Corruption in the Health Care Sector -The Influence of Bribery and Relative Reciprocity on a Physician's Prescription Decision

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Chapter 1

Introduction

1.1 Corruption in the Health Care Sector

The Constitution of the World Health Organization stated "the highest attainable standard of health as a fundamental right of every human being" (World Health Organization, 1946). Corruption in the health care sector leads to a violation of this human right. Public money that should have been spent on health, is lost due to bribery and corruption. Transparency International (2006) states in their Global Corruption Report - Focus Health that corruption in the health care sector affects people all over the world. Money that is intended to be used for public health, disappears due to corruption. The worldwide health care expenditures mounted up to 7.7 billion US\$ in 2016 (Emergo, 2016). In Germany, 11.3% of the GDP (i.e., 374.2 billion Euros), was spent for health care expenditures (Statistisches Bundesamt, 2018). The US, for example, spent 15.3% of their GDP on health care and at the same time Medicare and Medicaid, the two largest US public health care programs, estimate that 5%-10% of their budget is lost due to corruption (Transparency International, 2006). As corruption happens secretely it is not possible to quantify the actual amount that is gone on the basis of corruption actions.

Transparency International defines corruption as "the misuse of entrusted power for private gain" (Transparency International, 2006). Corruption in the health care sector happens on different levels between different actors: for example, in the area of medical supplies, health research, overbilling, embezzlement and also informal payments influencing the relationships between physicians and pharmaceutical companies (Vian, 2008; Transparency International, 2006; Mackey and Liang, 2012). Corruption in the health care sector is especially supported by the huge amount of health care expenditures and the health care sector's special characteristics (Savedoff and Hussmann, 2006).

Various kinds of information asymmetries, uncertainty, and complexity make the health care sector prone to corruption. First, there exists an information asymmetry between a physician and his patients. The patient has to trust the physician, as he cannot evaluate the prescribed pharmaceutical's quality before and even after the treatment. Therefore, a medical treatment can be characterized as a credence good (Darby and Karni, 1973). Additionally, a physician's prescription is influenced by a supplier induced demand. On the one hand, the physician is the supplier of a prescription, on the other hand, he is the one who prescribes a treatment. Conflicts of interest can appear in cases in which unnecessary, additional treatments are prescribed.

Second, the health care sector is also influenced by uncertainties. It is not possible to predict the time and severity of an illness. Also, the number of ill people and the spreading of epidemics cannot be forecasted. Therefore, the health care sector has to deal with a lot of uncertainties and risks. On the physician's level, uncertainties can lead to time pressure and unpredictable working situations. Considering health care authorities, they have to take precautions for several operational and organizational opportunities.

Third, a high number of various actors, such as patients, physicians, pharmaceutical companies, health insurance funds and legislators lead to a complex network of relationships. The interaction between the different participants as well as the multiple cash flows are non-transparent and not easily traceable (Savedoff and Hussmann, 2006).

Several studies show that corruption in the health care sector is still a current issue. The Special Eurobarometer 397 (European Commission, 2014) asked for the perception of corruption in the health care sector. In Germany, 30% of the participants think that giving and taking bribes and the abuse of power for personal gain are widespread among health care. This is a little below the EU-28 average with 33%.

In 2013, the European Union published their first study about corruption in the health care sector (European Comission, 2013). This study was updated and then published again in October 2017 (European Comission, 2017). The results are based on a online survey and thematic interviews with all EU-28 Member States. In all EU-28 Member States, corruption is still perceived to be present in the health care sector. In the first study of 2013, different types of corruption in the health care sector were defined: Improper marketing relations were identified as one of the main types of corruption in the health care sector. Improper marketing focuses on the relationship between health care providers and the pharmaceutical companies. It includes direct and indirect prescription influencing. On the one hand, the relationships between physicians and the pharmaceutical industry are necessary, especially in the context of financing pharmaceutical studies and research. On the other hand, these relationships can influence a physician's prescribing behavior (Savedoff and Hussmann, 2006). The physicians' prescriptions can be influenced indirectly by the creation of loyalty or directly by special pay-back deals (European Comission, 2013). To stimulate the prescription of their pharmaceuticals, the pharmaceutical companies do not only use monetary payments as a bribe, instead they

also bribe with gifts, research and equipment sponsorships as well as conference trips. That is one of the reasons why these improper marketing relationships are so difficult to investigate (Vian, 2008). The study of the European Union shows that 38% of the respondents in North West Europe (including Germany) answer that improper marketing happens occasionally or sometimes (European Comission, 2017).

One special example of improper marketing relations, presented in the study of the European Commission (2013), was the Ratiopharm scandal in Germany. Between 2002 and 2005, Ratiopharm implemented a bonus scheme that payed 5% of a pharmaceutical's price to the physician who prescribed it. This included checks with amounts of up to 18,000 Euros. The German Medical Association investigated against 1,000 physicians, and in the end 163 physicians were fined. Additionally, the pharmaceutical agent of Ratiopharm who implemented the bonus payments received a fine (European Comission, 2013). This started a discussion about the legal framework in Germany.

Since June 2016 a new law against corruption in the health care sector is part of the criminal law (Bundesrat, 2016). Paragraphs 299a and 299b of the German penal law (StGB¹) now contain regulations for corruptibility as well as bribery in the health care sector. While paragraph 299a focuses on the passive side of corruption, e.g. the acceptance of a bribe, paragraph 299b includes the active side, e.g. the bribery itself. From now on, penalties can include monetary fines or even imprisonment of up to three years for both participants of a corrupt act.

The mentioned studies and examples show that the relationship between pharmaceutical companies and physicians is discussed controversially. Pharmaceutical companies constantly make bribery attempts to influence a physician's prescription. To analyze the scope of non-optimal prescriptions due to pharmaceutical bribery, in this dissertation we set up a theoretical model and then conduct two experiments to analyze a physician's behavior in case of bribery.

1.2 Theoretical Background

Corruption in the health care sector includes a wide range of research. As we focus on the influence of bribery on a physician's prescription behavior, we now take a closer look at the literature on reciprocity and experiments in the context of corruption.

Several studies in various fields of research show that humans are not only motivated by their own material profit (e.g., Tidd and Lockard 1978; Kahneman

¹Strafgesetzbuch in der Fassung der Bekanntmachung vom 13. November 1998 (BGBl. I S. 3322), das zuletzt durch Artikel 1 des Gesetzes vom 30. Oktober 2017 (BGBl. I S. 3618) geändert worden ist.

et al. 1986; Fehr and Gächter 2000). Humans are also influenced by the utilities of other persons. Reciprocity is a social phenomenon that appears in the relationship between individuals. Bolton and Ockenfels (2000) show that people are motivated by their own payoff but do also consider reciprocal thoughts in their behavior. Reciprocity is the reaction of one individual to the action of another individual: Individuals respond kindly to kind actions and unkindly to unkind actions (Falk and Fischbacher, 2006). They are able to build up cooperative relationships on the basis of reciprocity. In our theoretical model, we analyze the influence of reciprocal relationships on a physician's treatment decision. Thereby we assume that the physician has a reciprocal relationship to a briber and also another reciprocity towards the briber and towards the patient. He has to consider both relationships in his decisions.

By conducting several experiments, mostly designed as trust games, reciprocal behavior was analyzed in various contexts. In a trust game a first mover can send an amount of money to a second mover. This amount is multiplied with a factor and then the second mover can decide to send back some money to give a favor to the first mover. These experiments show that individuals reciprocate the other individual's behavior (e.g., Fehr et al. 1993; Berg et al. 1995; Jacobsen et al. 1996; Fehr et al. 1997). It is shown that reciprocity can lead to stable bribery relationships (Abbink et al., 2002).

