.2.

Based on the above characterizations of vertical and lateral job promotions, this paper analyzes how both promotion schemes affect individuals' behavior i) in the competition for promotion as well as ii) in the subsequent interaction between promoted and non-promoted individuals. With the help of controlled laboratory experiments I study two main questions. First, I am interested in whether people, when taking their decisions in the competitive stage, take into account that they will or will not continue to interact with their opponent after the promotion. The corresponding results will also help to answer the question of whether one of the promotion schemes has particularly desirable properties. Second, I study whether the experience of competition, which is inherent in job promotions, can have disadvantageous effects on individuals' behavior in subsequent interactions. An affirmative answer to this question would call for a more general reconsideration of the use and appropriateness of promotion tournaments.

I address these questions with two main and an additional control treatment in a between-subjects design. The main treatments, VERTICAL and LATERAL, reproduce vertical and lateral job promotions, in particular capturing the already described two-stage nature. The first competitive stage is implemented as a tournament with binary sabotage in which two participants compete for promotion (see, e.g., Falk et al. 2008). After the tournament, competitors are informed about their opponent's previous decisions as well as about the outcome of the tournament. In the second

stage, promoted and non-promoted subjects interact with each other according to the new hierarchy. Similar to the sales agent example introduced above, they play a gift-exchange game, which is frequently used to study cooperative behavior (see, e.g., Fehr et al. 1993, 1997, Gächter & Falk 2002, Abeler et al. 2010, Kube et al. 2012). Tournament winners are thereby assigned to the role of a principal, whereas tournament losers take the role of an agent. The treatment variation consists in whether competitors continue to interact with each other in the second experimental stage or face a different individual there whose tournament behavior they are completely unaware of. Comparing both treatments thus allows to test whether the presumably different relevance of reciprocal preferences between treatments translates into behavioral differences.[2] Based on participants' behavior in the main treatments, the control treatment, GE-Only, takes the initial promotion outcome as given and consists of the gift-exchange stage only. In combination with the main treatments, it therefore allows me to study to what extent individuals' cooperative behavior may be affected by the previous experience of competition.

My findings can be summarized as follows: first, participants' behavior in the promotion tournament differs considerably between treatments. Most importantly, there exist substantial differences in subjects' inclination to engage in sabotage. Sabotage occurs more than 50% more often in Lateral than in Vertical. Second, principals' and agents' behavior in the gift-exchange game does, in contrast, not significantly differ between both main treatments. Aggregated over both experimental stages, treatment Vertical consequently leads to higher social efficiency than treatment Lateral according to various efficiency measures. Third, participants' behavior in the gift-exchange game does not significantly differ between GE-Only and the main treatments. Competitive experience therefore seems to have no effect on subjects' gift-exchange game behavior. In particular, my results thus show that job promotions do not influence subjects' behavior negatively. In fact, the opposite holds true, especially if one refers to vertical promotions.

So far, competition and cooperation of the same individuals usually have been considered as incompatible and inefficient. For a one-stage setting, i.e., an environ-

[2]The interplay between vertical and lateral promotions and social preferences has also been touched on by Grund & Sliwka (2005). The authors incorporate in their model that "compassion and envy are stronger when promotions are vertical". However, this assumption is not empirically tested.

ment in which people are required to cooperate *while competing* for promotion, this view has been put forward inter alia by Lazear (1992) and Baron & Kreps (1999). By contrast, my results indicate that in a frequently occurring two-stage setting, i.e., an environment in which people are required to cooperate *after having competed* for promotion, it may well be advantageous for firms and social welfare to have the same individuals compete and subsequently cooperate. As my results show, the anticipation of future interaction with the same instead of a different person affects participants' behavior in the tournament positively, leading subjects to refrain more often from sabotage under vertical promotions. Given that tournaments with sabotage, when studied in isolation, have proven to be rather inefficient, since i) many subjects actually engage in costly sabotage and ii) subjects provide lower effort than if the opportunity to sabotage is absent (e.g., Lazear 1989, Falk et al. 2008, Carpenter et al. 2010, Harbring & Irlenbusch 2011), my paper suggests that subsequent interaction may mitigate this problem.

My experimental findings, in particular those documenting the treatment difference in individuals' tournament behavior, are consistent with participants exhibiting reciprocal preferences. In Appendix B.2, I provide an extension of the model of action-based reciprocity of Cox et al. (2007), which shows that there may well be equilibria in which individuals with reciprocal preferences refrain from sabotage if promotions are vertical but not if they are lateral.[3] The reason is that the anticipation of further interaction with the same subject and correspondingly strong reciprocal inclinations may be able to discipline participants under vertical promotions, whereas under lateral promotions similar concerns are largely ruled out by design. Nevertheless, there still exists a discrepancy between subjects' anticipated and their actually exhibited reciprocal inclination at the end of the tournament stage, since principals' and agents' behavior in the gift-exchange game does not significantly differ between treatments.

The findings of this paper first of all inform the literature on tournaments with sabotage and on gift-exchange games (e.g., Akerlof 1982, Lazear 1989, Fehr et al. 1993, Gächter & Falk 2002, Falk et al. 2008, Carpenter et al. 2010, Harbring & Ir-

[3]For further theory-based studies on the behavioral relevance of reciprocity and other motives beyond self-interest, see, e.g., Rabin (1993), Levine (1998), Fehr & Schmidt (1999), Bolton & Ockenfels (2000), Dufwenberg & Kirchsteiger (2004) and Falk & Fischbacher (2006).

lenbusch 2011, Kube et al. 2012). So far, these strands of the literature have studied the respective games almost exclusively in isolation, whereas my paper focuses on a two-stage setting in which individuals experience a tournament with sabotage and a gift-exchange game sequentially. In this regard, my paper also adds to the growing literature on spillover effects between games (e.g., Nalbantian & Schotter 1997, Duffy & Kornienko 2010, Sheremeta & Savikhin 2013), which, to the best of my knowledge, has not yet studied the structured sequential experience of competition and cooperation analyzed in this paper. Interestingly, the irrelevance of competitive experience for subjects' behavior in the cooperative stage that this paper uncovers also obtains in a simultaneous setting, as shown by Sheremeta & Savikhin (2013). Given that in my experiments many people take into account how their tournament decisions may affect other subjects' reciprocal inclinations, my findings also contribute to the strand of the tournament literature that incorporates behavioral aspects (e.g., Grund & Sliwka 2005, Kräkel 2008, Altmann et al. 2012). Finally, my paper also complements the theoretical and empirical literature on labor markets, which so far has often focused on the comparison of internal promotions and external recruitment, while rather having neglected the case of lateral promotions (e.g., Chan 1996, 2006, Waldman 2003, DeVaro & Morita 2013).

From a policy perspective, my results are telling as well. They underline that job promotions may affect employee behavior and in particular mitigate sabotage, which usually constitutes a major drawback of tournaments (e.g., Chen 2005, Harbring et al. 2007, Falk et al. 2008, Carpenter et al. 2010, Harbring & Irlenbusch 2011). In particular, my findings demonstrate that more desirable outcomes are attained if promotions are vertical. For firms and other organizations it may therefore be attractive to design career paths such that the *same* instead of *different* employees are sequentially exposed to competitive and cooperative incentive schemes. At the same time, my results show that potentially adverse effects on cooperative behavior, caused by the experience of competition, need not be feared.

The remainder of this paper is organized as follows: while Section 2.2 presents the design of my experiment, Section 2.3 derives the corresponding behavioral predictions for individuals who are rational and selfish as well as for individuals with reciprocal preferences. Section 2.4 presents the results of my two main treatments and the

control treatment. Section 2.5 concludes.

2.2 Experimental Design

My experiment consists of two main treatments and one additional control treatment, set up in a between-subjects design. The main treatments shall reproduce vertical and lateral promotions and thus capture the most essential features of job promotions, in particular their two-stage nature and the assignment of tournament winners and losers to the roles of principals or agents, respectively. The control treatment takes the initial promotion outcome as given and allows me to study to what extent cooperative behavior may be affected by previous competitive experience.[4]

In the following, I present the design of my experiment in three steps: I start with a detailed description of the games that subjects face in both experimental stages. Afterwards, I present the different treatments and explain why they allow i) for a clean comparison of vertical and lateral promotions as well as ii) to assess the relevance of competitive experience in explaining individuals' inclination to cooperate. The experimental procedures are described at the end of this section.

2.2.1 Basic Games

In the first experimental stage, two participants compete against each other in a *tournament with binary sabotage* (see, e.g., Falk et al. 2008). Subjects are endowed with $\omega = 20$ each and decide simultaneously how much effort, $e \in \{1, 2, 3, \ldots, 10\}$, to provide and whether to engage in sabotage, $s \in \{0, 1\}$.[5] Both the provision of effort and sabotage is costly for the contestants. While sabotage entails fixed costs of $c_s = 20$, effort costs are convex according to Table 2.1.

Table 2.1: Effort levels and costs of effort

e	1	2	3	4	5	6	7	8	9	10
$c(e)$	0	2	4.5	8	12.5	18	24.5	32	40.5	50

[4]Please note already at this point that subjects are provided with complete information about their treatment, including the order and type of the games played, at the very beginning of the experiment.

[5]$s = 1$ indicates a subject's decision for sabotage, whereas $s = 0$ if she refrains from sabotage.

Both decision variables as well as a random error term, $\epsilon \in [0, 2]$, capturing output shocks or measurement error of output, influence a participant's output, y, and thereby also her chances of winning the tournament.[6] More precisely, output is given by the function $y_i = (e_i + \epsilon_i) \cdot (1 - s_j)$. Own output is thus increasing in own effort and one's error term, whereas being sabotaged by one's opponent ($s_j = 1$) immediately leads to an output of zero. The subject with higher output wins the tournament and receives the winner prize, $w_P = 90$. The tournament loser receives the loser prize, $w_A = 30$. In case of a tie, the winner of the tournament is determined by an additional random draw. The corresponding first-stage payoffs of tournament winners and losers are given by $\pi_{1i}^{\text{winner}} = w_P - c(e_i) - c_s \cdot s_i$ and $\pi_{1i}^{\text{loser}} = w_A - c(e_i) - c_s \cdot s_i$, respectively.

In the second stage, subjects participate in a *gift-exchange game*, which is frequently used to study cooperative behavior (e.g., Fehr et al. 1993, 1997, Gächter & Falk 2002). In the present context of job promotions this game fits particularly well because it assumes a hierarchy between subjects, which can very naturally be based on the outcome of the initial promotion tournament here. More precisely, as promoted individuals usually become the new boss of a certain group of non-promoted coworkers, tournament winners play the gift-exchange game in the role of a principal, whereas tournament losers take on the role of an agent. Every principal is then matched to exactly one agent and has to choose a transfer payment, $t \in [0, 100]$, that she wants to direct to her agent. After having observed this payment, the agent has to decide how many points, $p \in \{0, 1, 2, \ldots, 10\}$, to allocate to her principal. While the allocation of points entails convex costs for the agent according to Table 2.2, the principal benefits from these points with the factor $v = 15$. Principals' and agents' payoffs from the second stage are thus given by the functions $\pi_{2P} = 15 \cdot p - t$ and $\pi_{2A} = t - c(p)$, respectively.

Table 2.2: Points allocated and costs of point allocation

p	0	1	2	3	4	5	6	7	8	9	10
$c(p)$	0	0.5	2	4.5	8	12.5	18	24.5	32	40.5	50

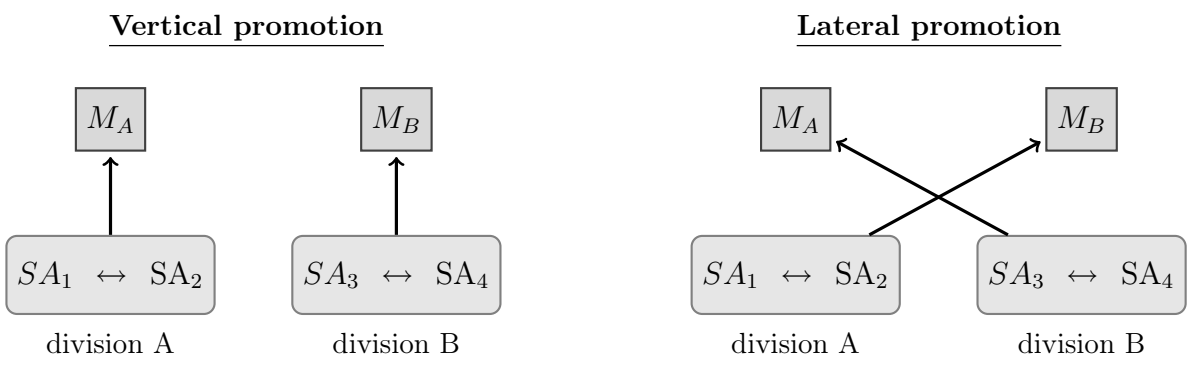
[6] Note that for each subject an individual error term is independently drawn from the same distribution, i.e., ϵ_i and ϵ_j are assumed to be i.i.d..

Between both games, i.e., immediately after subjects have taken their tournament decisions, every participant is informed i) about whether she has won or lost the tournament and whether she will play the gift-exchange game in the role of a principal or an agent, ii) about her own effort and sabotage decision, iii) about her opponent's effort and sabotage decision, and iv) about her income after the tournament.

2.2.2 Treatments

As this paper is interested in whether the incentives provided by vertical and lateral promotions are perceived and responded to differently, my two main treatments replicate both promotion schemes of interest. The matching procedure constitutes the crucial treatment variation, since vertical and lateral promotions only differ in the way tournament winners and losers are matched, as depicted in Figure 2.1. More precisely, I consider one treatment, VERTICAL, in which the *same* two subjects interact with each other in both the competitive and the cooperative stage of the promotion scheme. In VERTICAL there is hence sufficient scope for reputation and common-history-based social concerns like reciprocity or emotions to come into play. The second treatment, LATERAL, is identical to the first one, except for the fact that subjects are now rematched after the tournament stage. Each individual consequently interacts with two *different* subjects in both stages of the experiment. Given this setting, I analyze in a between-subjects design whether participants' effort and sabotage decisions as well as the chosen transfer payments and point allocations differ between VERTICAL and LATERAL.

Figure 2.1: Vertical and lateral promotions[7]



[7]Sticking to the terms used in the initial example in Section 2.1, the abbreviations SA_i and M_i indicate 'sales agents' and 'division managers', respectively.

At this point a final concern could still be that the experience of competition significantly alters participants' gift-exchange game behavior. I therefore implement a third treatment, GE-Only, that allows me to properly address this issue. Treatment GE-Only consists of only one stage in which subjects play a gift-exchange game either in the role of a principal or an agent with a randomly matched partner. To ensure that gift-exchange game results in Vertical and Lateral on the one hand and GE-Only on the other hand can appropriately be compared, also subjects' endowments need to be sufficiently comparable. I therefore endow principals (agents) in GE-Only with the average amount that principals (agents) in the main treatments possess at the beginning of the gift-exchange stage.[8]

For a short overview, Table 2.3 again summarizes all conducted treatments and their most important design features.

Table 2.3: Treatments

Treatment	Tournament Stage	Gift-Exchange Stage	Features
Vertical	✓	✓	the tournament winner becomes a principal, and the loser of the *same* tournament becomes her agent
Lateral	✓	✓	the tournament winner becomes a principal, and the loser of a *different* tournament becomes her agent
GE-Only		✓	subjects are randomly matched to the position of a principal or an agent; their endowments correspond to the average earnings that principals in Vertical and Lateral have acquired until the beginning of the gift-exchange stage

2.2.3 Procedures

The experiment was run in 2013 at the Laboratory for Experimental Economics at the University of Bonn (BonnEconLab). All experimental treatments were programmed and conducted with the software z-Tree (Fischbacher 2007). Recruitment was made using ORSEE (Greiner 2004). While 48 subjects took part in each of the main

[8] I acknowledge that it would also have been possible to assign endowments in GE-Only based on the distribution of principals' and agents' pre-gift-exchange endowments in the main treatments. However, given that average pre-gift-exchange endowments are almost identical in Vertical and Lateral, I opted in favor of the endowment averages to keep the situation as simple as possible for the participants.

treatments, 42 subjects participated in the control treatment, leading to a total of 138 study participants. During the experiment participants could earn Taler in addition to their show-up fee, which were transformed into Euros at the end of the experiment at a rate of 1 Taler = €0.05. On average, subjects earned about €6.55 per session.[9] Each session lasted no more than one hour.

Upon arrival, subjects were randomly assigned to private cubicles and received written instructions, which were afterwards also read aloud (see Appendix B.3). In order to check whether participants had understood the design of the experiment, in particular the different games and the matching procedure, they had to answer a set of control questions. Only after having solved these questions correctly, subjects entered the actual experiment. Throughout the experiment, interaction was anonymous and subjects did not learn the identity of other participants they were interacting with.

At the end of the experiment, subjects were asked to fill out different questionnaires. Besides information on their sociodemographics, also other more specific characteristics that might explain participants' behavior in the experiment were of particular interest for me. Inter alia, I used the Competitive Index by Smither & Houston (1992) to assess individuals' level of competitiveness, which might in particular be related to their first-stage decisions, as well as the Cognitive Reflection Test by Frederick (2005), which constitutes an established predictor of an individual's cognitive abilities.

2.3 Behavioral Predictions

Having outlined the design of my experiment in Section 2.2, the current section is dedicated to the corresponding behavioral predictions. I derive the predictions according to standard theory first, before I discuss potential departures from these predictions that may result if I allow for social aspects in subjects' decision-making process, like reciprocal preferences or reputation building. As an example, Appendix B.2 introduces a suitable model of action-based reciprocity. This model extends the one of Cox et al. (2007) by taking into account the behavior of *two* indi-

[9] At the time of the experiment, 1 Euro was worth approximately 1.34 US dollars.

viduals in *two* stages, explicitly allowing for interdependencies between the stages.

2.3.1 Predictions for Rational and Selfish Individuals

As a natural benchmark for the behavioral predictions in the presence of reciprocal preferences or reputation building that are derived in the next section, I now present the predictions according to standard economic theory.

The experimental setting being a two-stage game, rational individuals will solve this game by backward induction, i.e., starting with the gift-exchange game. In this game, purely money-maximizing agents will always allocate the minimal number of points to their principal. Rational and selfish principals, in turn, will anticipate this behavior and therefore offer no more than the minimal transfer payment. The continuation values after the tournament stage thus being zero for both principals and agents, in the first experimental stage subjects will solely respond to the direct incentives of the promotion tournament. Since these are relatively high-powered, with a tournament prize spread of 60 Taler, the strictly dominant tournament strategy consists in sabotaging one's opponent, while providing only minimal effort. The reason is that for non-saboteurs the provision of effort, regardless of its size, always poses the risk of losing the tournament for sure if the opponent engages in sabotage. By contrast, opting for sabotage oneself makes it much more likely to win the tournament. Even if the opponent engages in sabotage as well, the chance to win the tournament still amounts to fifty percent in this case. At the same time, even the loser prize exceeds the costs associated with sabotage, so that sabotaging alone can never lead to a loss. Therefore, and because the additional provision of effort cannot improve a saboteur's chances of winning the tournament, it is optimal for her to only provide minimal effort in the tournament.

The corresponding equilibrium strategy of rational and selfish individuals in the two-stage game is thus characterized by i) sabotage ($s^* = 1$), ii) minimal effort ($e^* = 1$) and iii) minimal transfer payments or point allocations ($t^* = p^* = 0$), respectively. This holds irrespective of whether the promotion scheme at hand is vertical or lateral.

2.3.2 Alternative Predictions

The behavioral predictions may change considerably and in particular differ between both main treatments if subjects are no longer assumed to be pure money maximizers but take additional aspects in their decision-making process into account. Possibly different behavior under vertical and lateral promotions may be due to the fact that, while there is sufficient scope for status, reputation or common-history-based social concerns to come into play in treatment VERTICAL, these are completely ruled out in LATERAL because participants have no information about the tournament behavior of their new gift-exchange partner.

For the sake of clarity, I will henceforth focus only on the case of individuals with reciprocal preferences.[10] More precisely, the following predictions are based on a simple model of action-based reciprocity in the spirit of Cox et al. (2007). The model itself as well as detailed derivations of the predictions are provided in Appendix B.2, while this section rather concentrates on building some intuition for the predicted behavioral differences between treatments.

With reciprocal preferences, i.e., the desire to reward friendly actions and to punish hostile actions, an agent's behavior in the gift-exchange game may now clearly depend on her principal's transfer payment choice. This is true both for treatment VERTICAL and treatment LATERAL. The positive relationship between principals' and agents' generosity, which is generally documented in gift-exchange games (see, e.g., Fehr et al. 1993, 1997, Gächter & Falk 2002, Falk 2007), is also predicted by my model of action-based reciprocity. Moreover, if two reciprocators interact with each other in *both* stages, as is true in VERTICAL, the agent's and the principal's second-stage behavior may additionally be affected by what has happened in the previous stage. By contrast, a reciprocity-driven spillover between stages is not possible if a subject interacts with two *different* individuals in the promotion tournament and the subsequent gift-exchange game, as subjects do in LATERAL. In this case, both games will rather be regarded as independent.[11]

[10] Different assumptions, like individuals incorporating reputational concerns in their decision making or responding to status in the gift-exchange game, would be reasonable as well and possibly lead to different predictions. However, such considerations shall not constitute the focus of this paper.

[11] Please note that throughout this paper I speak of reciprocity in its narrower sense. If, for example, I additionally considered indirect reciprocity here (see, e.g., Alexander 1989, Nowak &

The correspondingly different behavioral relevance of reciprocity concerns in VERTICAL and LATERAL is also reflected in the predictions that result in the presence of reciprocal preferences. A particularly important role is thereby attached to the opponent's sabotage choice, which is reasonable to be treated as the most important determinant of an individual's attitude and subsequent behavior towards the other person. In the gift-exchange game of treatment VERTICAL, a participant will therefore behave kindly towards the other person only if this latter has refrained from sabotage in the tournament. Otherwise, even a generous transfer payment cannot fully overcome the negative act of sabotaging. This assumption is in line with the findings of Baumeister et al. (2001) who document that bad experiences have psychologically more impact than good ones. By contrast, in the gift-exchange game of treatment LATERAL, an individual cannot condition her behavior on the other player's sabotage choice because she does not have any information about it. An agent with reciprocal preferences in LATERAL therefore conditions her point allocation only on the transfer payment received, with the number of points chosen increasing in the generosity of the transfer payment.

In line with the notion of backward induction, each subject anticipates her own as well as other subjects' future behavior already when taking her decision in the promotion tournament. Since in terms of utility it shall pay off to become a principal, subject to appropriate behavior in the gift-exchange game, participants will always try to win the tournament. In LATERAL, the most adequate way to reach this goal is to provide minimal effort and to engage in sabotage because the decision for sabotage cannot influence the continuation values from the gift-exchange game but improves the chance of winning the tournament and obtaining a higher payoff (see Appendix B.2). Tournament behavior of individuals with reciprocal preferences is in treatment LATERAL thus predicted to coincide with the behavior of pure money maximizers. The crucial difference between both predictions, however, consists in the

Sigmund 1998, Wedekind & Milinski 2000, Engelmann & Fischbacher 2009), individuals' behavior would no longer have to be independent in both stages of the lateral promotion regime. However, the inclination to reciprocate the other subject's (supposed) tournament behavior is still likely to be higher in VERTICAL than in LATERAL because i) one has experienced the gift-exchange partner's tournament behavior *personally* and ii) knows this behavior for sure, while reactions in LATERAL may be weaker in order to correct for the fact that a participant is always uncertain about the gift-exchange partner's actual tournament behavior.

fact that non-minimal transfer payments and point allocations are only possible with reciprocators. The corresponding equilibrium strategy of individuals with reciprocal preferences is under the lateral job promotion scheme therefore characterized by i) sabotage ($s^{*/\text{Lat}} = 1$), ii) minimal effort ($e^{*/\text{Lat}} = 1$) and iii) possibly non-minimal transfer payments or point allocations ($t^{*/\text{Lat}}, p^{*/\text{Lat}} \geq 0$), respectively, which depend on the exact parameters in subjects' utility functions.

Because a reciprocator has no incentive to behave kindly towards a person by whom she has previously been sabotaged, the continuation values of both participants are less or equal to zero if at least one of them engages in sabotage. Consequently, in the presence of individuals with reciprocal preferences one possible equilibrium strategy in VERTICAL coincides with that of pure money-maximizers. As long as the continuation values that would result if both opponents refrained from sabotage are sufficiently high, also a second equilibrium may exist. In this equilibrium, participants have a strategic incentive to refrain from sabotage in the tournament due to the expected reciprocity-driven cooperation in the subsequent gift-exchange game. Because of its Pareto dominance, subjects may prefer to coordinate on this "no sabotage" equilibrium. The corresponding equilibrium strategy of individuals with reciprocal preferences is under the vertical job promotion scheme thus characterized by i) refraining from sabotage ($s^{*/\text{Vert}} = 0$), ii) possibly non-minimal effort ($e^{*/\text{Vert}} \geq 1$) and iii) possibly non-minimal transfer payments or point allocations ($t^{*/\text{Vert}}, p^{*/\text{Vert}} \geq 0$), respectively, which depend on the exact parameters in subjects' utility functions.

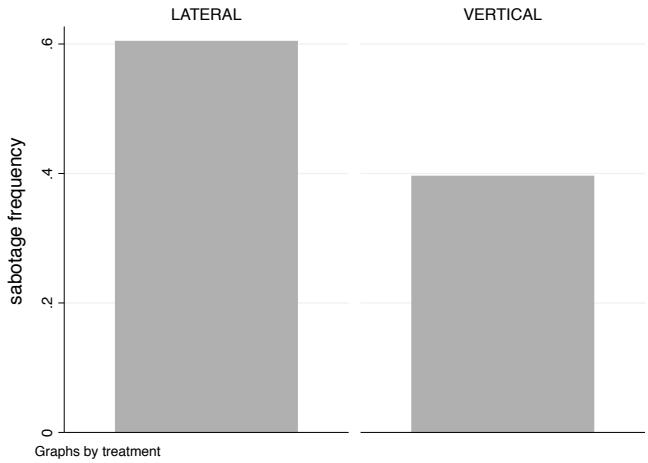
2.4 Results

To test for potential differences in individuals' behavior under vertical and lateral promotions, respectively, I focus on subjects' tournament decisions first, before I consider their behavior in the subsequent gift-exchange game. Finally, I expand the analysis to treatment GE-ONLY to identify how the previous experience of competition impacts on participants' gift-exchange game behavior.

2.4.1 The Promotion Tournament

Participants' tournament behavior consists of two choices - one with respect to sabotage and another with respect to effort. The following analysis therefore compares vertical and lateral job promotions along both dimensions. Since treatment differences are primarily predicted to arise in the sabotage domain, let us focus on subjects' sabotage decisions first. Figure 2.2 depicts the proportion of individuals opting for sabotage in treatment LATERAL and treatment VERTICAL, respectively.

Figure 2.2: Relative sabotage frequencies, treatments LATERAL and VERTICAL



The figure shows that subjects sabotage their tournament opponent significantly less often if both will also interact in the subsequent gift-exchange game than if they will face a different individual there. While more than 60% of subjects sabotage their opponent in LATERAL,[12] the fraction of saboteurs amounts to only 40% in VERTICAL (Fisher's exact test, $p = 0.066$).[13] Sabotage thus occurs more than 50% more often under the lateral than under the vertical job promotion regime. The robustness of this treatment effect is confirmed by the Probit regressions in Table 2.4. Furthermore, column (2) reveals that also gender and individual competitiveness influence the decision to sabotage in a significant way. More precisely, males and more competitive individuals are more likely to engage in sabotage. While a one-point increase in a subject's competitiveness, which may range from 0 to 20, on average increases

[12]This fraction is somewhat smaller than the 75% found in Falk et al. (2008) who employ a very similar tournament setting.

[13]Unless specified otherwise, all tests reported in this paper are two-sided.

the probability to engage in sabotage by 3%, being female reduces this probability on average by 16%. By contrast, exposure to the vertical promotion scheme makes a subject on average 21% less likely to sabotage her tournament opponent. The treatment effect is thus not only statistically significant but also economically relevant, as it exceeds the gender effect by one third.

Table 2.4: Individuals' sabotage decisions

Dependent variable: Sabotage		
	(1)	(2)
VERTICAL	-0.204^{**}	-0.212^{**}
	(0.093)	(0.090)
Competitiveness		0.033^{***}
		(0.011)
Age		-0.005
		(0.011)
Gender		-0.159^{*}
		(0.096)
CRT		-0.009
		(0.044)
Observations	96	96
Log-likelihood	-64.443	-56.746
Pseudo R^2	0.032	0.147

Notes: This table shows average marginal effects from a Probit model (standard errors are given in parentheses). The dependent variable is a dummy variable indicating whether a subject has engaged in sabotage ($s = 1$) or refrained from it ($s = 0$). The variable "VERTICAL" is a dummy variable indicating treatment VERTICAL. "Competitiveness" is a subject's score on the Competitiveness Index of Smither & Houston (1992), ranging between 0 (low competitiveness) and 20 (high competitiveness). "Gender" is 1 for female and 0 for male. "CRT" is a subject's score on the Cognitive Reflection Test of Frederick (2005), ranging between 0 (low cognitive reflection) and 3 (high cognitive reflection). Significance levels are denoted as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

The reported findings demonstrate that the treatment difference in subjects' sabotage behavior is qualitatively in line with the predictions in Section 2.3.2. Moreover, my results contribute a novel aspect to the literature on gender effects in tournaments, since they reveal that men, who are usually found to exhibit more competitive behavior than women (see, e.g., Gneezy et al. 2003, Gneezy & Rustichini 2004, Dato

& Nieken 2013) and also report a higher level of competitiveness in the ex-post questionnaire to this study (Wilcoxon rank-sum test, $p = 0.006$), are more likely to engage in sabotage than women even if I control for the individual degree of competitiveness.

Let us now turn to participants' effort choices in the tournament. First, taking the already discussed sabotage choices as given, I find that saboteurs and non-saboteurs differ significantly in this second dimension of tournament behavior. More precisely, saboteurs provide much less effort than non-saboteurs, with the large majority of saboteurs only providing minimal effort, as predicted in Section 2.3.[14] This pattern emerges both in treatment LATERAL and treatment VERTICAL (Wilcoxon rank-sum tests, $p \leq 0.005$).[15] Second, when comparing subjects' tournament effort between treatments, I find that the average effort level in VERTICAL exceeds the one in LATERAL by more than 20% ($\overline{e}_{\text{Vert}} = 3.8$ vs. $\overline{e}_{\text{Lat}} = 3.2$).[16] While non-parametric tests fall short of identifying a statistically significant treatment difference with respect to subjects' effort choices (Wilcoxon rank-sum test, $p = 0.297$), the coefficient of the treatment dummy reaches significance in the corresponding OLS regression in Table 2.5 if I control for the same explanatory variables as in the Probit regressions for sabotage mentioned above.[17]

Aggregating these findings with respect to individuals' tournament behavior, I obtain the following result:

Result 1. *Under vertical promotions, subjects refrain substantially more often from sabotage than under lateral promotions. Under vertical promotions, subjects rather rely on effort to win the promotion tournament.*

To identify whether the behavioral patterns just described also have consequences for the degree of social efficiency that is attained under vertical and lateral promotions, respectively, I consider several suitable efficiency measures. It is straightforward to first compare sabotage frequencies between treatments. Subjects' behavior is considered as socially more efficient the less they engage in sabotage. The reason

[14] That subjects may substitute from effort to sabotage is also observed by Falk et al. (2008).

[15] For a graphical illustration, see Figure 2.4 in Appendix B.1.

[16] Histograms of subjects' effort choices in both treatments are provided in Figure 2.5 in Appendix B.1.

[17] Qualitatively similar results are obtained when using Tobit regressions.