As corruption normally appears secretly and in hiding, it is difficult to measure corruption. Informal payments will be taken secretly and often it is difficult to distinguish between a bribe and a gift (Gaal and McKee, 2005). In the past, experiments were established as a practical method to analyze an individual's corrupt behavior (Abbink, 2006). Laboratory experiments allow to test individual factors in a controlled environment. There are reviews on the first experiments on corruption by Andvig (2005), Dusek et al. (2005) and Bobkova and Egbert (2013). These experiments can be distinguished between ones in which an interaction between the participants takes place and ones without any interaction. As to the latter, the focus is on the individuals' decisions, such as in the experiment of Frank and Schulze (2000), which was the first controlled experiment on corruption and analyzed differences in the behavior of economics students and other students.

Abbink et al. (2002) conducted the first *interactive* experiment on corruption and analyzed the interaction between two players, a briber and a public official. They used a neutral framing and avoided any corruption related wording. In this experiment they shed light on the influence of reciprocity, negative externalities and sudden death on corrupt behavior. Reciprocity leads to stable cooperative relationships, while negative externalities show no effect on the level of cooperation. Implementing a sudden death with a probability of 0.003, the level of reciprocal cooperation is significantly reduced. In another experiment of Abbink (2004), he analyzed the effect of staff rotation on corrupt behavior. By meeting only once within the experiment, reciprocal relationships between the participants cannot arise. The subjects can reciprocate a favor only in one period of the experiment. In the next rounds, they will meet another player, so that no reciprocity throughout different periods can establish. Based on the staff rotation, bribery was reduced significantly and the reciprocation of bribes was also reduced.

Schulze and Frank (2003) analyzed measures to combat bribery and introduced the possibility of detection into their first experiment (see Frank and Schulze (2000)). Individuals had to role a die to determine whether they were caught or not. In case of detection they received zero profit. Then individuals had to calculate the determinded risks and rewards before accepting a bribe. In the end, they did not find a reduction of the bribing level, but differences in the distribution of offered bribes: Higher bribes were offered less often, lower bribes more often.

We designed our experiments on the basis of the experiment of Abbink et al. (2002). In contrast to Abbink et al. (2002), we use a framed design with loaded instructions. Subjects interact in the role of a physician or a briber. As we cannot use real patients in the lab, the patient's payoff is donated to the charity organization "Doctors Without Borders" ². Our participants are students of Paderborn University. In the first experiment we set up a partner treatment and a stranger treatment to analyze the influence of reciprocity. In the second experiment we apply different punishment schemes to shed light on the influence of different anti-corruption measures.

1.3 Outline of the Thesis

As explained in the first part of the introduction, corruption in the health care sector is an up-to-date topic. Pharmaceutical companies try to build up reciprocal relationships to physicians so that they tend to prescribe special pharmaceuticals. With the help of the following studies we analyze the influence of bribery on a physician's prescription behavior. Thereby, we shed light on reciprocal relationships between physicians and pharmaceutical companies. Throughout this thesis, we define a corrupt act as successful in cases in which a pharmaceutical company offers a bribe, the physician accepts it, and prescribes a patient-non-optimal pharmaceutical. After identifying reciprocity as one crucial factor for a physician's corrupt behavior, we look at the influence of different punishment schemes.

²It is common for experiments in health economics to donate the patient's payoff to a charity organization working in the health care sector, e.g. Brosig-Koch et al. (2013).

The following studies are part of this thesis:

- 1. "Corruption and the Physician's Treatment Decision The Crucial Role of Reciprocity"
- 2. "The Influence of Bribery and Relative Reciprocity on a Physician's Prescription Decision - An Experiment"
- 3. "The Influence of Penalties on Corrupt Behavior in the Context of Pharmaceutical Prescriptions - An Experiment" (with Britta Hoyer)

First, we develop a theoretical model to analyze the influence of bribery and reciprocity on a physician's pharmaceutical prescription. We assume that in a first step a briber, in this case a pharmaceutical company, can decide whether to bribe a physician or not. The physician can accept or reject the bribe. After that he can decide to prescribe a patient-optimal or a patient-non-optimal treatment to a patient. We apply assumptions of different behavioral models in order to model the physician's behavior and decisions. First, we look at the behavior of a rational physician that is motivated only by his own profit. Afterwards, we shed light on the decisions of an altruistic physician who acts in a patient-orientated manner. Last, we analyze the prescriptions of a reciprocally motivated physician who is influenced by his own profit as well as the patient's and briber's profit. In this case we find that a physician with a reciprocal motivation and a stronger relationship to the briber than to the patient will accept an offered bribe and prescribe a patient-optimal treatment. Altruistic and rational physicians will accept a bribe, but still prescribe a patient-optimal pharmaceutical.

As we find in our theoretical model that reciprocity may lead to an acceptance of a bribe and a prescription of a patient-non-optimal treatment, we set up an experiment to analyze the relationship between reciprocity and a physician's corrupt behavior in detail. In the second study, we shed light on the interaction between subjects in the role of a briber or physician with the help of two different treatments. Thereby we vary the influence of reciprocity with the help of a partner treatment and a stranger treatment: In the partner treatment both participants in the role of a pharmaceutical company as a briber and in the role of the physician play together for the whole experiment. By playing all periods together we allow subjects to build up reciprocal relationships. In the stranger treatment, both players are re-matched after every period, hence no reciprocal relationship can occur. The results of this experiment show that participants in the partner treatment act corruptly more often than the participants in the stranger treatment. Reciprocal relationships lead to cooperation and therefore to successful corrupt acts: Bribers bribe the physicians more often, and at the same time, physicians that accepted a bribe reciprocate by prescribing a briber-optimal treatment.

On the basis of the results of our first experiment, we conduct a second experiment in which we introduce different punishment structures. We design three different treatments and in all treatments we implement a detection probability of 0.3%. In all cases in which a pharmaceutical company offers a bribe and the physician accepts it, a detection can take place. In the first treatment, the "no-penalty" treatment, a detection of an accepted bribe does not have any consequences for both participants. The penalty structures of the other treatments relates to the German anti-corruption law. In the second treatment, the "old-law" treatment, a detection will only lead to a punishment of the physician who accepted the bribe. In the third treatment, the "new-law" treatment, both participants will be punished. In case of a punishment, the participants will lose their payoffs. Our results show that the fewest corrupt acts take place in the "new-law" treatment where both players receive a punishment in case of detection. Comparing all three treatments, we find that the participants only change their behavior only in cases in which they are directly influenced by a possible punishment. They do not change their own behavior in the cases when the other player might be punished.

With the help of the above-mentioned studies we shed light on corruption in the health care sector with a special focus on the influence of bribery on the physician's treatment decision. Thus, we analyze the factors that lead to a patient-non-optimal prescription. Additionally, we take into account the effect of different penalty structures. The following chapters were written as independent research papers. Therefore, it was not possible to avoid any overlap in the introductions. Moreover, some terms and expressions may vary between the chapters.

Chapter 2

Corruption and the Physician's Treatment Decision -The Crucial Role of Reciprocity

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Abstract

Pharmaceutical companies try to build up reciprocal relationships to influence a physician's treatment decision. Focusing on the physician-patient relationship, this paper explains the reasons for a physician to prescribe a patient-non-optimal treatment as a result of accepting a bribe. We develop a theoretical model to describe the influence of a bribe on a physician's therapy decision. To this end we consider three different behavioral models: rationality, altruism, and reciprocity. Among these three behavioral characteristics, reciprocity is the only one that influences the physician's therapy decision in such a way, that he might act corruptly. However, a rational or altruistic physician will not act in a corrupt way.