Table 2.5: Individuals' effort choices

Dependent variable: Effort	(1)	(2)
VERTICAL	0.667	1.046*
	(0.564)	(0.554)
Competitiveness		−0.018
		(0.067)
Age		0.089
		(0.061)
Gender		1.634***
		(0.581)
CRT		−0.344
		(0.259)
Constant	3.167***	0.817
	(0.399)	(1.950)
Observations	96	96
R^2	0.015	0.151
Adjusted R^2	0.004	0.104

Notes: This table shows coefficient estimates from a linear regression model (standard errors are given in parentheses). The dependent variable is a subject's effort choice, ranging between 1 and 10. The variable "VERTICAL" is a dummy variable indicating treatment VERTICAL. "Competitiveness" is a subject's score on the Competitiveness Index of Smither & Houston (1992), ranging between 0 (low competitiveness) and 20 (high competitiveness). "Gender" is 1 for female and 0 for male. "CRT" is a subject's score on the Cognitive Reflection Test of Frederick (2005), ranging between 0 (low cognitive reflection) and 3 (high cognitive reflection). Significance levels are denoted as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

is that sabotage i) destroys an other participant's output, while being costly for the saboteur, and ii) may also discourage participants from exerting effort in the first place (see, e.g., Carpenter et al. 2010, Gürtler et al. 2013). According to this first efficiency measure, social efficiency is substantially higher in VERTICAL because there sabotage only occurs in 40% of all cases, compared to 60% in LATERAL. The second efficiency measure considers thefraction of groups in which *both* competitors refrain from sabotage. While in VERTICAL in one in three groups no subject engages in sabotage, in LATERAL seven in eight groups consist of at least one saboteur. Naturally, this also has consequences for average output, my third efficiency

measure. Average output in LATERAL represents only half of the output generated in VERTICAL ($\overline{y}_{\text{Lat}} = 1$ vs. $\overline{y}_{\text{Vert}} = 2.06$; Wilcoxon rank-sum test, $p = 0.023$). The final efficiency measure that I look at in the tournament stage is output per unit of costs incurred. While this measure is equal to 0.05 in LATERAL, it takes on a value of 0.11 in VERTICAL. This increase of more than 100% constitutes a statistically significant treatment difference (Wilcoxon rank-sum test, $p = 0.028$).[18] I summarize these findings as follows:

Result 2. *Individuals' tournament behavior is socially more efficient under vertical than under lateral promotions.*

2.4.2 The Gift-Exchange Game

To analyze subjects' behavior in the gift-exchange game, I mainly compare the choices of i) principals and ii) agents between VERTICAL and LATERAL. In addition, I present several results that can be observed at the more individual level. The comparison of subjects' gift-exchange game behavior in the main treatments to that in treatment GE-ONLY is drawn at the very end of this section.

Starting with principals' behavior in the gift-exchange game, I observe that in both main treatments the chosen transfer payments are relatively dispersed, covering the total possible range between 0 and 100 (see Figure 2.6 in Appendix B.1). While in LATERAL principals on average offer a payment of 53.8 to their agent, the average transfer payment in VERTICAL amounts to 46.9. The corresponding treatment difference is statistically insignificant (Wilcoxon rank-sum test, $p = 0.360$). The same holds true when testing for the equality of both transfer payment distributions (Kolmogorov-Smirnov test, $p = 0.183$).

Investigating the determinants of principals' payment choices in more detail, the OLS regressions in Table 2.6 do not only confirm the absence of a treatment effect but also reveal that under vertical promotions saboteurs offer particularly low transfer payments. This finding is in line with my model of action-based reciprocity, because sabotaging principals in VERTICAL, who expect that sabotaging impacts negatively

[18] Note that the reported test statistic is based on a subset of all participants because the corresponding efficiency measure is not defined if a subject does not incur any costs. This holds true for five and six participants in LATERAL and VERTICAL, respectively.

on the generosity of their opponent's subsequent point choice, should indeed offer zero or at least lower transfer payments than non-saboteurs. The comparison of columns (1) and (2) shows that this effect gets even stronger if additional individual characteristics are controlled for. By contrast, the opponent's sabotage decision has in none of the treatments a significant effect on principals' transfer payment offers.[19]

Table 2.6: Principals' transfer payment choices

Dependent variable: Transfer payment	(1)	(2)
VERTICAL	38.708	38.550
	(23.438)	(23.228)
Sabotage_i	34.718	25.328
	(22.175)	(27.405)
VERTICAL $\times$ Sabotage_i	-54.093^{*}	-60.971^{**}
	(27.088)	(26.336)
Sabotage_j	8.365	-4.883
	(15.557)	(16.391)
VERTICAL $\times$ Sabotage_j	-5.032	10.045
	(27.088)	(26.290)
Constant	20.667	63.652^{*}
	(19.988)	(36.260)
Individual Controls	*No*	*Yes*
Observations	48	48
R^2	0.116	0.311
Adjusted R^2	0.011	0.147

Notes: This table shows coefficient estimates from a linear regression model (standard errors are given in parentheses). The dependent variable is the transfer payment a principal directs to her agent. The variable "VERTICAL" is a dummy variable indicating treatment VERTICAL. "Sabotage_i" and "Sabotage_j" are dummy variables indicating a principal's own sabotage decision and the sabotage decision of her tournament opponent, respectively. "VERTICAL $\times$ Sabotage_i" and "VERTICAL $\times$ Sabotage_j" are the corresponding interactions between treatment and sabotage choice. Individual controls include age, gender, CRT score and the interaction between gender and sabotage choice. Significance levels are denoted as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Turning to agents' behavior in the gift-exchange game, I find that the points agents allocate to their principal do not significantly differ between VERTICAL and

[19] Qualitatively similar results are obtained when using Tobit regressions.

LATERAL ($\overline{p}_{\text{Vert}} = \overline{p}_{\text{Lat}} = 1.5$; Wilcoxon rank-sum test, $p = 0.765$). The absence of a treatment effect with respect to agents' point choices also becomes visible in Figure 2.7 in Appendix B.1 and is further supported by the OLS regression in Table 2.7 in Appendix B.1. Given that principals' transfer payments have already been shown to be similar in both treatments, the similarity of agents' point choices is not surprising per se. However, due to the higher frequency of sabotage in LATERAL, we rather could have expected agents to exhibit more aggressive, i.e., selfish behavior in LATERAL, irrespective of the offered transfer payment. Although Spearman's ρ is indeed lower in LATERAL than in VERTICAL ($\rho_{\text{Lat}} = 0.37$ vs. $\rho_{\text{Vert}} = 0.67$), the regression reveals that in both treatments an agent's point choice is only significantly affected by her principal's transfer payment, and not by the interactions between treatment and transfer payment or sabotage, respectively.[20]

Hence, while substantial treatment differences in participants' behavior exist in the tournament stage, individuals' gift-exchange game behavior does not significantly differ between VERTICAL and LATERAL. This is synthesized in the following result:

Result 3. *Principals offer similar transfer payments to their agent under the vertical and the lateral job promotion setting. The same holds true for agents' corresponding point allocations.*

I conjecture that the described behavioral patterns in VERTICAL and LATERAL are caused by a discrepancy between subjects' *anticipated* and their *actually exhibited* reciprocal inclination. More precisely, the substantially higher sabotage frequency in treatment LATERAL suggests that participants indeed anticipate differently pronounced reciprocal inclinations in both treatments. It is possibly only because of this behavioral adjustment to the different potential of reciprocity under vertical and lateral promotions that subjects' choices in the gift-exchange game do eventually not significantly differ between both treatments. Otherwise, i.e., if participants in VERTICAL had sabotaged as often as subjects in LATERAL, gift-exchange game behavior might have been substantially less cooperative in VERTICAL.

After having analyzed subjects' behavior and its efficiency under vertical and lateral promotions separately for each type of interaction, it is crucial to also evaluate

[20] Qualitatively similar results are obtained when using Tobit regressions.

more generally whether the combination of competitive and cooperative incentive schemes should be preferred over the separate play of both single-stage environments. More precisely, I am interested in whether the previous experience of competition impacts negatively on subjects' gift-exchange game behavior. To answer this question, I conducted an additional treatment, GE-Only, in which participants only played the gift-exchange game. The tournament stage was absent.

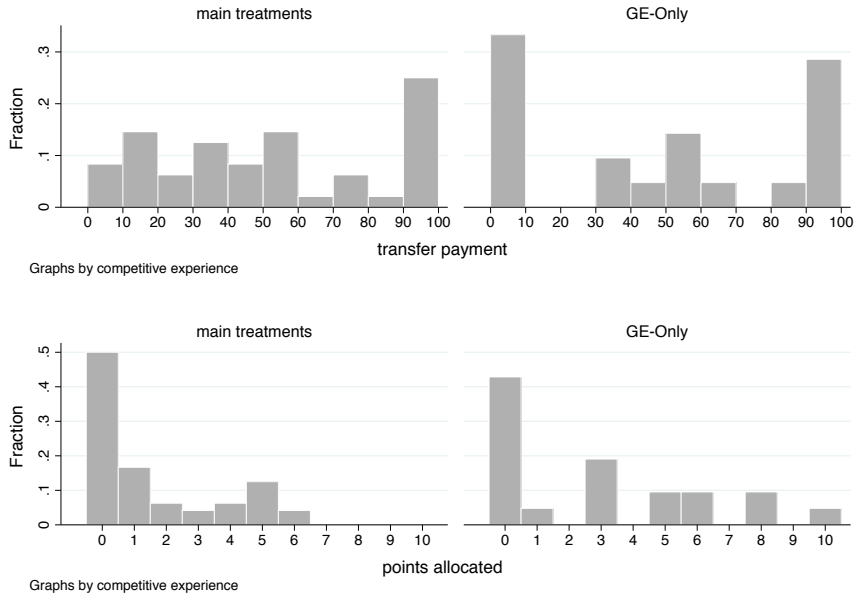
Since subjects in GE-Only are endowed with the average income that principals in the main treatments possessed after the tournament, I can directly compare principals' transfer payments between treatments. With average payments of 46.5 in GE-Only and 46.9 and 53.8 in Vertical and Lateral, respectively, no statistically significant difference can be identified (Wilcoxon rank-sum tests, $p > 0.359$). The same holds true for the number of points that agents allocate to their principal ($\overline{p}_{\text{GE-O}} = 2.9$ vs. $\overline{p}_{\text{Vert}} = \overline{p}_{\text{Lat}} = 1.5$; Wilcoxon rank-sum tests, $p > 0.198$). These insights are underlined by Figure 2.3, contrasting subjects' gift-exchange game behavior in GE-Only to that in the main treatments. Moreover, also in GE-Only there exists a positive correlation between both variables, with Spearman's ρ of 0.63 ($p = 0.003$) lying between those found in Lateral and Vertical. These findings are summarized in the following result:

Result 4. *The experience of competition does not seem to alter subjects' behavior in the gift-exchange game.*

In particular, my results thus show that job promotions do not influence subjects' behavior negatively, as would have been predicted for example by a preference for consistency in acting competitively (see, e.g., Falk & Zimmermann 2011).[21] In fact, the opposite holds true, especially if one refers to vertical promotions. The reason is that, both according to the model predictions and the analysis carried out in this section, the efficiency of participants' tournament behavior in Vertical exceeds the one in Lateral, while there are no significant treatment differences in subjects' gift-exchange game behavior.

[21] If they had occurred, behavioral differences between GE-Only and the main treatments could also have been the result of emotions or mood, because these are presumably much more pronounced after the experience of competition and may carry over to the gift-exchange stage. For studies on mood and emotions, see, e.g., Liberman et al. (1994), Bosman & van Winden (2002), Fehr & Gächter (2002), Capra (2004), Kirchsteiger et al. (2006) and Ben-Shakhar et al. (2007).

Figure 2.3: Transfer payments offered by principals and points allocated by agents, main treatments (Vertical and Lateral, pooled) and treatment GE-Only



2.5 Conclusion

Promotions are in most hierarchical organizations not viewed as end in themselves. Besides providing incentives in the form of higher hierarchical positions and better pay for well-performing employees, a probably even more important objective of promotions consists in ensuring the proper functioning of a firm or organization also in the future. To reach this second objective, it is decisive that also under the new hierarchy individuals interact with each other efficiently. Since the corresponding multi-stage nature of job promotions, which is in particular characterized by the sequential experience of competitive and cooperative incentives, had so far been largely neglected in the economic literature, this paper studied behavior in such promotion settings with the help of controlled laboratory experiments.

My results demonstrate the importance of taking behavioral aspects like social preferences into account when implementing a particular job promotion scheme. In the promotion setting studied in this paper, especially reciprocal preferences may have been responsible for the observed treatment differences. Along these lines, my results suggest that in the presence of reciprocal preferences vertical promotions have particularly desirable properties. As compared to lateral promotions, vertical promo-

tions were able to mitigate sabotage, which usually constitutes a major drawback of tournaments (e.g., Chen 2005, Harbring et al. 2007, Carpenter et al. 2010). Furthermore, the previous experience of competition had no detrimental effects on behavior in a cooperative environment, as revealed by the control treatment.

My findings bear practical implications with respect to the future design of promotions and career paths within firms and other organizations. More precisely, firms that wish to provide incentives with the help of promotion tournaments and know that contestants may engage in sabotage, should contemplate having competitors continue to interact. My results suggest that by implementing such a vertical promotion scheme, firms may generate substantial additional gains from a reduction of unproductive sabotage activities, relative to the case of lateral promotions. Also several positive indirect effects may go along with the proper selection of a firm's job promotion regime. A less hostile working atmosphere without sabotage might, for example, lead to a higher identification of employees with their firm and to lower turnover rates, which may further support the transition to a more stable, more cooperative, and, hence, also more productive working atmosphere.[22]

A number of previous papers have studied tournaments with sabotage in settings consisting of one single stage. These papers have generally identified sabotage as a major drawback of tournaments since the opportunity to sabotage is frequently used and, in addition, discourages many subjects from providing productive effort (e.g., Lazear 1989, Falk et al. 2008, Carpenter et al. 2010). This problem was found to be particularly severe if people are additionally required to cooperate while competing for promotion (e.g., Lazear 1992, Baron & Kreps 1999). Lazear (1992) therefore postulated that "individuals who need to cooperate with one another should not be grouped into the same tournament" (p. 28). In view of my findings it is not clear whether this postulation would still be valid if the setting of Lazear was extended by a second cooperative stage in which competitors continued to interact with each other. For example, the anticipation of future interaction with the same person might mitigate sabotage and increase productive effort also in the modified framework.

Further research is also needed with respect to the role that ability might play

[22] Additional advantages of vertical promotions, which did not constitute the focus of this study, inter alia include the preservation of team or department specific knowledge as well as the reduction of uncertainty with respect to the working standards set by the new boss.

in two-stage job promotions. This holds particularly true for environments in which people take real effort and sabotage decisions. Furthermore, the use of real-effort tasks or field studies constitutes already in itself a straightforward next step, given that the setting studied in this paper is empirically motivated. Also studies that concentrate, both at the institutional and individual level, on the driving forces of behavioral spillovers between games promise to be interesting for future research. In this regard, it might be particularly telling to identify factors that cause anticipatory behavioral effects because these have so far only received little attention in the literature. At the same time, a more profound knowledge of the determinants of potential interdependencies between different incentives schemes can help to design multi-stage environments more intelligently in the future. Irrespective of the environment of interest, the findings of this paper underline the importance of taking social preferences into account when implementing or designing incentive schemes.

B Appendix

B.1 Figures and Tables

Figure 2.4: Effort choices of saboteurs/non-saboteurs, treatments Lateral and Vertical

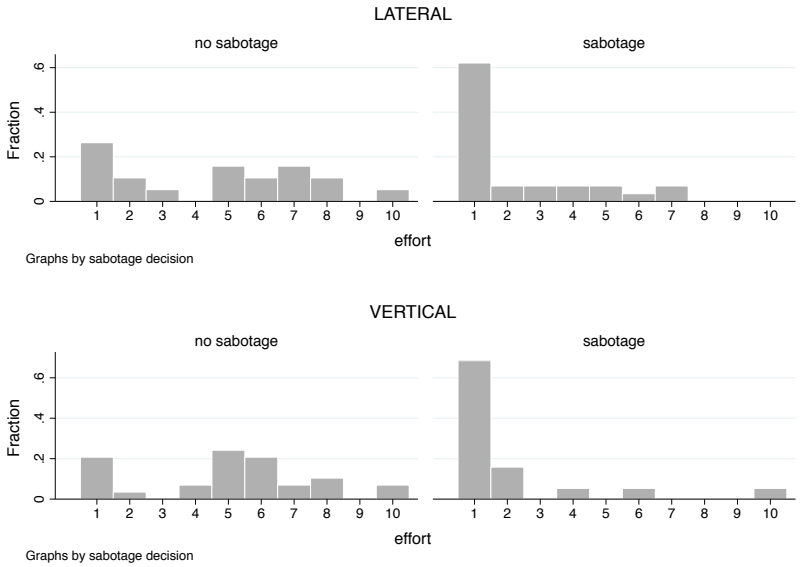


Figure 2.5: Effort choices, treatments Lateral and Vertical

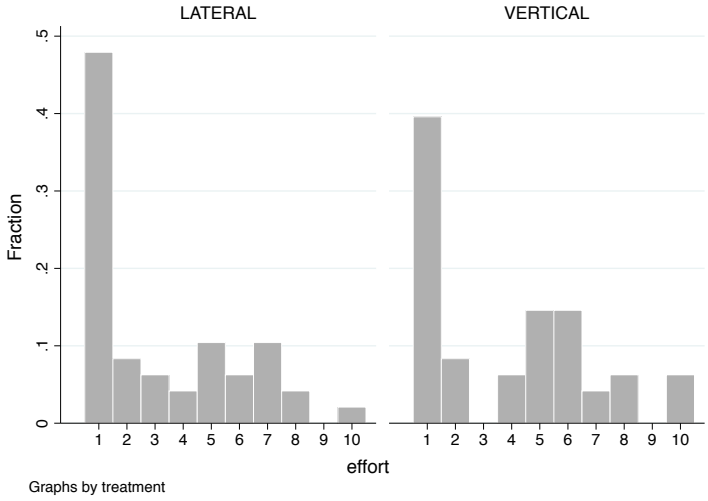


Figure 2.6: Transfer payments offered by principals, treatments Lateral and Vertical

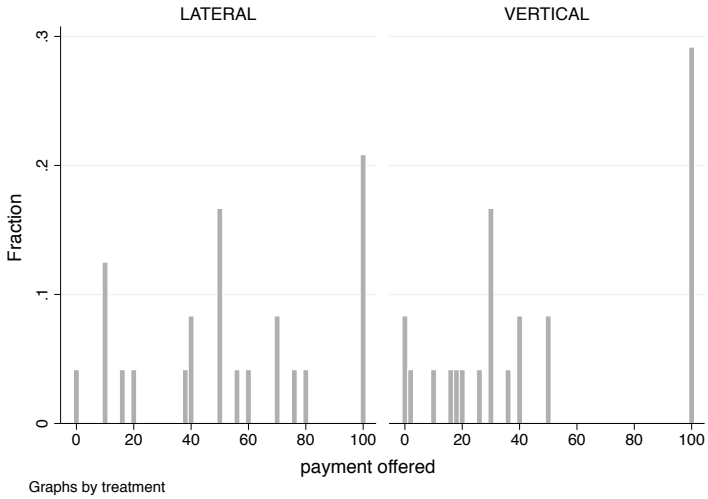


Figure 2.7: Points allocated by agents, treatments Lateral and Vertical

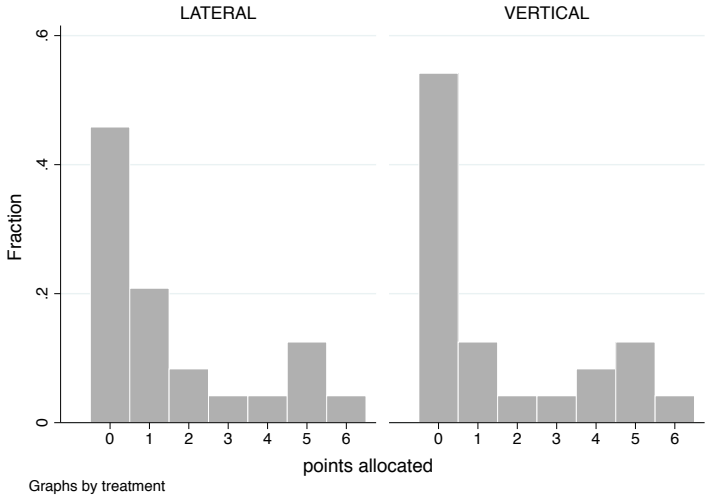


Table 2.7: Agents' point choices

Dependent variable: Points allocated			
	(1)	(2)	(3)
VERTICAL	0.071	0.180	−0.527
	(0.510)	(0.553)	(1.516)
Payment	0.032***	0.032***	0.023*
	(0.007)	(0.007)	(0.011)
Sabotage_j	−0.743	−0.828	−0.612
	(0.605)	(0.623)	(1.159)
VERTICAL × Payment			0.016
			(0.015)
VERTICAL × Sabotage_j			−0.113
			(1.459)
Constant	0.444	−0.942	−0.382
	(0.768)	(1.571)	(2.136)
Individual Controls	*No*	*Yes*	*Yes*
Observations	48	48	48
R^2	0.345	0.374	0.392
Adjusted R^2	0.301	0.282	0.267

Notes: This table shows coefficient estimates from a linear regression model (standard errors are given in parentheses). The dependent variable is the number of points an agent allocates to her principal. The variable "VERTICAL" is a dummy variable indicating treatment VERTICAL. "Payment" indicates the transfer payment that has previously been directed to the agent. "Sabotage_j" is a dummy variable indicating the sabotage decision of an agent's tournament opponent. "VERTICAL × Payment" and "VERTICAL × Sabotage_j" are the corresponding interactions between treatment and transfer payment or sabotage choice, respectively. Individual controls include age, gender and CRT score. Significance levels are denoted as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

B.2 A Model of Action-Based Reciprocity

The model of action-based reciprocity that I lay out in the following builds on the job promotion setting of the experiment described in Section 2.2. It thereby extends the model of Cox et al. (2007) by taking into account the behavior of *two* individuals in *two* stages, explicitly allowing for interdependencies between both stages. In particular, it therefore allows me to analyze whether individuals with reciprocal preferences may behave differently under vertical and lateral promotions and whether the corresponding behavioral predictions differ from those for purely money-maximizing individuals.

Basic Setup of the Model

The model replicates the setting of job promotions employed in the experiment, as consisting of a tournament with binary sabotage and a subsequent gift-exchange game.

In the *tournament stage*, a subject is awarded the winner prize, $w_P = 90 > 30 = w_A$, if her output y_i exceeds the output y_j of her opponent. In the case of a tie, the winner of the tournament is determined by random draw. Subjects can affect their own output and that of their opponent by choosing an effort level, $e \in \{1, 2, 3, \ldots, 10\}$, and by opting for or against sabotage, $s \in \{0, 1\}$.[23] Output is also influenced by the realization of a random error term, ϵ, which is uniformly distributed over the interval $[0, 2]$ and captures output shocks or measurement error of output. ϵ_i and ϵ_j are assumed to be i.i.d.. Formally, output is given by the function $y_i = (e_i + \epsilon_i) \cdot (1 - s_j)$. At the same time, both the provision of effort and sabotage is costly for the contestants. While sabotage entails fixed costs of $c_s = 20$, effort costs are convex according to Table 2.8.

Table 2.8: Effort levels and costs of effort

e	1	2	3	4	5	6	7	8	9	10
$c(e)$	0	2	4.5	8	12.5	18	24.5	32	40.5	50

With $c(s_i) = c_s \cdot s_i$, subject i's payoff from the tournament stage is therefore

[23] $s = 1$ indicates a subject's decision for sabotage, whereas $s = 0$ if she refrains from sabotage.

given by

$$\pi_{1i} = \begin{cases} w_P - c(e_i) - c(s_i) & \text{if } i \text{ wins the tournament} \\ w_A - c(e_i) - c(s_i) & \text{if } i \text{ loses the tournament.} \end{cases} \tag{2.1}$$

In the *gift-exchange stage*, a tournament winner and a tournament loser interact with each other in a gift-exchange game. Under vertical promotions these are the same individuals that have already faced each other in the preceding tournament, whereas under lateral promotions subjects encounter a different person. After being informed about their own and their previous opponent's tournament behavior, subjects take sequential decisions. Tournament winners are in the roles of a principal and have to choose a transfer payment, $t \in [0, 100]$, that they want to direct to their agent, which is a tournament loser matched to them. After having observed this payment, each agent has to decide how many points, $p \in \{0, 1, 2, ..., 10\}$, to allocate to her principal, from which this latter benefits with the factor $v = 15$. Agents' costs associated with the allocation of points are convex according to Table 2.9.

Table 2.9: Allocated points and costs of point allocation

p	0	1	2	3	4	5	6	7	8	9	10
$c(p)$	0	0.5	2	4.5	8	12.5	18	24.5	32	40.5	50

Principals' and agents' payoffs from the gift-exchange stage are therefore given by:

$$\pi_{2P} = v \cdot p - t \tag{2.2}$$

$$\pi_{2A} = t - c(p). \tag{2.3}$$

Hence, also incorporating the initial endowment of $\omega = 20$, subjects' expected payoff from taking part in the experiment can be written as:

$$E[\pi_i] = q_i \cdot \big(w_P + v \cdot p - t\big) + (1 - q_i) \cdot \big(w_A + t - c(p)\big) + \omega - c(e_i) - c(s_i), \tag{2.4}$$

with $q_i \geq 0$ the probability that subject i wins the tournament.

Modeling Reciprocity

In the following I describe how exactly reciprocity is incorporated in the present model of job promotions. However, before I introduce you to the concrete form of reciprocity, I would like to emphasize that this model is not intended to focus on closely related concepts like indirect reciprocity (see, e.g., Alexander 1989, Nowak & Sigmund 1998, Wedekind & Milinski 2000, Seinen & Schram 2006, Engelmann & Fischbacher 2009) that might be relevant as well. In the context of lateral promotions it would for example be possible that an agent who has been sabotaged before may allocate only the minimal number of points to her newly matched principal in the gift-exchange game because she holds the (possibly incorrect) belief that also her principal has to be a saboteur since otherwise he would not have been able to win his own tournament. However, such reasoning of indirect reciprocity is explicitly ruled out here to keep the model as simple as possible, so that it can focus exclusively on "direct" reciprocity, i.e., on what is usually understood under the term reciprocity in its narrower sense.

In analogy to the concept of the "emotional state function" in Cox et al. (2007), the degree to which a subject behaves reciprocally is henceforth modeled with the help of the *reciprocity function* $\theta(\cdot)$. More precisely, one's inclination to behave reciprocally is influenced by whether one has been treated kindly or unkindly by another person before. The reciprocity function $\theta(\cdot)$ does not only increase in the other subject's kindness, but also indicates how much one cares about the other subject's payoff. In multi-stage environments like job promotions it therefore also determines individuals' future behavior. Consequently, the higher a participant's reciprocity function after the tournament, both in the positive or the negative domain, the more reciprocal will be her behavior in the subsequent gift-exchange game.

In the following I will mainly focus on the setting of *vertical* job promotions. The reason is that it impacts in more complex ways on subjects' reciprocity than the setting of lateral job promotions because the information about one's opponent's tournament behavior is uninformative under lateral promotions as one faces a different person in the subsequent gift-exchange game. However, the model of vertical job promotions whose components I present in the following contains i) lateral

job promotions with reciprocal individuals and ii) job promotions with pure money maximizers as special cases.

When modeling subjects' reciprocity functions, it seems natural to use different functions for agents and principals. The reason is that an agent observes *both her principal's tournament behavior as well as his transfer payment* which may both affect the agent's reciprocal inclination when deciding about her action in the gift-exchange game. A principal, in contrast, *only* observes *her agent's tournament behavior* before she has to choose her desired transfer payment. At this point it is important to note that, although all (up to three) observable choices may affect a participant's reciprocal inclination, I do not incorporate all of them in her reciprocity function in order to keep the model tractable. More precisely, in addition to the principal's transfer payment I only include the opponent's sabotage choice because this latter is more decisive for the tournament outcome and therefore also psychologically more important than the opponent's effort choice. In the spirit of Cox et al. (2007), the corresponding reciprocity functions of agents and principals are thus given by:

$$\begin{aligned} \theta^A(s_P, t) &= a^A \cdot \left(1_{s_P=0} - 1_{s_P=1}\right) + b^A \cdot \frac{t - t_0}{t_{\max} - t_0} \\ \theta^P(s_A) &= a^P \cdot \left(1_{s_A=0} - 1_{s_A=1}\right), \end{aligned} \tag{2.5}$$

with $a^A, a^P, b^A > 0$, $a^A > b^A$ and $t_0 \geq 0$. While s_A, s_P, t and $t_{\max}$ depict agents' and principals' sabotage choice as well as principals' actual and maximal transfer payment, respectively, t_0 constitutes the transfer payment that is considered as 'fair'. More precisely, I henceforth assume $t_0 = 50$ because i) heuristics could lead subjects to consider this transfer payment as fair (because it is exactly in the middle of the possible payment range) and ii) actual transfer payments in the experiment on average coincide with $t_0 = 50$.[24] Furthermore, for the sake of comparability, the absolute value of both θ^i is assumed to be less than 1, directly implying $a^P < 1$ and $a^A + b^A < 1$.

Depending on the value of t, the second term in agents' reciprocity function can

[24] Although, inter alia, status and entitlement have been identified as major determinants of whether a given allocation decision is perceived as fair or not (see, e.g., Hoffman et al. 1994, Fahr & Irlenbusch 2000, Albrecht et al. 2013), I abstract from these and related issues here in order to keep the model tractable.

either become positive or negative. The same holds true for the expression in parantheses in both players' reciprocity function. Its sign is positive if one's opponent does not engage in sabotage, otherwise it is negative. Subjects' reciprocal inclination, as depicted by the formulas in (2.5), can thus either be positive or negative. The additional restriction $a^A > b^A$ implies that an agent's reciprocal inclination is influenced more strongly by her principal's sabotage decision than his payment offer. This assumption is in line with the findings of Baumeister et al. (2001) who document that bad experiences have psychologically more impact than good ones.

It is well-established that reciprocators do not only care about their own payoff, $\pi_{1i} + \pi_{2i}$, but, depending on their reciprocal inclination $\theta^i(\cdot)$, also about how nicely they behave towards others. In the context of vertical promotions, this means that, if the person a subject is matched to has treated her so kindly that her reciprocity function is positive, the subject assigns positive weight θ^i to those of her actions that benefit the other person. Analogously, if the participant's θ^i is negative, behaving nicely towards the other person reduces her own utility. Finally, if θ^i is equal to zero, the subject does not at all care about the other person's payoff and therefore acts as a pure money maximizer.

Because subjects' utility functions should fulfill all the requirements presented above, in my model they are assumed to be of the following form:

$$U_i = \begin{cases} U_i^A = w_A - c(e_i) - c(s_i) + t - c(p) + \theta^A \cdot \Big(\gamma_1 \cdot \big(1 - s_i\big) + p\Big) \cdot \gamma_2 & \text{if } i \text{ loses the tournament} \\ U_i^P = w_P - c(e_i) - c(s_i) + v \cdot p - t + \theta^P \cdot \Big(\delta \cdot \big(1 - s_i\big) + t\Big) & \text{if } i \text{ wins the tournament,} \end{cases} \tag{2.6}$$

with suitable weights γ_1, γ_2, $\delta > 0$.

Since there is uncertainty ex ante about whether one will win the tournament and therefore act as a principal in the gift-exchange game, subjects maximize the following expected utility:

$$\mathbb{E}\mathbb{U}_i = q_i \cdot U_i^P + (1 - q_i) \cdot U_i^A. \tag{2.7}$$

As we will see in the next section, this expected utility does not only depend on a subject's own choices in stage 1 and stage 2, but also on the realizations of the error term and the tournament and gift-exchange choices of the person(s) the subject is matched with. The other participants' decisions as well as the error term realizations impact on a subject's expected utility both via the probability of winning and her reciprocity function.

Before I proceed to the derivation of the predictions for individuals with reciprocal preferences as well as for pure money maximizers under both promotion schemes, I briefly explain how the setup described above changes if I consider i) lateral instead of vertical promotions or ii) rational and selfish individuals instead of reciprocators.