Keywords: Corruption, Reciprocity, Physician-Patient Relationship *JEL*: 112, 118, D73

2.1 Introduction

This paper introduces a model to analyze cases in which corruption between physicians and pharmaceutical companies takes place. Thereby we focus, next to the special characteristics of the health care sector, on the role of reciprocity. We shed light on a physician's treatment decision in cases in which he is bribed by a pharmaceutical company. Therefore, we use different behavioral models to identify the cases in which a physician accepts a bribe and prescribes a patient-non-optimal treatment. Our model shows that a sufficiently strong relationship between physician and briber can lead to an acceptance of the bribe and prescription of a patient-non-optimal treatment. Even though the legal and ethical environment in Germany tries to ensure that physicians only act for the good of their patients.

Physicians accepting a payment for prescribing a patient-non-optimal therapy violate regulations of the professional and federal laws. The Professional Code for Physicians in Germany (MBO-Ä, 2015) claims "Medical Independence" (Art. 30, MBO-Ä) and contains several regulations about "Impermissible Allocations" (Art. 31, MBO-Ä), and "Impermissible Donations" (Art. 32, MBO-Ä). Moreover, the federal law contains several articles regarding the cooperation of physicians and third parties in Germany and regulates the inadmissible cooperation between physicians and third parties such as producers of medical goods, pharmaceutical companies and other physicians (§128 SGB V¹, Germany). Since June 2016, the German penal law has added a paragraph against corruption in the health care sector (§299a and §299b StGB, Germany). Now, not only physicians accepting a bribe, but also pharmaceutical companies that offer bribes can be punished. These regulations aim to guarantee the therapeutical independence of physicians.

But even though different sections of the professional, social and penal laws prohibit corrupt actions, corruption in the health care sector is a serious issue currently. It can be frequently observed that physicians accept payments or other rewards for the prescription of special pharmaceuticals from the pharmaceutical industry (Transparency International, 2006). In our model we focus on such a case: We look at a briber's influence on the physicians' prescriptions. Vian (2008) structured the different types of corruption in the health care sector. One central area in which corruption happens is the distribution and use of drugs and supplies in service delivery. In a study on corruption in the health care sector, the European Commission names improper marketing relations, consisting of direct and indirect prescription influencing as one of the most problematical areas in health care regulation. The relationship between pharmaceutical companies and physicians and other medical suppliers is close, but often not publicly known (European Comission, 2013).

In addition, there are several characteristics that make the health care sector, and especially the physician-patient relationship, prone to corruption. The health care sector includes a high number of different actors with numerous, in-transparent connections to each other. Moreover, in the health care sector a comparatively high number of private

¹Das Fünfte Buch Sozialgesetzbuch – Gesetzliche Krankenversicherung – (Artikel 1 des Gesetzes vom 20. Dezember 1988, BGBl. I S. 2477, 2482), das zuletzt durch Artikel 4 des Gesetzes vom 17. August 2017 (BGBl. I S. 3214) geändert worden ist.

providers is entrusted with public roles. The health care sector is also characterized by uncertainty. The date and severity of an illness is not plannable as well as the number of persons who fall ill (Savedoff, 2006).

However, the central aspect for this study is the information asymmetry between physicians and their patients. Thus, the physician's therapy decision can be characterized as a credence good (Darby and Karni, 1973). This means that, patients cannot control the physicians therapy prescriptions and consequently have to trust in the physicians and believe that they will act in their best interests. Even after the treatment patients cannot assess the quality of the prescriptions, which leads to a high corruption potential. Therefore, pharmaceutical companies have the chance to influence physicians for their own benefit.

Several studies show that a close relationship to a pharmaceutical company leads to an influence on a physician's behavior. After offering some benefits, pharmaceutical companies expect reciprocal return services from physicians. Hitherto, there has been evidence that reciprocity can have an influence on a physician's therapy decision. Chren et al. (1989) state that the "acceptance of gifts makes physicians agents of the companies that have entered into the relationships with them". A survey from Banks and Mainous (1992) supports that theory: A majority of medical students at the Medical School Faculty of the University of Kentucky believes that personal relationships have the potential of influencing a physician's prescribing. Following Stokamer (2003), gifts create a relationship between health professionals and pharmaceutical companies and induce a reciprocal behavior. Primarily physicians have an ethical obligation to their patients, but by accepting gifts, hidden obligations with pharmaceutical companies can occur and these multiple obligations can conflict with each other. Gifts from pharmaceutical companies can have an impact on the physician and may create a feeling of indebtedness. This feeling of obligation does not depend on the size of the gift. Nevertheless most physicians state that they are immune regarding pharmaceutical influence (Connors, 2009). In a field experiment, Grande et al. (2009) show that even small promotional items can influence the attitude of medical students towards pharmaceutical products. However, the students' attitudes are also affected by the university's position regarding pharmaceutical marketing. As physicians are limited in their means of returning a favor, they use mostly product support as a return service (Katz et al., 2003).

To our knowledge, there is no theoretical model that explains the influence of reciprocity on a physician's treatment decision. We set up a model that considers the physician's utility as the main factor for a physician's decision to act corruptly or not. To describe the physician's preferences we assume a physician to be rationally, altruistically or reciprocally motivated. By analyzing the preferences of a physician, the model shows that an altruistic or rational physician will not act in a corrupt way. The key explanation for corrupt behavior in the physician-patient relationship is the physician's reciprocal behavior. A reciprocally motivated physician compares his relative reciprocity towards the briber to his relative reciprocity towards the patient. A close relationship to the briber will influence the physicians' behavior in such a way, that the latter are likely to disregard what is best for their patients even if they break legal or moral regulations. In all other cases corruption is unlikely to occur. In what follows, Section 2.2 provides the basic assumptions of our model. In Section 2.3 we analyze the model using the assumptions of the behavioral models. The last Section 2.4 concludes.

2.2 The Model

The aim of our model is to analyze cases in which the therapy decision of a physician is influenced by corruption. We look at a two-stage game in pure strategies between a briber and a physician . The patient is a passive actor that has no active choice. However, he will be influenced by the choices of the other actors. In this section, we introduce the assumptions of the model regarding the special physician-patient context.

The briber is the person that demands the corrupt act from the physician and pays the bribe. There are several possible bribers: Pharmaceutical companies, producers of medical goods, physio- and psychotherapists as well as other physicians. Even though there are numerous potential bribers, all types have in common that they want to influence the physician's therapy decisions. Patients consult a physician when they are ill. The physician then prescribes a therapy for the patient. A patient cannot estimate the quality and correctness of a physician's decision in respect to the prescribed therapy. The patient has an information disadvantage towards the physician since medical services are characterized as credence goods. In the model the physician is a practicing doctor regardless of a specific field. Furthermore, our model does not distinguish between employed or self-employed physicians and physicians who are working in hospitals. Physicians are potential suppliers of a corrupt act as they can decide to take a bribe as a payment for some illegal service. Even though physicians have therapeutic freedom, they are supposed to act in the best interest of their patients.

In our model, the briber is the first mover, who has two options. He can either bribe the physician or not. The briber has some initiation costs $c_b \ge 0$ for bribing the physician. These costs include search and information costs for finding a potentially corrupt physician. In cases in which the physician accepts the bribe, the briber also has to pay the bribe $b \ge 0$. In case a bribe is offered, the physician has three options. He can refuse the bribe and prescribe the optimal therapy, accept the bribe and prescribe the optimal therapy, or accept the bribe and prescribe the non-optimal therapy ². Even if the physician accepts the bribe, the physician still has the option of prescribing the optimal therapy. If a physician accepts a bribe, this acceptance will generate some moral costs $c_a \ge 0$. The prescription of the patient-non-optimal therapy leads to additional prescription costs $c_p \ge 0$. These include some moral costs as well as some real costs induced by the prescription of a non-optimal treatment. Therefore, the patient-non-optimal treatment could be more expensive or more time consuming.

The model has four possible outcomes (I-IV). Outcome one depicts the situation in which the briber refrains from bribing. The second outcome describes the case in which the

²As we assume physicians to act generally patient-oriented, we omit the case in which a physician rejects a bribe and prescribes a patient-non-optimal pharmaceutical.



Figure 2.1: Structure of the Model

physician rejects the bribe. Outcome three shows the scenario in which the physician first accepts the bribe but then prescribes the optimal therapy. In outcome four the physician accepts the bribe and prescribes the patient-non-optimal pharmaceutical. Note that only the last outcome represents a successful corrupt act, while in the first three outcomes the corrupt act will not be successful. For a better understanding, see Figure 2.1.

The briber will generate a surplus $z \ge 0$ from the successful corrupt act. If the physician prescribes the patient-non-optimal treatment, the briber will benefit from it. At the same time, the patient will have a loss $l \ge 0$ due to this patient-non-optimal treatment. The loss includes different types of cost such as the patient can have some time costs, more side effects or a higher risk factor in comparison to the patient-optimal treatment.

The model represents the strength of the relationships between the physician and the briber with the factor β as well as the strength of the relationship between the physician and the patient with the factor α . Both relationships are assumed to be non-negative. However, the strength of the relationships can vary. The strength of the physician-patient relationship may depend on the number of visits, the type of illness and many other factors such as sympathy. Besides sympathy and the number of visits, the physician-briber relationship relationship might be influenced by the gifts and services the briber provides for the physician.

Next we analyze the individual payoffs and utilities of the actors. The patient's payoff depends on the treatment he receives,

$$\Pi_P = p - l, \tag{2.1}$$

where $p \ge 0$ denotes the monetary value of the patient-optimal treatment and $l \ge 0$ is the monetary loss of a patient-non-optimal treatment. In cases in which the patient-optimal treatment is prescribed, the patient has no loss and l = 0.

Also the briber's payoff depends not only on the prescribed treatment, but also on the bribe and bribing costs,

$$\Pi_B = z - c_b - b, \tag{2.2}$$

where $c_b \ge 0$ represents the initiation costs for the briber, $b \ge 0$ is the paid bribe and $z \ge 0$ denotes the monetary value of the patient-non-optimal treatment for the briber. We assume $z \ge c_b + b$ as otherwise the corrupt act will not be profitable for the briber and he will not bribe the physician.

The physician receives a payment for the prescription of a treatment. If he decides to accept a bribe, he also receives the bribe, but has accepting costs and in case of prescribing the patient-non-optimal treatment, additional prescription costs,

$$\Pi_D = d + b - c_a - c_p, \tag{2.3}$$

where $d \ge 0$ denotes the monetary value of prescribing any treatment to the patient, $b \ge 0$ is the received bribe, $c_a \ge 0$ represents the acceptance cost for accepting a bribe and $c_p \ge 0$ are the moral costs for prescribing a patient-non-optimal treatment. It is assumed that the bribe will compensate the physician for the corrupt act and therefore $b \ge c_a$ and $b \ge c_a + c_p$.

In order to analyze the physician's behavior with the help of the assumptions of different behavioral models, we have to take into consideration the influence of the other parties' utilities on the physician's utility. The physician's utility, independent from the underlying behavioral model, is given by,

$$u_D = \Pi_D + \alpha * \Pi_P + \beta * \Pi_B,$$

$$u_D = d + b - c_a - c_p + \alpha * (p - l) + \beta * (z - c_b - b),$$

(2.4)

where $\alpha, \beta \in [0, 1]$. The physician's utility depends on his own payoff Π_D as well as on the weighted payoffs of the patient Π_P and the briber Π_B . The weighting factors $\alpha, \beta \in [0, 1]$ express the physician's relationship to the patient and pharmaceutical company, respectively. We assume only non-negative relationships. For the rational physician we set the weighting factors $\alpha, \beta = 0$, because he acts self-interested and is only interested in his own payoff. We set $\alpha \in (0, 1]$ and $\beta = 0$ for the altruistic physician. We assume that he is motivated by his own monetary incentives as well as his inherent motivation to always act in the best interest of his patients, while he does not care about the briber's utility. In the case of a physician who is motivated reciprocally, we set the weighting factors $\alpha, \beta \in (0, 1]$ to model the strength of the different relationships. We assume a reciprocal physician to care about his patients' interests as well as about the briber's interests and his own monetary payoff.

2.3 Analysis

Independent from the underlying behavioral model, it is straightforward to see that the physician will not prescribe the patient-non-optimal treatment in all cases in which the pharmaceutical company does not offer a bribe.

Lemma 2.1. *In case no bribe is offered, the physician will prescribe the patient-optimal treatment.*

Now we analyze the cases where a bribe is offered. The pharmaceutical company offers a bribe to a physician. Given his utility function, he will reject the bribe and prescribe the patient-optimal treatment if his utility from this is higher than his utility from accepting a bribe and prescribing the patient-optimal treatment or accepting the bribe and prescribing the patient-non-optimal treatment. Thus, the physician will only reject a bribe and prescribe the patient-optimal treatment if the following two statements hold true:

$$d + \alpha * p - \beta * c_b > d + b - c_a + \alpha * p + \beta * (-c_b - b)$$
(2.5)

and

$$d + \alpha * p - \beta * c_b > d + b - c_a - c_p + \alpha * (p - l) + \beta * (z - c_b - b).$$
(2.6)

We can reduce equations (2.5) and (2.6) to the following conditions:

$$c_a > b * (1 - \beta) \tag{2.7}$$

and

$$c_a + c_p > b - \alpha * l + \beta * (z - b).$$
 (2.8)

Equation (2.7) shows that the physician will reject the bribe as long as his acceptance costs are larger than the offered bribe weighted with the physician's relationship to the briber. The physician considers his relationship to the briber in his decision. Equation (2.8) depicts that the physician's decision is influenced by the briber's surplus and the patient's loss. He will also reject the bribe if his costs for accepting a bribe and his costs for prescribing the patient-non-optimal treatment are larger than the bribe minus the weighted patient's loss and the briber's surplus.

Given that the physician accepted a bribe, he will prescribe the patient-non-optimal treatment as long as the following statement holds true:

$$d + b - c_a - c_p + \alpha * (p - l) + \beta * (z - c_b - b) > d + b - c_a + \alpha * p + \beta * (-c_b - b).$$
(2.9)

This leads to the following condition:

$$\beta * z - \alpha * l > c_p. \tag{2.10}$$

Equation (2.10) indicates that that the physician will only prescribe the patient-nonoptimal treatment after accepting a bribe if his prescription costs are smaller than the weighted values of the briber's surplus minus the patient's loss.

We now analyze these conditions with including the assumptions of the behavioral models. For the rational physician, where α , $\beta = 0$, condition 2.7 holds as long as $c_a > b$, condition (2.8) holds as long as $c_a + c_p > b$. In these cases the physician will reject the bribe. But we assume above, accepting a bribe must be worth the costs and therefore $b > c_a + c_p$. Under this assumption, the rationally acting physician will always accept the bribe. Analyzing condition (2.10) we see directly that once having accepted the bribe, he will never prescribe the patient-non-optimal treatment, because of $c_p \ge 0$.

Proposition 2.1. The rational physician will never reject the bribe, given the assumption that the bribe is higher than his moral costs. He will accept the bribe but prescribe the patient-optimal treatment.

For the physicians who are motivated altruistically we assume $\alpha \in (0, 1]$ and $\beta = 0$. Condition (2.7) is satisfied as long as $c_a > b$. As we assume $b > c_a$ the altruistic physician will accept the bribe. Condition (2.8) holds as long as $c_a + c_b > b - \alpha * l$. With a large weighting factor α or a high loss l the assumption might be satisfied and the physician will reject the bribe. But for a sufficiently small weighting factor α and loss l, the altruistic physician will accept the bribe. However, condition (2.10) is never satisfied, so that an altruistic physician will never prescribe a patient-non-optimal treatment.