Since, under the lateral job promotion regime, subjects are rematched after the tournament stage, they are unaware of their new partner's tournament behavior. Hence, an individual's reciprocal inclination can no longer be affected by the other subject's sabotage choice, i.e., $a^P = a^A = 0$. Whereas a principal, thus, remains completely uninformed about the kindness of her agent, an agent can still base her gift-exchange game behavior on the generosity of her principal's transfer payment. Under the lateral job promotion regime, the reciprocity functions of reciprocal agents and principals are therefore given by

$$\begin{aligned} \theta^{A/\text{Lat}} &= b^A \cdot \frac{t - t_0}{t_{\max} - t_0} \\ \theta^{P/\text{Lat}} &= 0. \end{aligned} \tag{2.8}$$

The change in individuals' reciprocity function naturally affects their utility functions as well. More precisely, since a subject's sabotage choice does no longer affect the reciprocal inclination of her gift-exchange partner, there is no need to feel regret about having engaged in sabotage when facing a kind partner. Therefore, under lateral promotions, agents' and principals' utility functions take the following form:

$$U_i^{\text{Lat}} = \begin{cases} U_i^{A/\text{Lat}} = w_A - c(e_i) - c(s_i) + t - c(p) + \theta^{A/\text{Lat}} \cdot p \cdot \gamma_2 & \text{if } i \text{ loses the tournament} \\ U_i^{P/\text{Lat}} = w_P - c(e_i) - c(s_i) + v \cdot p - t + \theta^{P/\text{Lat}} \cdot t & \text{if } i \text{ wins the tournament.} \end{cases} \tag{2.9}$$

By contrast, if individuals are rational and selfish, they will exhibit no reciprocal behavior. Their reciprocity functions are hence equal to zero, i.e., $\theta^{A/0} = \theta^{P/0} = 0$, implying that also their utility is not at all influenced by mutually generous actions. The utility functions of purely money-maximizing agents and principals are therefore given by

$$U_i^0 = \begin{cases} U_i^{A/0} = w_A - c(e_i) - c(s_i) + t - c(p) & \text{if } i \text{ loses the tournament} \\ U_i^{P/0} = w_P - c(e_i) - c(s_i) + v \cdot p - t & \text{if } i \text{ wins the tournament.} \end{cases} \tag{2.10}$$

Predictions

In the following, I derive the predictions of the model introduced above, focusing on symmetric equilibria in pure strategies. However, it is important to note that, due to the many possible combinations of values the up to six free parameters in subjects' reciprocity and utility functions $(a^P, a^A, b^A, \gamma_1, \gamma_2, \delta)$ can take, no universally valid predictions can be obtained. My aim is therefore to at least prove that the different job promotion schemes may well induce different behavior. Hence, I set the six free parameters at reasonable values to derive the behavioral predictions that would result for this particular parameter constellation. In total, I distinguish three different cases: First, I focus on the behavioral predictions for individuals with reciprocal preferences in *vertical* job promotions. Afterwards, I determine the predictions for reciprocators in *lateral* job promotions. The predictions concerning the job promotion behavior of *rational and selfish* individuals are derived at the very end of this section.

Reciprocators in vertical job promotions

Using the reciprocity and utility functions in (2.5) and (2.6), I solve the present two-stage game by backward induction, starting with agents' decision on the number of points they want to allocate to their principal in the gift-exchange game. More precisely, agents maximize their utility from the second stage by choosing the optimal number of points, p, taking all previous decisions as given. Agents' corresponding

objective function is thus given by[25]

$$OF_A = t - c(p) + \Big(a^A \cdot \big(1_{s_P=0} - 1_{s_P=1}\big) + b^A \cdot \frac{t - t_0}{t_{\max} - t_0}\Big) \cdot \Big(\gamma_1 \cdot \big(1 - s_A\big) + p\Big) \cdot \gamma_2. \quad (2.11)$$

At this point two cases have to be distinguished because agents' utility function differs, depending on whether their principal has previously engaged in sabotage or not:

Firstly, if $s_P = 1$, then $OF_A = t - c(p) + \big(-a^A + b^A \cdot \frac{t-t_0}{t_{\max}-t_0}\big) \cdot \big(\gamma_1 \cdot (1 - s_A) + p\big) \cdot \gamma_2$. Since this objective function is decreasing in p due to $a^A > b^A \geq b^A \cdot \frac{t-t_0}{t_{\max}-t_0}$, agents allocate the minimal number of points to their principal, i.e., $p^* = p_{\min} = 0$, if they have been sabotaged before. This reaction does not depend on the transfer payment an agent receives.

Secondly, if $s_P = 0$, then $OF_A = t - c(p) + \big(a^A + b^A \cdot \frac{t-t_0}{t_{\max}-t_0}\big) \cdot \big(\gamma_1 \cdot (1 - s_A) + p\big) \cdot \gamma_2$. In this case, agents may also allocate a non-minimal number of points to their principal which, however, depends both on the received transfer payment and the exact parameter values. All else being equal, agents are more willing to allocate a high number of points in the gift-exchange game the more generous their principal's payment offer has been. If I consider for example a setting with $a^P = 0.6$, $a^A = 0.41$, $b^A = 0.38$, $\gamma_1 = 1$, $\gamma_2 = 5$ and $\delta = 30$, which ensures that the weights associated with the reciprocity-based component in subjects' utility functions are reasonable, for payment offers greater than or equal to 89, agents allocate $p = 4$ to their principal. If payments lie in $[62, 88]$, agents choose $p = 3$. Moreover, if $t \in [36, 62]$, then $p = 2$, and if $t \in [10, 35]$, then $p = 1$. Finally, for payment offers smaller than 10, agents respond with the minimal number of points, i.e., $p = 0$.

Principals anticipate agents' reactions to their payment offer as specified above and maximize the objective function

$$OF_P = v \cdot p - t + a^P \cdot \big(1_{s_A=0} - 1_{s_A=1}\big) \cdot \big(\delta \cdot (1 - s_P) + t\big). \quad (2.12)$$

Consequently, I have to distinguish three different cases, depending on principals' and agents' sabotage choices in the tournament:[26]

[25] The subscripts $_A$ and $_P$ indicate variables relating to an agent or a principal, respectively.

[26] The constellation that the agent has engaged in sabotage, while the principal has not, is

Firstly, if both the principal and the agent have engaged in sabotage, principals know that their agent will only choose $p^* = p_{\min} = 0$ and thus face the following objective function: $OF_P = v \cdot 0 - t - a^P \cdot t = -(1 + a^P) \cdot t$. Hence, due to $a^P > 0$, the optimal payment offer is the minimal one, i.e., $t^* = t_{\min} = 0$.

Secondly, if only the principal has decided to sabotage her opponent, the principal again anticipates that her agent will choose $p^* = 0$. Given the corresponding objective function $OF_P = v \cdot 0 - t + a^P \cdot t = (a^P - 1) \cdot t$, the principal still finds it optimal to offer nothing to the agent, i.e., $t^* = 0$, since $a^P < 1$ by assumption.

Finally, if both the agent and the principal have refrained from sabotage, the principal knows that her agent will respond reciprocally to the offered transfer payment. With p^* depending on t, t_0, a^A, b^A, γ_1 and γ_2, as laid out above, the agent's objective function is given by: $OF_P = v \cdot p^*(t, t_0, a^A, b^A, \gamma_1, \gamma_2) - t + a^P \cdot (\delta + t)$. With the parameter values of the previous example I obtain that it is optimal for the principal to choose the smallest payment at which the agent still assigns her four instead of only three or less points, i.e., $t^* = 89$ and $p^* = 4$. Please note that this prediction only holds for the parameter values assumed above and therefore would change if one used different parameter values instead. However, it is much more important at this point to realize the huge difference in subjects' gift-exchange behavior that depends on their previous sabotage choices. More precisely, while already one competitor opting for sabotage suffices to bring about inefficient behavior in the gift-exchange game, non-minimal transfer payments and point allocations can occur if both competitors refrain from sabotage.

Given the parameter specifications and the corresponding second-stage behavior of principals and agents outlined above, I can determine the continuation values that agents and principals will obtain after the tournament stage in each of the three possible cases. These continuation values are given by $CV_A^{11} = CV_P^{11} = 0$ if both subjects have engaged in sabotage, by $CV_A^{01} = -\gamma_1 \cdot \gamma_2 \cdot \left(a^A + b^A \cdot \frac{t_0}{t_{\max} - t_0}\right)$ and $CV_P^{10} = 0$ if only the principal has sabotaged the agent, and by $CV_A^{00} = t^* - \frac{(p^*)^2}{2} + \left(a^A + b^A \cdot \frac{t^* - t_0}{t_{\max} - t_0}\right) \cdot (\gamma_1 + p^*) \cdot \gamma_2$ and $CV_P^{00} = v \cdot p^* - t^* + a^P \cdot (\delta + t^*)$ if both subjects have refrained from sabotage, respectively.[27]

obviously not feasible because the saboteur would in this case win the tournament and therefore become a principal.

[27] The two-digit superscripts used here indicate whether in the respective scenario the considered

When determining their optimal tournament behavior, subjects take not only the immediate benefits and costs into account but also the resulting continuation values. More precisely, they compare all possible sabotage-effort combinations with respect to their expected utility and finally choose the combination with the highest expected utility. Naturally, saboteurs will only provide minimal effort in the tournament. This is due to the fact that, if the opponent opts for sabotage as well, the winner is determined by chance, whereas if the other subject refrains from sabotage, the saboteur will always win the tournament. In either case, providing more than minimal effort does not affect the saboteur's chances of winning the tournament and is at the same time costly.

Since it is important that the tournament generates incentives to win it, one needs to check for each of the three sabotage profiles whether the utility from winning the tournament exceeds the utility from losing it. Exemplarily doing this for the already considered parameter constellation, I obtain the following utilities:

a) $U_A^{11} = w_A - c(s) + CV_A^{11} = 10; \quad U_P^{11} = w_P - c(s) + CV_P^{11} = 70$

b) $U_A^{01} = w_A - c(e) + CV_A^{01} = -88.5 - c(e); \quad U_P^{10} = w_P - c(s) + CV_P^{10} = 70$

c) $U_A^{00} = w_A - c(e) + CV_A^{00} = 128.66 - c(e); \quad U_P^{00} = w_P - c(e) + CV_P^{00} = 132.4 - c(e)$

These comparisons confirm that in the considered setting individuals have an incentive to win the tournament and take on the role of the principal. Moreover, we see that refraining from sabotage does not only prevent the costly destruction of output in the promotion tournament but also increases individuals' earnings in the gift-exchange game. It would thus be efficient if subjects abstained from sabotage in the tournament.

To determine individuals' actual tournament behavior, I calculate the best response for each possible sabotage-effort combination of one's opponent. I thereby take the following information into account: In case that one participant decides to sabotage, whereas the other one refrains from doing so, the saboteur (non-saboteur) will act as the principal (agent) in the subsequent gift-exchange game, so that each subject's utility is straightforward to determine (see case b)). By contrast, if both

subject (first digit) and her opponent (second digit) have engaged in sabotage (=1) or refrained from it (=0).

individuals have opted for sabotage, each subject's likelihood of winning the tournament is equal to 0.5. The corresponding expected utilities of both subjects do therefore coincide and are given as the equally weighted sum of agents' and principals' utilities in case a), i.e., $EU_A^{11} = EU_P^{11} = 0.5 \cdot (10 + 70) = 40$. Finally, if both individuals refrain from sabotage, both effort choices and the realizations of ϵ_i and ϵ_j determine the tournament winner. More precisely, if both subjects choose the same effort level, the likelihood of winning the tournament is 0.5. By contrast, if a subject chooses an effort level that exceeds the opponent's effort level by one, this likelihood rises to $\frac{7}{8}$. Finally, if her effort level is two or more units higher, she wins the tournament with certainty. A deviation of more than two units is, however, not profitable since it is more costly than a deviation of exactly two units and cannot further increase the winning probability. Depending on the actual difference in effort, subjects' expected utility is thus determined by weighting principals' and agents' utilities in case c) with the corresponding winning and losing probabilities, i.e., $EU_i^{00} = Pr(y_i > y_j) \cdot U_P^{00} + Pr(y_j > y_i) \cdot U_A^{00}$.

It is easy to see that both individuals engaging in sabotage and providing minimal effort is always part of a symmetric equilibrium. However, depending on the exact parameter specifications, there also exists a second symmetric equilibrium in pure strategies in which both subjects refrain from sabotage in the tournament. For example, with the parameter values used so far, I obtain that mutual best responses consist as well in refraining from sabotage and providing an effort of $e = 1$ in the tournament.

In this concrete example, the two resulting symmetric Nash equilibria in pure strategies of the vertical job promotion scheme with reciprocal individuals are thus given by the action profiles $\Big[\big(s^{*/\text{Vert}} = 0, e^{*/\text{Vert}} = 1, [t^{*/\text{Vert}} = 89, p^{*/\text{Vert}} = 4]\big); \big(s^{*/\text{Vert}} = 0, e^{*/\text{Vert}} = 1, [t^{*/\text{Vert}} = 89, p^{*/\text{Vert}} = 4]\big)\Big]$ and $\Big[\big(s^{*/\text{Vert}} = 1, e^{*/\text{Vert}} = 1, [t^{*/\text{Vert}} = 0, p^{*/\text{Vert}} = 0]\big); \big(s^{*/\text{Vert}} = 1, e^{*/\text{Vert}} = 1, [t^{*/\text{Vert}} = 0, p^{*/\text{Vert}} = 0]\big)\Big]$, respectively. Since utilities and joint payoffs are strictly higher in the first equilibrium in which subjects refrain from sabotage, it is reasonable to assume individuals to coordinate on the Pareto-superior of the two equilibria. Given the parameter values as specified above, reciprocators' equilibrium strategy under the vertical job promotion scheme would therefore be characterized by $s^{*/\text{Vert}} = 0$, $e^{*/\text{Vert}} = 1$, $t^{*/\text{Vert}} = 89$ and $p^{*/\text{Vert}} = 4$.

Reciprocators in lateral job promotions

In analogy to the analysis under vertical job promotions, I start the analysis of lateral job promotions with agents' behavior in the gift-exchange game, making use of the adjusted reciprocity and utility functions in (2.8) and (2.9). Agents try to maximize their objective function, $OF_A = t - c(p) + b^A \cdot \frac{t-t_0}{t_{\max}-t_0} \cdot p \cdot \gamma_2$, with respect to p. As in the case of vertical promotions, agents are generally more willing to allocate a high number of points to their principal the kinder this latter's transfer payment has been. However, since under lateral promotions a generous payment offer is the only way to appeal to agents' reciprocity and can no longer be supported by the abstainment from sabotage, agents may reciprocate even high transfer payments with only a small number of points. This happens, for example, also if the same parameter constellation prevails that I considered above. For payment offers greater than or equal to 90, agents allocate $p = 2$ to their principal, while they only choose $p = 1$ or $p = 0$ if $t \in [64, 89]$ or $t \leq 63$, respectively. Given this strategy, principals are, according to their objective function, $OF_P = v \cdot p - t$, eventually better off if they offer only the minimal transfer payment. In this case, both agents' and principals' continuation values are equal to zero.

Turning to subjects' tournament behavior, it is evident that under the lateral job promotion regime it is the strictly dominant strategy to engage in sabotage. The reason is that second-stage payoffs cannot be influenced by individuals' decisions in the tournament as they are equal to zero either way. Consequently, each participant will sabotage her opponent in order to increase her chances of receiving the higher winner prize. Furthermore, as I have already shown for the case of vertical promotions, it is optimal for saboteurs not to provide any effort in the tournament.

With the parameter values as specified above, reciprocators' equilibrium strategy under the lateral job promotion scheme is hence characterized by $s^{*/\text{Lat}} = 1$, $e^{*/\text{Lat}} = 1$, $t^{*/\text{Lat}} = 0$ and $p^{*/\text{Lat}} = 0$.

Pure money maximizers

If individuals are rational and selfish, their reciprocal inclination is equal to zero, i.e., $p^{*/0} = p_{\min} = 0$, irrespective of other participants' previous behavior as well as the

vertical or lateral structure of the job promotion scheme. Hence, applying backward induction as before, rational and selfish agents will only allocate the minimal number of points in the gift-exchange game, irrespective of their principal's payment offer. Principals with the same characteristics anticipate this behavior and consequently offer no more than the minimal transfer payment, i.e., $t^{*/0} = t_{\min} = 0$. Agents' and principals' continuation values are thus equal to zero and do not at all depend on their own or other participants' behavior in the preceding tournament. For pure money maximizers, it is consequently the strictly dominant strategy to engage in sabotage and provide only minimal effort in the tournament because this maximizes their chances of receiving the higher winner prize.

If we again consider the exemplary parameter specification used in the previous sections, the equilibrium strategy of rational and selfish individuals is thus characterized by $s^{*/0} = 1$, $e^{*/0} = 1$, $t^{*/0} = 0$ and $p^{*/0} = 0$.

B.3 Instructions

Below is the English translation of the German instructions used in treatment VERTICAL. Differences in the instructions in treatment LATERAL are marked by square brackets "[...]". The instructions were adapted appropriately in treatment GE-ONLY and are available from the author upon request.

General information

You are participating in a study on economic decision-making. If you read the following explanations carefully, you can earn a substantial amount of money. It is therefore very important that you read these explanations carefully and understand them.

The decisions you take during the study will be analyzed in an exclusively anonymous way. This means that your decisions will never be related to your identity. During the study no communication of any kind of is allowed. If you have any questions, put a hand out of your booth. The experimenters will then come over and answer your question in private, so that the other participants will not be disturbed.

During the study, all monetary amounts are presented in Taler. At the end of the study, the Taler you have earned will be converted into Euro and paid out to you. The conversion rate is **1 Taler = €0.05**.

At the beginning of the study, every participant is **endowed with 20 Taler**. She can spend these and possible additional revenues from the experiment to cover potentially occurring costs.

The study consists of two different parts, which are separately presented to you now. Please read these instructions carefully.

Information on part one of the study

Every participant competes against an other randomly determined person in a **tournament**. The consequences of winning or losing the tournament are twofold. On the one hand, tournament winners and losers obtain different payoffs from the tournament. On the other hand, the outcome of the tournament determines to which role a participant is assigned in part two of the study. It holds:

Tournament winners

- earn the **winner prize** of **90 Taler** and
- take the **role of player A** in part two of the study.

Tournament losers

- earn the **winner prize** of **30 Taler** and
- take the **role of player B** in part two of the study.

The person that generates the highest output wins the tournament. Her output - and thus her chances of winning the tournament - are affected by **two different decisions**: **own effort** and/or **sabotage**.

Own effort increases own output. More precisely, each unit of own effort generates one unit of output. If, for example, you choose an effort level of 3, your output will increase by 3 units. You can select any effort level between 1 and 10. The choice of an effort level entails **costs**. The higher the effort level chosen, the higher the corresponding costs. The following table indicates the costs associated with each possible effort choice.

Table 2.10: Costs of effort

effort	1	2	3	4	5	6	7	8	9	10
costs [in Taler]	0	2	4.5	8	12.5	18	24.5	32	40.5	50

Own output additionally depends on chance. For each participant, the computer randomly determines a number between 0 and 2, which is rounded to four decimals

(e.g. 0.103, 1.746, 0.955 etc.). Every number between 0 and 2 is drawn with equal probability. **Own output is eventually calculated as sum of own effort chosen and random number drawn.**

Furthermore you can influence the output of your opponent by opting for sabotage. **Sabotage reduces your opponent's output (effort plus random number) to 0.** Opting for sabotage entails **costs of 20 Taler**.

If, for example, participants 1 and 2 compete against each other, the output of participant 1 depends on the sabotage choice of participant 2 as follows:

a) if participant 2 opts *for* sabotage	b) if participant 2 opts *against* sabotage
output of participant 1 = 0	output of participant 1 = effort of participant 1 + random number of participant 1

After you and your opponent have taken the decisions with respect to effort and sabotage and after the computer has drawn a random number for each of you, your output is compared to that of your opponent. The participant with higher output wins the tournament. In case of a tie, the winner of the tournament is determined by an additional random draw.

Ignoring participants' endowment, the **incomes from part one of the study** are for tournament winners and losers given by:

income of **tournament winner**	income of **tournament loser**
= **winner prize** (90)	= **loser prize** (30)
– costs of effort	– costs of effort
– costs of sabotage	– costs of sabotage

Immediately after this part of the study, all participants obtain the following information:

a) whether they have won or lost the tournament, and which role (player A or player B) they will thus take in part two of the study,

b) the decisions they themselves have taken with respect to effort and sabotage,

c) the decisions their opponent has taken with respect to effort and sabotage,

d) the income they possess after the tournament (= income from the tournament + endowment).

Information on part two of the study

As already explained, tournament winners secure the role of player A, whereas tournament losers take the role of player B. **In part two of the study, every player A faces exactly one player B, and every player B faces exactly one player A.**

Players A and B take their decisions in the following order:

1. **Player A directs** a **transfer payment between 0 and 100 Taler** to the corresponding player B.

2. **Player B** observes the transfer payment of player A and **allocates between 0 and 10 points to player A**.
   The higher the number of points chosen, the more player A benefits in terms of income. **Player A receives 15 Taler per point that is allocated to her by player B.** For player B the allocation of points entails **costs**. The higher the number of points chosen, the higher the corresponding costs. The following table specifies the costs associated with each possible point choice.

Table 2.11: Costs of allocating points to player A

points allocated	0	1	2	3	4	5	6	7	8	9	10
costs [in Taler]	0	0.5	2	4.5	8	12.5	18	24.5	32	40.5	50

After player A and player B have taken their decisions, the resulting incomes from this part of the study are calculated.

As described above, the **income from part two of the study** is for player A and player B given by the following formulas:

income of **player A** = 15 * points allocated by player B – transfer payment
income of **player B** = transfer payment sent by player A – costs of point allocation

Please note: The groups of two that are randomly determined at the beginning of the study will remain in place for both parts of the study. This means that in part two of the study you will face the same participant with whom you have already interacted in the tournament. **Thus, during the whole study you will interact with one and the same person.** [Please note: The groups of two that are randomly determined at the beginning of the study will only remain in place for the tournament. This means that in part two of the study you will face a participant with whom you have not interacted yet. **Thus, during the whole study you will interact with two different persons.**]

Additional information on the study

Both parts just presented follow each other immediately. After you have taken your decision in part two of the study, we will ask you to answer several questions. **For answering these questions honestly and conscientiously you will receive an additional €3 at the end of the study.** Afterwards, you will be informed about your income from both parts of the study, which will be paid to you in private.

Before the actual study starts, we ask you to answer the **control questions** that will appear on your screen in a few seconds. If you have additional questions, please indicate this by raising your hand. Part one of the study will start as soon as all participants have answered the control questions correctly.

Chapter 3

Leadership Effectiveness and Institutional Frames

3.1 Introduction

Elinor Ostrom has contributed to our understanding of social dilemmas like no other researcher before her, and the Nobel Prize in Economics in 2009 was an award well deserved. In her outstanding lifework, she has identified key aspects that shape the success of self-organization in mitigating social dilemmas. One of the most prominent pieces of her work is certainly Ostrom (1990), which at the time of this writing has been cited more than 16,000 times. Although not at the key of her analysis, already in this book she refers to "the presence of participants with substantial leadership" (Ostrom 1990, p. 188) as a factor that influences outcomes of collective actions. In a more recent paper (Ostrom 2009), she presented a general framework for analyzing sustainability of social-ecological systems. It included ten factors, with leadership being one of them. In both instances, however, she pointed out that the presence or absence of leadership (as well as of any other factor she identified being relevant, e.g., social norms) alone cannot explain observed differences in the success to overcome social dilemmas. Instead, leadership must be seen in the context of the other factors that shape the situation at hand.

In this spirit, our paper studies if leadership behavior and leadership effective-

ness are affected by the institutional framing. It also sheds light on the stability of cooperative behavior, measured at the individual level, between different frames. The lab experiments that we use are partly based on a setup introduced by Elinor Ostrom (Cox, Ostrom, Sadiraj & Walker 2013). The design allows for a paired comparison of positive (give-some) and negative (take-some) frames (see also Andreoni 1995, Sonnemans et al. 1998, Park 2000 or Dufwenberg et al. 2011 for corresponding simultaneous-move games). In the positive frame (treatment GIVE), subjects are endowed and can give (contribute) something to the common pool. In the negative frame (treatment TAKE), the payoff functions and other basic elements of the situation are exactly identical - with the exception that subjects are not endowed but can take (withdraw) something from the common pool. The game is played sequentially, with an entitled leader moving first and three followers, observing the leader's decision, moving second.[1] On the second stage, we introduce a strategy-method approach to exactly measure followers' reactions to leaders' decisions and to cleanly compare these reactions between the institutional frames. By eliciting followers' decisions conditional on each possible action of the leader, we can classify subjects into selfish types or conditional cooperators (with respect to the leader's decisions).

We find that leaders' behavior, followers' reactions and consequently the effectiveness of the leadership institution are strongly influenced by the institutional frame. Leaders under the positive frame on average contribute more than twice as much as leaders under the negative frame leave in the common pool (12.67 tokens contributed in GIVE vs. 6.17 tokens left in TAKE). With respect to followers' behavior, we find that the institutional framing substantially shapes the distribution of cooperation types. While in GIVE 67% of followers can be classified as conditional cooperators and 14% as free riders, in TAKE only about one third of followers exhibit conditionally cooperative behavior, and an even larger fraction engages in free riding. These differences in leaders' and followers' behavior between frames have straightforward consequences in terms of social efficiency. While the average pool size is 40.67 tokens under the positive frame, on average only 23.83 tokens remain in the

[1] Entitlement is induced by choosing the leader based on his or her performance in a general-knowledge quiz.

common pool under the negative frame.

The findings of our paper inform the growing literature on the effectiveness of leadership in social dilemmas (e.g., Gächter & Renner 2004, Güth et al. 2007, Levati et al. 2007, Potters et al. 2007, Haigner & Wakolbinger 2010, Rivas & Sutter 2011). So far, this strand of literature has established an unambiguously positive effect of leading by example only if leadership is endogenous. Our paper also adds to the literature on framing effects in social dilemmas which so far has produced mixed evidence. While some papers report higher total contributions under the negative frame (e.g., Brewer & Kramer 1986, Sell & Son 1997, Sell et al. 2002, Dufwenberg et al. 2011), other papers find a framing effect in the opposite direction (e.g., Andreoni 1995, Willinger & Ziegelmeyer 1999, Park 2000). We enrich this discussion on framing effects by studying them under a sequential setting. Closest to our work is Cox et al. (2013). However, our sequential framework consists of a first-moving leader and second-moving followers, whereas Cox et al. (2013) implement the reverse move order. Moreover, to the best of our knowledge we are the first to introduce a strategy-method approach in such a framework to exactly measure followers' reactions to leaders' decisions and to cleanly compare these reactions between institutional frames.

The data from our experiment suggest that, at least in our setup, individual cooperation types seem to be malleable. In this regard, our results are in line with Blanco et al. (2011). They find that social preferences, specifically inequality aversion, are not stable across different games. If the malleability of cooperation types translates into other setups as well, it might be of general interest for the literature measuring social preferences (e.g., Fischbacher et al. 2001, Fischbacher & Gächter 2010, who also use a strategy method to identify cooperation types in social dilemmas). Moreover, it might be of relevance for many papers that measure cooperation preferences in one game and use them as a predictor in their main experiment - in particular those papers where subjects' interpretation of the frame potentially changes between games. Under these circumstances, any interpretation should be taken with caution, which builds on the observation that elicited types do not predict behavior in the main experiment because this could just be driven by a change in types between the two situations.

From a policy perspective, our results are telling as well. Assuming that the lab

evidence translates to the field (see Rustagi et al. 2010), our results underline that leaders can potentially affect followers' behavior and mitigate social dilemmas. At the same time, our findings show that the example provided by the leader must be desirable.[2] Finally, in particular when a leadership mechanism is in place, (social efficiency-oriented) policy makers might want to set the institutional frame such that it addresses the positive aspects (do something good, give something, contribute) rather than focuses on the negative aspects of behavior (do not do something bad, do not withhold something, do not withdraw).

The remainder of the paper is organized as follows. In Section 3.2 we describe our experimental design. In Section 3.3 we present the results of the experiment, and in Section 3.4 we discuss these results and conclude.

3.2 Experimental Design

Our experiment features a social dilemma that is played as a one-shot game. Each of $n = 4$ players has to choose how to allocate a given amount of tokens between a 'private' and a 'public' account (group account). Each token allocated to the public account yields a marginal per capita return of $\alpha = 0.4$, i.e., the sum of tokens allocated to the public account is multiplied by 1.6 before being distributed equally among all four players. Tokens in players' private accounts increase only the respective player's payoff. Given that $1/n < \alpha < 1$, players face a social dilemma because tokens allocated to the group account are *socially* efficient, while it would be *individually* rational for egocentric payoff maximizers to allocate all tokens to the private account.

We study two frames of the social dilemma, i) a give-some as well as ii) a take-some public-good game. The frame is manipulated between treatments. The two treatments, TAKE and GIVE, only differ with respect to wording (take or give) and

[2] In this respect, our work is also connected to papers that study the role of social information in social dilemmas (e.g. Engel et al. 2011, Shang & Croson 2009, List & Lucking-Reiley 2002, Berg et al. 1995). These studies show that positive examples can foster cooperation, increase donations, or promote trusting behavior. At the same time, some of these studies also demonstrate that negative examples can be detrimental to the problem at hand. Moreover, Baumeister et al. (2001) stress that, in general, bad information is processed more thoroughly than good information and suggest that "bad is stronger than good, as a general principle across a broad range of psychological phenomena" (p. 323).

to the initial token allocation. In treatment GIVE, each player is endowed with $E = 20$ tokens in the private account, while the group account is initially empty. By contrast, players in treatment TAKE do not have any endowment in their private accounts ($E = 0$), but the group account initially consists of $nE = 4 \cdot 20 = 80$ tokens. Subjects in GIVE have to decide how many tokens they want to *contribute to* the public account, whereas subjects in TAKE have to decide how many tokens they want to *withdraw from* the public account. Importantly, each subject's action space is identical in both treatments, i.e., up to 20 tokens can be contributed to the public account in GIVE and be withdrawn from the public account in TAKE, respectively. Correspondingly, each subject's payoff space is identical between treatments. In both treatments, subject i's payoff π_i is given by

$$\pi_i = \text{tokens in } i\text{'s private account} + 0.4 \cdot \text{ tokens in } i\text{'s group account.}$$

In order to reflect the difference in initial endowments between both treatments, subject i's payoff in GIVE and TAKE can be rewritten as:

$$\begin{aligned} \pi_i^{\text{Give}} &= 20 - g_i + 0.4 \cdot (0 + g_i + \sum_{j \neq i} g_j) \\ \pi_i^{\text{Take}} &= 0 + t_i + 0.4 \cdot (80 - t_i - \sum_{j \neq i} t_j) \quad , \end{aligned} \tag{3.1}$$

with g_i and t_i being the number of tokens subject i contributes to the public account or withdraws from it, respectively.

Given that we are interested in leadership effectiveness, the game is implemented in a *sequential move order*. Instead of having all group members take their decision simultaneously, one group member, which we refer to as the *leader*, decides about her allocation before the others (*followers*) do.[3] Followers' responses to the leader decision are elicited using the strategy method (Selten 1967), i.e., for each of the 21 possible contributions or requests of the leader, followers have to indicate how many tokens they want to contribute to the public account or withdraw from it, respectively. Only after all followers have submitted a complete strategy

[3]The group leader is determined based on subjects' performance in a general-knowledge quiz taking place before the actual experiment. The quiz consists of 20 multiple-choice questions. When answering these questions, subjects know that another part of the experiment will follow, but they do not know about the game that will be played in this second part. The role of the leader is assigned to the best performing subject in each group.

profile, the leader's actual decision is revealed and followers' decisions are implemented accordingly. This approach renders followers' decisions directly comparable between treatments, irrespective of potential differences in leaders' choices between GIVE and TAKE. It also allows to study changes in followers' behavior at the individual level by classifying each follower according to his individual contribution or withdrawal profile, respectively.