Proposition 2.2. The altruistic physician will always prescribe the patient-optimal treatment. He will only reject the bribe, if the weighting factor α and the loss l are both sufficiently large. Otherwise he will accept the bribe.

For the physician who is motivated reciprocally we assume $\alpha, \beta \in [0, 1]$. Condition (2.7) is satisfied in all cases in which $c_a > b * (1 - \beta)$ and the briber will reject the bribe. But with a strong, positive relationship towards the briber, the physician will accept the bribe. Condition (2.8) holds in all cases with $c_a + c_b > b - \alpha * l + \beta * (z - b)$, a relatively stronger relationship to the briber and a relatively weak relationship to the patient can lead to an acceptance of the bribe. Condition (2.10) is only satisfied if the physician's prescription cost are smaller than the weighted briber's surplus and the weighted physician's loss: $\beta * z - \alpha * l > c_p$. Then the physician will prescribe the patient-non-optimal treatment.

Proposition 2.3. The reciprocally acting physician will only accept the bribe, if the weighted bribe $b * (1 - \beta)$ is sufficiently large. He will only prescribe the patient-non-optimal treatment if his relationship towards the briber it relatively stronger than his relationship to the patient.

Finally we use backward induction to analyze the cases in which the pharmaceutical company will offer a bribe. The pharmaceutical company will only offer a bribe in cases in which his utility from this is larger than his utility from not bribing.

Corollary 2.1. Only if the physician decides to accept the bribe and prescribe the patientnon-optimal treatment, the briber benefits from bribing. Thus, the pharmaceutical company will only bribe the physician in cases in which the prescription of the patient-non-optimal treatment is likely. As we find that the physician who is motivated altruistically or rationally might accept a bribe, but will never prescribe a patient-non-optimal treatment, the pharmaceutical company will not bribe them. For the pharmaceutical company, it is only beneficial to offer a bribe to a physician who is motivated reciprocally with a sufficiently stronger relationship to the briber than to the patient.

Corollary 2.2. The pharmaceutical company will only offer a bribe to a physician who is motivated reciprocally with a sufficiently stronger relationship to the briber than to the patient.

2.4 Conclusion

Several studies show that physicians accept benefits from pharmaceutical companies. We use our model to show that physicians who are motivated reciprocally might be influenced by a third party. Reciprocal concerns can have a negative influence on physicians' treatment decisions. The strength of their relationships towards patients and pharmaceutical companies determines the physicians' tendency to act corruptly: A close relationship to the briber and a weak relationship to the patient may lead to the acceptance of a bribe and prescription of a patient-non-optimal treatment.

We use two key factors to explain a physician's tendency to act corrupt: The physician's moral costs and the physician's relationships. Rational physicians, who do not consider the briber's or patient's payoffs, will not prescribe a patient-non-optimal therapy. Relationships to the briber and patient are not important for rational physicians. They will only consider their own payoffs and therefore accept the bribes, but prescribe the patient-optimal treatments. Altruistic physicians are assumed to act in the patient's best interest and have a positive relationship to their patients. They will decide to accept the bribe and to prescribe the patient-optimal treatment. Only physicians who are motivated reciprocally consider both relationships. With a close relationship to the briber, they might act corruptly and prescribe a patient-non-optimal treatment after accepting an offered bribe.

Possibilities to reduce successful bribing attempts of pharmaceutical companies should focus on a physician's relationships to pharmaceutical companies and his patients. It is not possible to regulate a relationship itself, but focussing on the pharmaceutical company-physician relationship, the number and character of visits of pharmaceutical sales representatives could be regulated. On the other hand, it could help to strengthen the relationship between physician and patient. From the patient's perspective it is necessary to reduce the information asymmetries between physicians and patients. Then the patient can assess the quality of a physician's treatment and it is no more possible to prescribe patient-non-optimal treatments.

Chapter 3

The Influence of Bribery and Relative Reciprocity on a Physician's Prescription Decision -An Experiment

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Abstract

Focusing on a physician's relationships to a briber and a patient, this experiment analyzes the influence of a bribe on a physician's treatment decision. We conduct a partner treatment, in which briber and physician play together for the whole experiment, and a stranger treatment, in which briber and physician are re-matched every period. With the help of the two treatments, we vary the relative reciprocity between the physician and the two other actors, briber and patient. Additionally, we use a follow-up questionnaire to measure the behavioral motivation of the participants. We find that reciprocity leads to bribery relationships: In the partner treatment, physicians act corruptly more often. Just the variation of the relative reciprocity between the treatments shows differences in the behavior of the subjects. Differences in the participants' preferences deliver no explanation for their behavior in our experiment.

Keywords: Corruption, Reciprocity, Physician-Patient Relationship *JEL*: 112, 118, D73

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3.1 Introduction

Even though corruption in the health care sector is forbidden by different legal regulations under social, professional and penalty law in Germany (e.g. §128 SGB V, Germany, §299a and §299b StGB, Germany), it can be frequently observed that physicians accept financial or other rewards from pharmaceutical companies for prescribing a special pharmaceutical (Transparency International Deutschland e.V., 2008). In this experiment we analyze the influence of bribing on a physician's choice of medical treatment. We focus on cases in which a pharmaceutical company bribes a physician. To measure the influence of reciprocity, we vary the relationship between physician and briber with the help of a stranger treatment and a partner treatment: In the partner treatment, all participants play together for the whole experiment; in the stranger treatment, all participants are re-matched in every period. Therewith we vary the strength of reciprocity and its influence on a physician's treatment decision. We use the trust game of Abbink et al. (2002) as a foundation for the design of our experiment. Additionally, we use "The Preference Survey Module" from Falk et al. (2016) as a follow-up questionnaire to measure the behavioral motivation of the participants.

Various studies from psychologists, economists, sociologists, ethnologists and anthropologists show that humans are not only motivated by their own benefit, but that they are also motivated by reciprocal concerns: Humans consider the utility of other persons in their own behavior. Reciprocity shows up in the relationship between individuals and is the reaction of one individual to the action of another individual: "People like to help those who are helping them, and to hurt those who are hurting them" (Rabin, 1993). There are several studies that analyze the reciprocal behavior of individuals with the help of experiments in different contexts, starting with Fehr et al. (1993). Most of the games are designed as trust games in which a first mover decides whether to transfer an amount of money to a second mover. The second mover can send back some money to favor the first mover. We also use a trust game with a partner treatment and a stranger treatment as the basis of our experiment.

Bolton and Ockenfels (2000) show that people are motivated by their own payoffs as well as the other participants' payoffs. Equity, fairness and reciprocity influence a person's behavior. People build up reciprocal relationships between each other. In contrast, Fehr and Gächter (2000) found that also in interactions with complete strangers, people tend to return services or gifts. Even in one-shot games, subjects tend to reciprocate the behavior of the first mover (e.g. Berg et al. 1995; Dufwenberg and Gneezy 2000). However, as shown by Gächter and Falk (2002), in a repeated gift-exchange game repeated interaction will increase reciprocity. One form of reciprocity is direct reciprocity, which often occurs in traditional markets: Traders base their decisions on their experiences with past transactions (Bolton et al., 2004). Additionally, reciprocity can also have strategic elements (e.g. Bolton et al. 2013). People reciprocate because they want others to behave in a certain way or because they want to build up beneficial reciprocal relationships. We conduct our partner treatment in the same way: Both subjects play together for several rounds, can observe the past behavior of the other subject, and can base their decisions on their past experience.

As corruption normally appears secretly and in hiding, experiments are a practical way to analyze corrupt behavior. Andvig (2005), Dusek et al. (2005) and Bobkova and Egbert (2013) review the first experiments on corruption. Most of the experimental investigations focus on the interaction between a businessmen and public officer. They use gift-exchange games (e.g. Abbink et al. 2002) or ultimatum games (e.g. Abbink and Hennig-Schmidt 2006). These experiments analyze different topics like the impact of negative externalities (e.g. Abbink et al. 2002, Abbink and Hennig-Schmidt 2006), wages (e.g. Azfar and Nelson 2007; Abbink 2004, Schulze and Frank 2003), gender (e.g. Frank and Schulze 2000, Frank et al. 2011) or culture (e.g. Barr and Serra 2010, Alatas et al. 2009).

To the best of our knowledge, the first interactive experiment on corruption was conducted by Abbink et al. (2002). They use a two-player sequential game in which a briber can transfer money to a public official. The official can accept or reject the bribe. With the help of three different treatments the influences of reciprocity, negative externalities and the risk of being caught are analyzed. They find that a corrupt relationship is based on reciprocity and trust. Adding negative externalities does not lead to a change in the participants' behavior, while including a probability of detection leads to less reciprocal cooperation. In another experiment, Abbink (2004) used a stranger treatment to study the effect of staff rotation on corrupt behavior. In every round of the experiment firms and public officials are re-matched randomly. The subjects do not know the other subject they are playing with. The experiment shows that staff rotation, implemented with the help of the stranger treatment, has a significantly negative impact on the number of offered bribes and the number of fulfilled corrupt acts.

We use the trust game of Abbink et al. (2002) as a basis for our experiment. Additionally we implement a partner and stranger treatment like in Abbink (2004). In contrast to these experiments we do not use a neutral framing. We implement the design into the context of a physician's prescription decision and assign the subjects to the role of a pharmaceutical agent, acting as a briber or physician. Further, subjects in our experiment can only decide whether to offer a bribe, they cannot determine the amount of the bribe. Moreover we do not implement any detection or penalty system.

With the help of our experiment we want to analyze the influence of bribery and relative reciprocity on a physician's treatment decision. To vary the relative reciprocity between physician and briber as well as between physician and patient, we implement a partner treatment and a stranger treatment. We focus on the physician's bribe acceptance behavior and his prescriptions in both treatments. Thereby we shed light on the influence of reciprocal concerns on the physician's prescription.

After explaining the experimental design in Section 3.2.1, we present our research hypotheses in Section 3.2.2 and the experimental procedure in Section 3.2.3. Next, Section 3.3 depicts the results and Section 3.4 concludes.

3.2 Experiment

3.2.1 Experimental Design

We designed an economic experiment to analyze the influence of reciprocity on a physician's treatment decision using the trust game of Abbink et al. (2002) as a basis. With the help of two different treatments we vary the intensity of reciprocity between a physician and a briber. In contrast to Abbink et al. (2002) we decided to conduct a framed experiment to emphasize the special relationship between a physician and his patients. Therefore, we use loaded instructions and but still avoid any corruption-related words such as "bribe" or "briber", instead the instructions use words such as "gift" and "pharmaceutical agent". (As we have a framed design, we will not consider any monetary equivalent to depict the moral costs.). To avoid end-game effects, the experiment ends randomly between period 10 and period 15. We use a follow-up survey to measure the physician's behavioral motivations, especially the characteristics of altruism and reciprocity.

The subjects are allocated randomly to the roles of either a physician or a pharmaceutical agent, acting as a briber.¹ There are no real patients in the lab. Rather, the monetary equivalent of the Patient's utility is donated to the medical charity organization "Doctors Without Borders".



Figure 3.1: Structure of the Experiment

The experiment consists of two treatments: one treatment with a partner matching in which Physician and Briber play together in all periods, the other in with a stranger

¹From now on we refer to subjects in the role of the physician as Physician and subjects in the role of the pharmaceutical agent as Briber.

matching in which the Physician and Briber are matched to another player in each period. The experimental structure is as follows: In the first step, Briber and Physician are matched respectively to the conducted treatment. Then each round in the experiment follows the same structure. First, the Briber decides about bribing the Physician. If he decides to bribe, the Physician can accept or reject the bribe. Next, the Physician decides to prescribe the patient-optimal or patient-non-optimal pharmaceutical. The decision of medical treatment is independent from the acceptance of the bribe. Figure 3.1 shows the decision structure of our experiment.

If the Briber wants to bribe the Physician, he has to pay 5 ECU (Experimental Currency Units) as a bribe. In case the Physician accepts the bribe, the amount is tripled, so that the Physician receives 15 ECU. The conversion factor reflects the difference in marginal utility, as the same amount of money means much less to the Briber than to the Physician. Note that accepting the bribe does not automatically lead to the prescription of the patient-non-optimal pharmaceutical. The Physician can accept the bribe and still prescribe the patient-optimal pharmaceutical. We framed the experiment in such a way that both pharmaceuticals are produced by the same pharmaceutical company, represented by the Briber. Pharmaceutical A is the patient-optimal pharmaceutical, while pharmaceutical B is the briber-optimal pharmaceutical. Pharmaceutical B leads to a higher payoff for the pharmaceutical agent, as it is a more profitable pharmaceutical. Pharmaceutical A is a very effective pharmaceutical with a short healing time, and leads to a higher payoff for the patient while it is less profitable for the pharmaceutical and *non-optimal pharmaceutical* refers to the patient-optimal pharmaceutical.

The Physician always receives the same payoff of 20 ECU, independent from the prescribed pharmaceutical. By accepting a bribe he can get an additional 15 ECU. He knows both pharmaceuticals, their payoffs for the Patient and for the Briber as well as his own payoff. Both, the Briber's and the Patient's payoff depend on the Physician's prescription decision. The Patient receives a payoff of 20 ECU if he is treated with the optimal pharmaceutical and a payoff of 15 ECU if he is treated with the non-optimal pharmaceutical. The Briber receives an additional 15 ECU in all cases in which the physician prescribes the non-optimal pharmaceutical. The difference in the payoffs between the two medical treatments is huge for the briber, but only small for the patient. In cases in which the Physician decides to prescribe the non-optimal pharmaceutical, the Briber benefits a lot, while the Patient is harmed only a little. Nevertheless this act might induce some moral costs for the Physician.

Table 3.1 depicts the Physician's, Briber's and Patient's payoffs in each round. It distinguishes between the payoffs in cases with the optimal and the non-optimal prescription. Additionally, it presents the influence of an accepted bribe on the individual's payoffs.

After the experiment we use parts of "The Preference Survey Module" from Falk et al. (2016) for our questionnaire. We focus on two questions for each of the following characteristics: altruism, positive reciprocity and negative reciprocity. The preference survey is a symmetric module that measures behavioral preferences in a qualitative and quantitative way. For the qualitative measure, the subjects have to self-assess their character

Prescriptions	Non-optimal		0	ptimal
Bribe accepted	yes no		yes	no
Patient	15	15	20	20
Briber	32	37	17	22
Physician	35	20	35	20

Table 3.1: Individual Payoffs per Round in ECU

on a 11-point scale. For the quantitative measure the subjects play a hypothetical version of an incentivized choice experiment. The questions that we have used can be found in Appendix 3.5.A.

3.2.2 Research Hypotheses

Our experiment is based on a trust game. Generally, in a trust game, a first mover can send money to a second mover, who can voluntarily return some money. In our case a pharmaceutical agent, acting as a Briber, can decide to send a bribe to a Physician. The Physician can accept this bribe and in the next step decide whether to return a favor by prescribing a non-optimal pharmaceutical.

The literature on reciprocity shows that people reciprocate favors of other individuals. Even in interactions with complete strangers, reciprocal return services can be observed (Fehr and Gächter, 2000). That is why we expect that Physicians who accepted a bribe will reciprocate this favor by prescribing a non-optimal pharmaceutical. These Physicians will more often prescribe a non-optimal pharmaceutical than Physicians who rejected a bribe or did not receive any bribe offer.