The Nash-equilibrium predictions for self-centered agents who maximize their own monetary payoff are identical in both frames: all subjects free-ride, i.e., allocate the maximum amount of 20 tokens to their private account, although it would be socially efficient to allocate all tokens to the public account. This implies that subjects' behavior is predicted to coincide in GIVE and TAKE. The same is, ceteris paribus, also true under any outcome-based model of social preferences (e.g. Fehr & Schmidt 1999). To hypothesize differences in behavior between GIVE and TAKE, one would need, for example, i) a change in beliefs about others' types in an outcome-oriented model, or ii) a change in beliefs about social norms or prescriptions in a norm-based or identity-based model (e.g. Akerlof & Kranton 2000), or iii) a change in the reference point in models of reciprocity (e.g. Dufwenberg & Kirchsteiger 2004, Falk & Fischbacher 2006). In fact, previous results from papers studying differences in behavior between give- and take-frames in social dilemmas with a *simultaneous* move structure suggest that individuals perceive the frames differently and react with substantially different contribution and withdrawal decisions (e.g. Brewer & Kramer 1986, Andreoni 1995, Sell & Son 1997, Willinger & Ziegelmeyer 1999, Park 2000, Dufwenberg et al. 2011). Yet, ex ante it is an open question if (and if so, how) these findings translate into our sequential-move game, because previous work on leading-by-example suggests that behavior under sequential moves differs from behavior under simultaneous-move games - in particular since the leadership institution frequently helps to mitigate social dilemmas (yet these social dilemmas are usually framed as give-some games; e.g., Gächter & Renner 2004, Potters et al. 2007, Normann & Rau 2011, Drouvelis & Nosenzo 2013).

Procedures

The study was conducted in July 2013 at the Laboratory for Experimental Economics

at the University of Bonn (BonnEconLab), using z-Tree (Fischbacher 2007) for the experiment and ORSEE (Greiner 2004) for the recruitment. We randomly recruited from the entire subject pool at the BonnEconLab, which at that time consisted of about 6300 subjects, most of them undergraduate students of all majors from the University of Bonn. In total, we invited 96 subjects and assigned them randomly to treatment GIVE or TAKE. Each subject participated in only one treatment, leaving us with 12 leaders and 36 followers per treatment.

Upon arrival at the lab, subjects were randomly assigned to private cubicles and received written instructions, which were also read out aloud to the subjects to create common knowledge about the game being played.[4] In order to check whether participants had understood the game structure, in particular the consequences of own and group members' contributions to (respectively withdrawals from) the public account, they had to answer a set of control questions. Only after having solved these questions correctly, subjects could proceed with the experiment. Throughout the study, interaction was anonymous and subjects did not learn about the identity of other participants they were interacting with. The experiment ended with a short questionnaire. Afterwards, subjects received feedback about the outcomes of the experiment and were then paid in private. Tokens earned in the experiment were converted at a rate of 1 Token = €0.2. Including the show-up fee of €4, subjects earned on average €8.97. Each session lasted no more than 50 minutes.

3.3 Results

We focus on followers' decisions first and compare them between treatments. As will be seen, followers' behavior differs significantly between the institutional frames, both on average and at the individual level. This difference seems to be anticipated by the leaders, as the subsequent analysis of leaders' decisions shows. Afterwards, we derive the implications for efficiency and players' realized payoffs. The result section concludes with suggestive evidence, based on data from the ex-post questionnaire, on the causes of the change in behavior.

Please note that for treatment comparisons to be easy to understand, we report

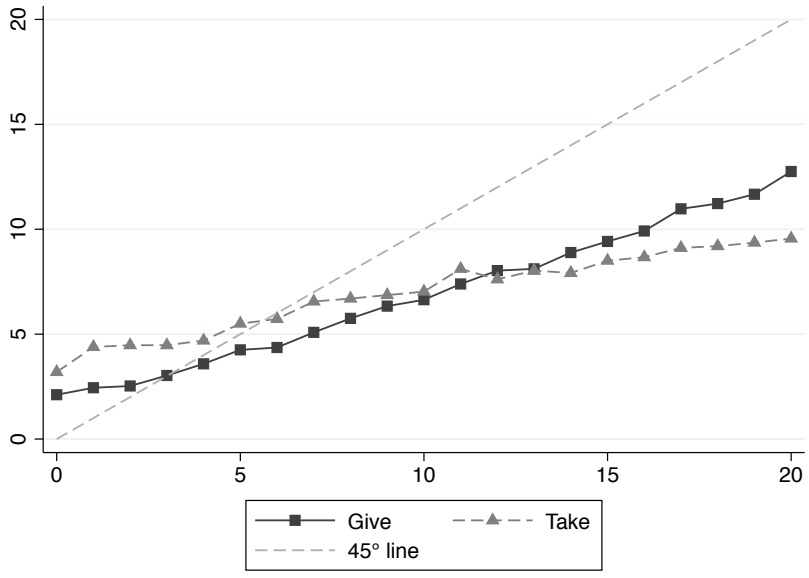
[4] Instructions and screenshots can be found in Appendix C.2.

subjects' decisions in both frames in terms of contributions, i.e., the withdrawal of t_i tokens from the public account in treatment TAKE corresponds to a contribution of $g_i = 20 - t_i$ tokens. Also note that, since followers made their decision before they were informed about the leader's actual decision, we can treat every leader and every follower as an independent observation. This leaves us with 12 decisions of leaders and 36 contribution plans of followers in each of the two treatments, for a total of 24 observations for leaders and 72 observations for followers (respectively $72 \cdot 21 = 1512$ data points when taking into account that followers make their decision contingent on each of the leader's 21 possible allocations). Finally, recall that subjects were randomly assigned to treatments. Behavioral differences between treatments should therefore primarily be driven by the difference in frames.

3.3.1 Followers' Behavior

Followers' decisions were elicited using the strategy method.[5] For each possible contribution decision of the leader, Figure 3.1 shows the corresponding contribution of the followers, averaged over all followers in the respective treatment.

Figure 3.1: Average contribution plans, all subjects



First, in both treatments we see that leaders' contributions affect followers' decisions. There is a significantly positive correlation between leaders' and followers'

[5]The contribution plans of each individual subject can be found in Appendix C.1.

contributions in both treatments. If we take the average contribution of followers for each given decision of the leader, we get Spearman's $\rho = 0.991$ in TAKE and $\rho = 1.0$ in GIVE, both with $p \leq 0.001$.[6] Second, the average contribution plans differ between treatments. For low contributions of the leader, followers in TAKE contribute more than followers in GIVE, and vice versa for high contributions of the leader.

This difference can also be seen in the following regression model:

$$c_i^f = \beta_0 + \beta_1 c_l + \beta_2 TAKE + \beta_3 c_l \times TAKE + \epsilon_i \ , \tag{3.2}$$

where c^f is the contribution made by followers, c_l the contribution of the leader, "TAKE" the treatment dummy which takes the value of 1 in TAKE and 0 in GIVE, and "$c_l \times$ TAKE" captures the interaction effects between leader's contribution and treatment. Table 3.1 lists the corresponding estimates. Estimates in Column (1) and Column (2) are based on the entire sample, with the difference being that additional covariates (gender, age, self-reported measures of risk and trust) are included in Column (2) to check for the robustness of the results. As we already observed in Figure 3.1, higher leader contributions induce higher follower contributions in both treatments, but slope and intercept of the contribution profiles differ. The coefficient of c_l is significant and positive, 0.534 in GIVE and $(0.534 - 0.230 =)$ 0.304 in TAKE. The difference in slopes of -0.230 is significant, but the coefficient of the treatment dummy "TAKE" just falls short of being significant ($p = 0.117$).

Result 1. *Followers' contributions react to the leader's contribution in both frames, although the average contribution profile differs between the give- and take-frame.*

The next question is why we observe the difference in the average contribution profile. One possibility is that all subjects react less strongly to the leader's decision in TAKE, but the individual data tell a different story. Having access to a complete contribution plan of every follower, we can use a type classification similar to the one introduced in Fischbacher et al. (2001) to discriminate between i) subjects who

[6] This conservative calculation is based on 21 observations per treatment. If we use each follower's actual contribution instead of the average contribution over all followers, we get Spearman's $\rho = 0.200$ in TAKE and $\rho = 0.458$ in GIVE, both with $p \leq 0.001$ but now based on 756 observations per treatment.

Table 3.1: Followers' contribution decisions

Dependent variable: c^f	(1)	(2)	(3)
c_l	0.534***	0.534***	0.800***
	(0.073)	(0.073)	(0.054)
TAKE	2.360	2.516	−0.706
	(1.462)	(1.606)	(1.306)
$c_l \times$ TAKE	−0.230**	−0.230**	0.240***
	(0.116)	(0.116)	(0.084)
Trust		0.871*	0.007
		(0.255)	(0.201)
Gender		0.093	−0.507
		(1.595)	(0.885)
Age		−0.188	−0.004
		(0.193)	(0.064)
Risk		−0.078	−0.059
		(0.250)	(0.185)
Constant	1.539*	1.870	0.761
	(0.807)	(3.998)	(1.518)
Observations	1512	1512	735
Subjects	72	72	35
Sample	full	full	cond. coop.

Notes: This table shows coefficient estimates from a random-effects model (standard errors are given in parentheses and corrected for clustering on the level of each individual). The dependent variable is the amount contributed by the follower for any possible contribution "c_l" of the leader. The variable "TAKE" is a dummy variable indicating treatment TAKE. "$c_l \times$ TAKE" is the corresponding interaction between leader contribution and treatment. "Gender" is 1 for male and 0 for female. "Risk" and "Trust" are self-reported measures elicited in the ex-post questionnaire, both ranging between 0 (low trust/risk averse) and 10 (high trust/risk seeking). Significance levels are denoted as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

free-ride on the leader's contributions, ii) subjects who conditionally cooperate with respect to the leader's contributions, and iii) other subjects that do not fall into the previous categories. More precisely, we use the following classification strategy:

i) free riders: subjects who contribute exactly zero for all 21 possible contributions of the leader.

ii) conditional cooperators: subjects with a positive Spearman correlation coefficient $\rho_{c_i,c_l} > 0$ between own contributions and leader's contributions that reaches a level of significance of $p \leq 0.01$.

iii) others: subjects who are neither free-riders nor conditional cooperators.

Table 3.2: Distribution of cooperation types

Type	GIVE	TAKE
free-riders	14%	36%
conditional cooperators	67%	31%
others	19%	33%

Table 3.2 shows the distribution of types between treatments. Strikingly, we observe strong treatment differences (Pearson χ^2 test, $p = 0.008$). In treatment GIVE, the number of subjects being categorized as conditional cooperators is more than twice as high as in TAKE (24 vs. 11 subjects). At the same time, only about half as many subjects are categorized as free-riders in GIVE than in TAKE (5 vs. 13), the same being true for the number of subjects classified as 'others' (7 vs. 12).[7] Considering that the treatments are randomly assigned to the subjects, one should expect to see roughly the same distribution of types in both treatments. Instead, it seems that in particular cooperative types are not stable but are prone to changes in the institutional frame.[8]

Result 2. *Cooperation types seem to be malleable, since the distribution of types differs significantly between the take- and the give-frame.*

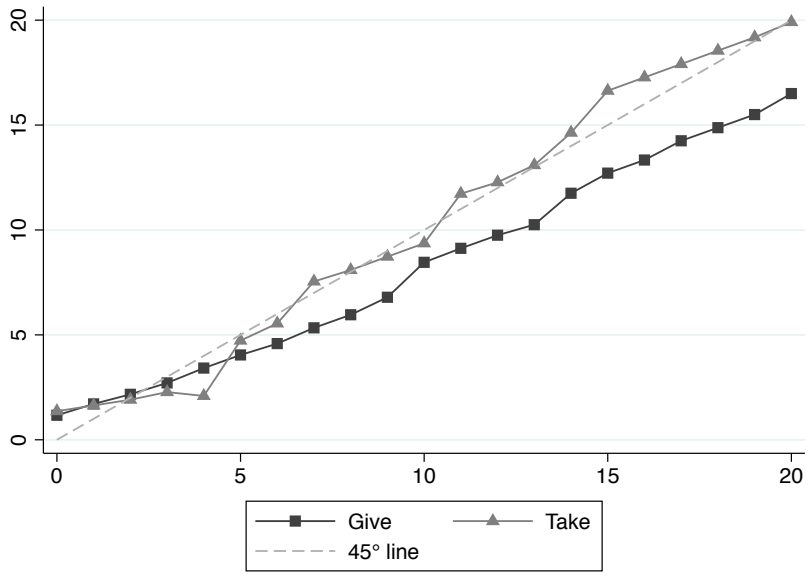
[7] In total, 26.4% of followers are categorized as 'others'. Within this classification type, there is a large heterogeneity in contribution patterns, e.g., some subjects contribute a positive but constant amount for all decisions of the leader, while some subjects show more 'random' patterns.

[8] Below, we will present further evidence stressing the interpretation that the change in distribution is indeed of systematic nature rather than just being a randomization failure.

When we compare the behavior of subjects within a given cooperation category, by definition we do not observe differences for free-riders (they always contribute nothing). We also do not observe significant differences for 'others'.[9] However, as Figure 3.2 shows, we do find significant effects for conditional cooperators. Conditional cooperators in treatment TAKE frequently match leaders' contributions or even surpass them, while they stay below leaders' contributions in GIVE. This can also be seen in Column (3) of Table 3.1, where we re-run the regression of followers' contributions on the leader's contributions, but restricted to the sample of conditional cooperators. The coefficient of "$c_l \times$ TAKE" is positive and significant, implying that the average contribution plan of conditional cooperators has a statistically higher slope in TAKE compared to GIVE (1.04 instead of 0.8 per token contributed by the leader).

Result 3. *For conditional cooperators, the positive impact of leaders' contributions on followers' contributions is significantly more pronounced in the take- than in the give-frame.*

Figure 3.2: Average contribution plans, conditional cooperators



[9]Interestingly, there is a slight tendency that more subjects always (i.e., for any of the 21 leader allocations) contribute the full amount in TAKE than in GIVE, i.e., there are more subjects that never take anything from the public account than there are subjects who always contribute everything.

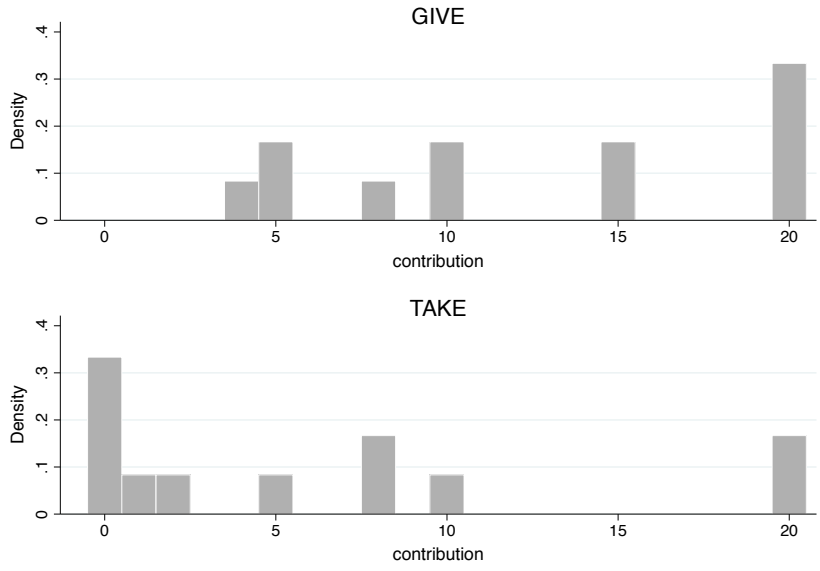
To wrap up, with respect to contributions the take-some frame has a positive effect on those followers who condition their behavior on the leader's decision - but at the same time the probability for being such a conditional cooperator is reduced under the take-frame. At least in our sample, the latter effect dominates. Thus, the marginal effect of an additional token contributed by the leader is on average smaller in TAKE than in GIVE. Interestingly, as we will show next, leaders seem to anticipate the difference in followers' behavior and contribute less themselves in TAKE.

3.3.2 Leaders' Behavior

Leaders in treatment GIVE contribute more than double the amount of leaders' contributions in treatment TAKE. They contribute on average 12.67 tokens in GIVE and only 6.17 tokens in TAKE, the difference being significant (Wilcoxon rank-sum test, $p = 0.026$). As Figure 3.3 shows, the difference in means is due to a significant difference in the distributions between GIVE and TAKE (Kolmogorov-Smirnov exact test, $p = 0.092$). While in TAKE one third of the leaders contribute nothing at all, in GIVE all leaders contribute a positive amount and one third even contribute the maximum amount.