Hypothesis 3.1.A. *Physicians prescribe the non-optimal pharmaceutical significantly more often in cases in which they accepted an offered bribe than in cases in which no bribe was offered.*

Hypothesis 3.1.B. *Physicians prescribe the non-optimal pharmaceutical significantly more often in cases in which they accepted an offered bribe than in cases in which they did not accept a bribe.*

In contrast we assume Physicians that rejected a bribe will prescribe the optimal pharmaceutical. Physicians that reject a bribe might feel a strong obligation regarding the Patient. By taking the Patient's payoff into account they will not accept a bribe and will not prescribe a non-optimal pharmaceutical.

Hypothesis 3.2. *Physicians that rejected a bribe prescribe the optimal pharmaceutical significantly more often than the non-optimal pharmaceutical. This is independent of the treatment.*

The next hypotheses focus on the treatment effects. In the partner treatment, Physician and Briber play together in every round of the experiment, so that a reciprocal relationship between Briber and Physician can develop. Both the Physician and the Briber have complete information about each other's current payoff and past payoffs. The Briber can observe the Physician's behavior of the previous round. In cases in which the Physician values his relationship to the Briber higher than to the Patient, for example due to an offered bribe, he will decide to prescribe the non-optimal pharmaceutical. Observing this behavior in previous rounds, the Briber will continue bribing the physician and the Physician will reciprocate the Briber's behavior by prescribing the non-optimal pharmaceutical. This can be seen as a kind of strategic reciprocity. By reciprocating, the Physician expects the Briber to send a bribe in the next round and so on. Thereby a bribery relationship based on reciprocity can be established.

In the stranger treatment, a stable reciprocal relationship cannot arise: Briber and Physician will meet only once and cannot observe the other's behavioral history. We expect that in this case the Physician has no strategic incentive to reciprocate the Briber's bribe. Thus, the Physician might not prescribe the non-optimal pharmaceutical. By assuming this behavior, the Briber will not bribe the Physician. However, there is evidence from anonymous one-shot experiments that subjects cooperate even in one-shot games (e.g. Berg et al. 1995; Dufwenberg and Gneezy 2000). Therefore, it is possible that even in the stranger treatment some successful corrupt acts can be observed.

Hypothesis 3.3.A. There are significantly more successful corrupt acts in the partner treatment than in the stranger treatment.

A successful corrupt act consists of the following three steps bribing, accepting a bribe, and prescribing a non-optimal pharmaceutical. In the following hypotheses we look at all steps in detail. We assume that in the stranger treatment fewer bribes are offered, because the Briber knows that he meets the Physician only ones and might not expect any reciprocation. The Physician will accept more bribes in the partner treatment as he has the chance to build up a reciprocal relationship. Thus, the Physician prescribes more non-optimal pharmaceuticals due to reciprocation of the bribe and because he knows that he can expect future bribes.

Hypothesis 3.3.B. *Bribers offer significantly more bribes in the partner treatment than in the stranger treatment.*

Hypothesis 3.3.C. *Physicians accept significantly more bribes in the partner treatment than in the stranger treatment.*

Hypothesis 3.3.D. *Physicians prescribe the non-optimal pharmaceutical significantly more often in the partner treatment than in the stranger treatment.*

We analyze the behavioral characteristics in our experiment with the help of "The Preference Survey Module" from Falk et al. (2016) with focus on altruism, positive and negative reciprocity. Therefore, we set up additional hypotheses regarding the behavioral characteristics.

We assume that Physicians who have a strong altruistic motivation will act with patient orientation and take care of the patient's payoff. As the Patient is harmed by the prescription of the non-optimal pharmaceutical, we expect altruistic Physicians to prescribe the optimal pharmaceutical more often than the non-optimal pharmaceutical. The Patient is not influenced by the acceptance of the Bribe. Therefore, we presume that even altruistic Physicians will accept an offered bribe, but will then prescribe the optimal pharmaceutical.

Hypothesis 3.4.A. *There is no significant difference in the amount of accepted bribes between Physicians with an above-average altruistic motivation and other Physicians.*

Hypothesis 3.4.B. Altruistic Physicians will prescribe significantly more patient-optimal pharmaceuticals than other Physicians.

In both treatments, Bribers bribe the Physicians and the Physicians can return the favor by prescribing the non-optimal pharmaceutical. We assume that Physicians that are reciprocally motivated in any direction will return the favor more often than Physicians that are not reciprocally motivated.

Hypothesis 3.5.A. After accepting a bribe, there is a significant difference in the amount of non-optimal prescriptions of Physicians with an above-average positive reciprocal motivation and other Physicians.

Hypothesis 3.5.B. After accepting a bribe, there is a significant difference in the amount of non-optimal prescriptions of Physicians with an above-average negative reciprocal motivation and other Physicians.

3.2.3 Experimental Procedure

The experiment was conducted in February 2017 in the Business and Economic Research Laboratory (BaER-Lab) at Paderborn University. The subjects were invited via Email with the online recruitment system ORSEE (Greiner, 2015) from a subject pool with around 2800 students from different faculties. Most of our subjects were cultural science students and economics students. The experiment was computerized, using the software z-Tree (Zurich Toolbox for Readymade Economic Experiments; Fischbacher, 2007).

Subjects were only allowed to take part in one session. The students were randomly assigned to the roles of the Briber or the Physician. We started each session with a short introduction about the rules of the lab before handing out the written instructions. The instructions explain all decisions and the calculation of all payoffs in detail. In the instructions we informed the participants that their payoffs could be influenced by the decisions of their partner. They also knew that they are responsible for the Patient's payoff. The original instructions as well as translations of both instructions, afterwards there was the possibility to ask questions. Next the students had to answer four control questions to ensure their understanding of the instructions. Then the experiment started.

Since every computer screen presented only one decision at the same time, the participants made each decision separately. At the end of each round, the participants were informed about the decisions in this round, their own payoffs, their partner's payoffs and the donations to the charity. To secure a complete understanding, the calculation of the payoffs was described and explained in detail. After informing the participants about their payoffs, participants in the partner treatment were informed that they play together with the same partner in the next round. In the stranger treatment, the participants got the information that they will be matched with a new partner who did not know their decisions and payoffs from the previous rounds.

The subjects played for 35 minutes on average and a whole session including an introduction and payments lasted one hour. Overall 134 students took part in our experiment: 68 students in the partner treatment and 66 students in the stranger treatment. Directly after the experiment, two rounds were randomly drawn and the payoffs of these rounds were payed out. The subjects received their payments anonymously. The exchange rate was 0.25 Euro per 1 ECU. Additionally, every participant received a show-up fee of 2.50 Euros. The payoffs varied between 8.70 Euros and 15.90 Euros, with an average payment of 11.48 Euros. In total, 448.20 Euros were donated to the charity "Doctors Without Borders".

3.3 Results

3.3.1 Descriptive Statistics

The following table provides an overview of the descriptive statistics. It provides the subjects' characteristics gender and age per treatment and in total and also gives an overview of the average rounds that were played.

	Partner	Stranger	Total
Participants	68	66	134
Male	38.97%	37.53%	38.24%
Mean Age	23.87	24.21	24.04
Rounds	13.67	14.33	14

Table 3.2: Summary Statistics

Due to the different number of rounds and to avoid any end-game effects, the following analysis focuses only on period 1 to period 10. You can find data for all periods in Appendix 3.5.C. Table 3.3 gives an overview of the Bribers' and Physicians' decisions in each treatment as well as in total. It shows the amount of offered bribes, the number of accepted bribes, and the physicians' prescriptions.