Result 4. *Leaders' contributions differ strongly between the take- and the give-frame.*

Figure 3.3: Leaders' contributions, treatments GIVE and TAKE



If we apply leaders' actual decision to followers' contribution plans to derive the actual realizations of contributions and payoffs, we see an interesting effect. First, the sum of contributions to the public account is almost 50% lower in TAKE than in GIVE (23.8 vs. 40.6 tokens, Wilcoxon rank-sum test, $p = 0.126$), which implies that the leadership institution is much less efficient in a take-some frame than in a give-some frame. At the same time, however, the distribution of final payoffs within the population is more equal in TAKE than in GIVE (Kolmogorov-Smirnov exact test, $p = 0.094$). The reason is that leaders are 'exploited' in GIVE, as they contribute on average 12.67 tokens and followers only 9.33 tokens - so they earn less than the followers (Wilcoxon rank-sum test, $p = 0.078$). By contrast, in treatment TAKE leaders seem to anticipate the high free-riding potential of followers. Leaders' contributions (6.17) are now lower but very closely matched by the followers (5.88), implying almost equal payoffs for leaders and followers (Wilcoxon rank-sum test, $p = 0.877$).

Result 5. *The leadership institution is less efficient in the take- than in the give-frame, but can result in more equitable payoffs.*

3.3.3 Potential Explanations for the Differences in Behavior

The differences in leadership behavior between treatments might potentially be explained by leaders' perception of the situation. In the ex-post questionnaire, we asked the leaders how responsible they felt for their group (on an 11-point Likert scale). We find that leaders in GIVE feel significantly more responsible for their group than leaders in TAKE (6.25 vs. 4.08, Wilcoxon rank-sum test, $p = 0.036$). We also asked leaders about different aspects that might have been of importance for their decision, and observe that leaders in TAKE state having cared significantly less about others' trustworthiness (8.25 vs. 5.66, Wilcoxon rank-sum test $p = 0.009$) and about fairness considerations (6.42 vs. 4.50, Wilcoxon rank-sum test $p = 0.096$) than in treatment GIVE. These observations suggest that leaders perceive the two frames differently, as the focus in the take-frame seems to shift away from social aspects like fairness, trust and responsibility.

For followers we do not observe significant differences in responses to the ex-

Table 3.3: Trust and cooperation type

	Trust
TAKE	-0.724
	(0.860)
FR	-3.342***
	(1.161)
FR × TAKE	2.216
	(1.511)
Constant	5.542***
	(0.482)
Observations	53
Adjusted R^2	0.1332

Notes: This table shows coefficient estimates from a linear regression model (standard errors are given in parentheses). The dependent variable is the self-reported level of trust in strangers. The variable "TAKE" is a dummy variable indicating treatment TAKE. "FR" is a dummy variable which is 1 for free-riders and 0 for conditional cooperators. "FR × TAKE" is the corresponding interaction between type and treatment. Significance levels are denoted as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

post questionnaire. However, we do observe that the impact of trust seems to differ between treatments. In the ex-post questionnaire, we asked subjects to which degree they trust strangers (ranging from 0 'do not trust at all' to 10 'fully trust'). The regressions in Table 3.1 above include this measure of 'trust' as a control variable. The coefficient of trust is significant and positive in the full sample (Column (2)), but almost zero in the restricted sample that only includes the conditional cooperators (Column (3)). This suggests that there might be a threshold level of trust from which on a subject starts contributing by becoming a conditional cooperator, and once this threshold is reached there are no additional effects of trust on contribution behavior. The regression reported in Table 3.3 indicates that, if such a trust-threshold really exists, it seems to be lower in the give-frame than in the take-frame. Among the group of free-riders and conditional cooperators, trust levels in TAKE are not per se different from trust levels in GIVE (the coefficient of "TAKE" is -0.7235 with $p = 0.404$). Yet, the amount of trust is significantly lower among free-riders than among conditional cooperators (the coefficient of "FR" is -3.342 with $p = 0.006$). The difference is less

pronounced in TAKE than in GIVE since the average level of trust among free-riders increases (the coefficient of "FR × TAKE" is 2.216 with $p = 0.149$). This suggests that in treatment GIVE, the group of free-riders mainly consists of individuals with low levels of trust, while in treatment TAKE, also persons with relatively high levels of trust occasionally end up as a free-rider.

3.4 Discussion

We studied the influence of positive and negative frames on leadership effectiveness in social dilemmas. Using lab experiments, we found significant differences in cooperation rates between the institutional frames for leaders and followers. Moreover, we implemented a strategy method to elicit followers' entire contribution plan contingent on the leader's decisions. The data at the individual level revealed that cooperation types were not stable between institutional frames, because the observed type distribution differed significantly between the take- and the give-frame. Specifically, the number of free-riders more than doubled and the number of conditional cooperators was almost reduced by half when comparing the take- to the give-frame. Based on self-reported measures that were elicited in an ex-post questionnaire, we provided indicative evidence that the change in cooperation behavior might have been due to i) differences in the perception of give- and take-frames, and ii) differences in the degree to which subjects needed to trust other group members in order to start cooperating.

Leading-by-example, or more general a sequential move structure, has been frequently promoted in recent years as a potential solution to social dilemmas. Yet, the corresponding evidence almost exclusively stems from experiments that use games with a voluntary contribution mechanism. Our experiment supports the previous findings, since we also observe high levels of social efficiency in the presence of leaders - but only in the give-some frame. If the institutional frame is more like in the case of a common-pool resource (take-some frame), cooperation rates are reduced by almost 50%.

Part of this loss in efficiency is due to a significant reduction in leaders' willingness to cooperate. Leaders set a much better example in the give- than in the take-frame.

One could think that, as soon as we find a way to increase leaders' contributions in the take-frame, the problem would be alleviated. However, we can observe this counterfactual because of the strategy-method data on followers' behavior, and prospects look bleak. We see that the marginal impact of leaders' contribution on followers' average contribution is significantly smaller in the take-frame than in the give-frame. Even worse, we observe that a substantial fraction of subjects seem to change their cooperation type altogether, i.e., behaving like a free-rider rather than like a conditional cooperator.

The malleability of cooperation types is striking. Assuming that types are also not stable across frames in other games (which remains to be shown), it implies that one should be cautious in comparing aggregate data between games, in particular when (subjects' interpretation of) the frame changes between games.[10] It also creates an additional difficulty for testing the empirical relevance of a behavioral theory, in particular when using data from different kinds of games. To overcome such problems, one would need to know why (or which) people react to the different frames, so that these relevant factors could be controlled for.

In this respect, our data contains some indicative evidence why cooperation behavior changes between frames. In particular, we observed that subjects reported that different aspects were of importance for their decision. We also observed that trust affected people differently in the two frames. However, a word of caution should be in place here. The potential reasons listed here that might explain a change in behavior between frames are based on self-reported measures that were elicited after the experiment. Subjects had already experienced the situation and made their decisions (although they did not receive information about the outcome of the game yet), so that a causal interpretation is not straightforward. The differences in the self-reported measures might as well be caused by the differences in subjects' decisions between the frames. Future studies should elicit potentially relevant measures

[10]For example, imagine that the cooperation type would be elicited in a positively-framed game (e.g., giving in a dictator game, contributing in a public-good game) and the main experiment under study is set in a negative frame (e.g., sabotage in tournaments, stealing game, market game with collusion). It might then be the case that the cooperation types as elicited in the first game do not predict behavior in the main experiment. One might jump to the conclusion that motives of cooperation are not of importance in the main experiment. But maybe they are, and one just did not observe it because too many people reacted to the difference in frames and changed their cooperation type between the two games.

ex-ante, before subjects make their decisions and before information about others' behavior and outcomes is resolved. Another thing that should be controlled for in future studies are beliefs about others' decisions, in particular when the type classification is based on a strategy method that focuses only on a subset of others' decisions (in our case on the leader's decisions, but not on the other followers' decisions).[11] In repeated games, doing so will also allow for a clearer interpretation of changes in cooperation types over time. In fact, it would be really interesting to learn more about the long-run effects; in particular to see if cooperation types are stable within a given frame, and to see if experience in one frame affects the perception of the situation (and thus the cooperation types) in other institutional frames or environments or decision situations (e.g., in the absence of a leader, or in the presence of a punishment mechanism).

Finally, from a policy perspective our results might also be understood as a chance. (Not only) in environments where leading-by-example can be implemented or already is in place, shifting people's attention to the positive aspects of the situation might increase social efficiency. This could be done by addressing people with regard to increasing cooperation rather than reducing free-riding, respectively. For instance, one could try telling people to start behaving in a 'desired' way instead of communicating that we need to stop behaving in an 'undesired' way. A concrete example might be environmental protection: instead of communicating that we are in a situation where there is too much pollution and everyone should reduce pollution, one should rather focus on the ways to reduce pollution and advise people to invest money/effort into these means (e.g., reducing power consumption vs. increasing energy efficiency; or stop using non-renewable resources vs. start using renewable resources; etc.). Whether this indeed works is, of course, ultimately an empirical question. To shed light on this question, further lab experiments are telling, but we should also carry on Elinor Ostrom's work and collect more field evidence to gain an even better understanding of the mechanisms that drive human behavior in social dilemmas.

[11] Here we elicit contributions contingent only on the leader's decisions. While followers cannot contingent their decisions on the actions of the other followers, this allows for a clear focus on the leader-follower relationship. It is possible, however, that part of the change in followers' contribution plans is because the frames change their beliefs about the contribution plans of the other followers; which can only be seen when eliciting beliefs about the other followers' contribution plans.

C Appendix

C.1 Figures

Figure 3.4: Individual contribution plans, treatment Give

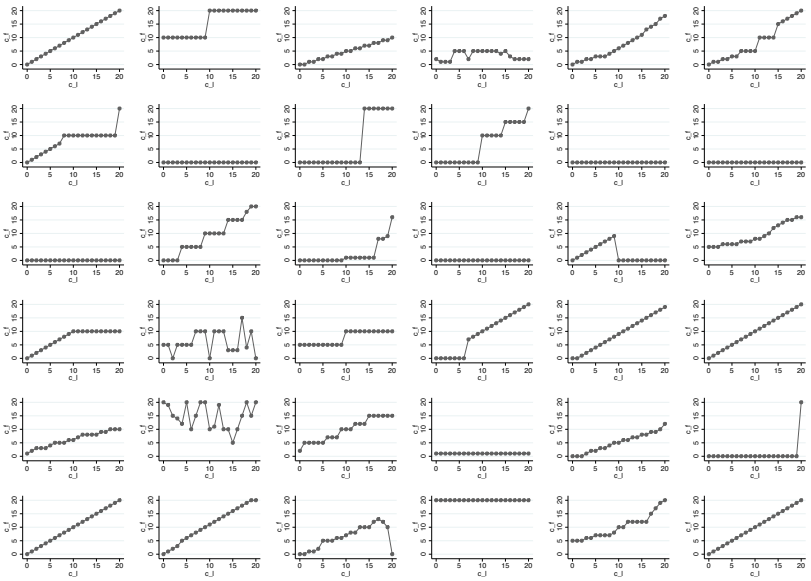
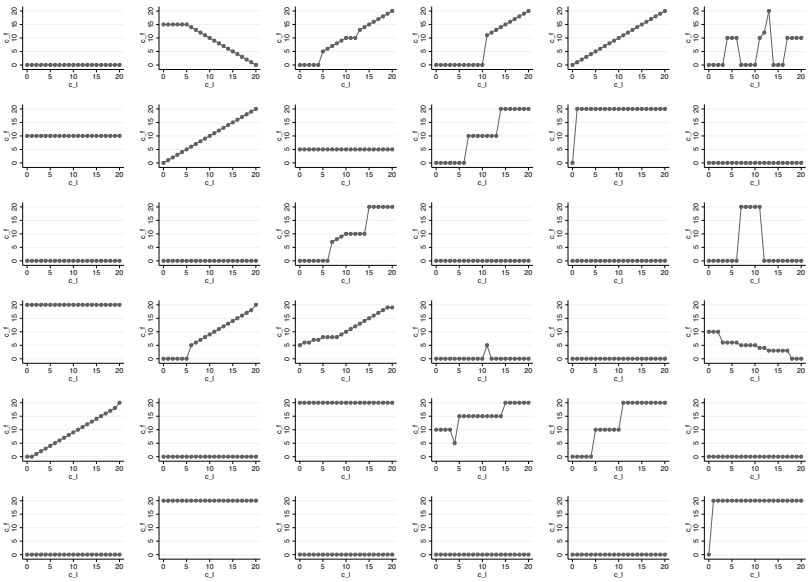


Figure 3.5: Individual contribution plans, treatment Take



C.2 Instructions

The original instructions in German are available from the authors upon request. Below is the English translation of the instructions used in treatment GIVE. Differences in the instructions in treatment TAKE are marked by square brackets "[...]".

General information

You are participating in a study on economic decision-making. If you read the following explanations carefully, you can earn a substantial amount of money. It is therefore very important that you read these explanations carefully and understand them.

During the study no communication of any kind is allowed. If you have any questions, please indicate it and raise your hand. We will come to you and answer your question in private, so that the other participants will not be disturbed.

The study consists of exactly two parts. Information on the second part will be handed out to you after you have completed part one. The first part features a quiz. The quiz consists of 20 multiple-choice questions with four given answers each, of which one is the correct solution. Please indicate for each question the answer that you think is correct.

Please confirm each of your answers by clicking "OK" in order to proceed to the next question. As soon as all participants have completed the quiz in part one of the study, you receive the instructions for part two.

Do you have any questions?

Information on part two of the study

In part two, all monetary amounts are presented in Taler. At the end of the study, the Taler you have earned will be converted into Euro and paid out to you. The conversion rate is 1 Taler = €0.2. In addition to the earnings from part two, every participant receives a show-up fee of €4.

At the beginning of the study, all participants are randomly matched into groups of four. Accordingly, except for yourself, three other participants belong to your group. Every participant has to decide how to allocate a certain amount of Taler between two different accounts. The first account is a private account. The second account is a public account (group account) for all group members. A participant's payoff at the end of the study is composed of these two accounts, i.e.:

your payoff = 1 * Taler in your private account
+ 0.4 * Taler in the group's public account

Initially, there are 0 [80] Taler in the public account of your group (group account) and 20 [0] Taler in your private account. Each participant has to decide how many Taler she wants to contribute to [withdraw for himself from] the group account. Every participant can contribute [withdraw] an integer amount between 0 and 20 Taler to [from] the group account.

Every Taler that you do not contribute to the group account remains on your private account. [Every Taler that you withdraw from the group account is put into your private account.] After all participants have made their decisions, the Taler in your group account are multiplied by the factor 1.6 and distributed equally among all four group members. Your payoff from the group account thus increases [decreases] by 0.4 Taler for each Taler that you contribute to [withdraw from] the group account. At the same time, also the payoffs of the three other members of your group increase [decrease] by 0.4 Taler, because they receive payoffs from the group account as well.

Participants make their decisions sequentially. In each group, one participant is the first to decide. This is the participant who, out of all four group members, has

answered the most quiz questions correctly. Before this participant's decision is revealed to the other three group members, these latter have to decide for each of the 21 possible contribution [withdrawal] decisions how many Taler they want to contribute to [withdraw from] the group account themselves. Of course, when you make the 21 decisions, you do not know which one will become relevant. Therefore, you should consider each decision carefully. Only after all participants have entered their decisions, the contribution [withdrawal] decision of the first participant is revealed. This decision and the decisions of the three other group members for this situation finally determine the participants' payoffs.

To further familiarize you with the procedure, the decision screens are presented below. Moreover, in a few seconds some additional control questions will appear on your screen. Afterwards, the second part of this study begins. After finishing the second part, we will ask you to fill out a short questionnaire. This questionnaire constitutes the final part of today's study. Afterwards you will be informed about your payoff, which will be paid to you in private.

Having answered the most quiz questions correctly in your group, you are now the first to decide how many Talers you want to contribute to (withdraw from) the group account. Afterwards, the other participants take their decisions.

Your contribution (withdrawal) decision:

OK

The participant who had answered the most quiz questions correctly in your group was the first to make his contribution (withdrawal) decision.

The following table depicts his possible contribution (withdrawal) decisions (between 0 and 20).
Please enter your own contribution (withdrawal) decision for each case in the cells beneath.

0	7	14
1	8	15
2	9	16
3	10	17
4	11	18
5	12	19
6	13	20

OK

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