Added up, in both treatments the Bribers decided 670 times about bribing a physician or not. They decided 296 times to bribe the Physician. The Physician accepted the bribe 270 times and rejected it only 26 times. In total, all Physicians had to make 670 decision

		Partner	Stranger	Total
Bribing	Bribe offered	52.65%	35.45%	44.18%
Diffung	No Bribe offered	47.35%	64.55%	55.82%
Accontance	Bribe accepted	87.71%	96.58%	91.22%
Acceptance	Bribe not accepted	12.29%	3.42%	8.78%
Prescription	Optimal	53.82%	82.12%	67.76%
(Total)	Non-optimal	46.18%	17.88%	32.24%

Table 3.3: Overview of the Decisions

about the prescribed pharmaceutical. The non-optimal pharmaceutical was prescribed 216 times. In nearly half of the cases, the Physician was bribed and the majority of Physicians accepted an offered bribe. In total, the prescriptions differ between the partner treatment and the stranger treatment. But also the number of accepted bribes differs between the two treatments: In the partner treatment less Physicians accept an offered bribe (see Table 3.3).

	Prescriptions	Partner	Stranger	Total
No bribe	Optimal	86.34%	94.84%	91.18%
offered	Non-optimal	13.66%	5.16%	8.81%
Bribe	Optimal	100%	100%	100%
rejected	Non-optimal	0%	0%	0%
Bribe	Optimal	14.01%	57.52%	32.22%
accepted	Non-optimal	85.99%	42.48%	67.78%

Table 3.4: Overview of the Prescriptions

For the physicians' prescription decisions we provide the data for the cases in which no bribe was offered, a bribe was offered and rejected and a bribe was offered and accepted in Table 3.4. We can see directly that Physicians that rejected a bribe will not prescribe a non-optimal pharmaceutical (see Table 3.4)

	Partner	Stranger	Total Sample	Min	Max
Altruism1	7.76	8.18	7.97	0	10
Altruism2	151.69	118.64	135.41	0	1000
Positive Reciprocity1	15.54	16.5	16.01	0	80
Positive Reciprocity2	18.09	18.79	18.43	5	30
Negative Reciprocity1	5.49	5.14	5.31	0	10
Negative Reciprocity2	42.07	40.92	41.51	0	100

Table 3.5: Overview of the Behavioral Characteristics

After the experiment, the subjects filled out a questionnaire based on the preference survey from Falk et al. (2016), with focus on altruism and reciprocity to analyze their

underlying behavioral motivations. Table 3.5 presents the mean-values, as well as the maximum and minimum values of the characteristics for each question and each treatment.

3.3.2 **Results on Corruption**

Now we analyze our data with respect to our previously presented hypotheses. We start with an analysis of the Physician's prescriptions. Thereby we focus on the influence of a bribe. The data is represented in Table 3.6.

	Optimal	Non-optimal	Total
Bribe not offered	341	33	374
Bribe rejected	26	0	26
Bribe accepted	87	183	270
Total	454	216	670

Table 3.6: The Physicians' Prescriptions

In cases in which no bribe was offered, only 8.82% of the Physicians decide to prescribe a non-optimal pharmaceutical. In contrast, 67.78% of all Physicians who accepted a bribe prescribe the non-optimal pharmaceutical. Physicians that reject a bribe never prescribed the non-optimal pharmaceutical. With the help of the χ^2 -test we can see that Physicians prescribe the non-optimal pharmaceutical significantly more often in cases in which they accepted a bribe than in cases in which no bribe was offered ($\chi^2 = 244.4860$, p = 0.000) or in cases in which they rejected the bribe ($\chi^2 = 46.1609$, p = 0.000). There is a significant difference in the prescription behavior in cases in which the Physician was successfully bribed. Therefore, we cannot reject Hypotheses 3.1.A and 3.1.B.

Result 3.1. *Physicians that accepted a bribe prescribe the non-optimal pharmaceutical significantly more often than other Physicians.*

Table 3.6 shows that all Physicians who rejected a bribe, prescribed the optimal pharmaceutical. Looking at the rejections in detail, Physicians rejected the bribe 22 times in the partner treatment and 4 times in the stranger treatment. In both treatments they never rejected the bribe and prescribed the non-optimal treatment. A rejection of the bribe leads to an optimal prescription. Thus, we cannot reject our second Hypothesis.

Result 3.2. *Physicians that rejected a bribe, prescribe always the optimal pharmaceutical.*

Now we shed light on the differences between the two treatments. We assume that the partner treatment strengthens the relationship and therefore increases the reciprocity between Physician and Briber. Thus, we expect more successful corrupt acts in the partner treatment in comparison to the stranger treatment, as stated in Hypothesis 3.3.A. A corrupt act is successful in all cases in which a bribe is offered and accepted and subsequently the non-optimal pharmaceutical is prescribed. Concurrently, we define all other outcomes

Corrupt Act	Partner	Stranger	Total
Unsuccessful	205	282	487
Successful	135	48	183
Total	340	330	670

Table 3.7: Successful Corrupt Acts

as unsuccessful corrupt acts. The following Table 3.7 depicts the corrupt acts across treatments.

Looking at both treatments, the corrupt act is successful in 27.31% of all cases. In the partner treatment the corrupt act is successful in 39.71% of all cases, in the stranger treatment only in 14.55%. We find that there are significantly more successful corrupt acts in the partner treatment than in the stranger treatment ($\chi^2 = 53.3978$, p = 0.000).

Result 3.3.A. *There are significantly more successful corrupt acts in the partner treatment than in the stranger treatment.*

As a successful corrupt act contains three elements - bribing, accepting the bribe and prescribing the non-optimal pharmaceutical, we shed light separately on every element of the corrupt act. First we look at the bribing and bribe-accepting behavior in Table 3.8.

		Partner	Stranger	Total
Total	Bribe not offered	161	213	374
Total	Bribe offered	179	117	296
Bribe	not accepted	22	4	26
offered	accepted	157	113	270

Table 3.8: Number of Offered and Accepted Bribes

In the partner treatment, the Bribers offer a bribe in 52.65% of all cases. In the stranger treatment they offer a bribe in only 35.45% of the cases. The χ^2 -test shows a significant difference between the number of offered bribes in the partner treatment and the stranger treatment ($\chi^2 = 20.0717$, p = 0.000). We cannot reject Hypothesis 3.3.B.

Result 3.3.B. *Bribers offer significantly more bribes in the partner treatment than in the stranger treatment.*

Now we look at the second element of a corrupt act: the acceptance of a bribe. In the partner treatment, Physicians accept an offered bribe in 87.71% of all cases, and in 96.58% of all cases in the stranger treatment. The Fisher's exact test shows that this difference is significant (p = 0.010). This result is contrary to our hypothesis and we have to reject Hypothesis 3.3.C. By accepting a bribe, the Physician can have the feeling to be forced to reciprocate the offered bribe by prescribing a non-optimal treatment. Physicians that do not want to prescribe a non-optimal treatment reject an offered bribe so that they do

not feel any obligation to return a benefit to the briber. Especially in the partner treatment, where Briber and Physician play together for the whole experiment and know each others decisions, Physicians reject an offered bribe more often to avoid any kind of liability to the Briber.

Result 3.3.C. *Physicians accept significantly more offered bribes in the stranger treatment than in the partner treatment.*

	Prescriptions	Partner	Stranger	Total
Total	Optimal	183	271	454
Total	Non-optimal	157	59	216
Bribe	Optimal	22	65	87
accepted	Non-optimal	135	48	183

Table 3.9: Optimal and Non-Optimal Prescriptions

After an accepted bribe, the last step for a successful corrupt act is the prescription of the non-optimal pharmaceutical. Table 3.9 shows the total optimal and non-optimal prescriptions and the prescriptions in cases in which a bribe was accepted. In total, in the partner treatment, Physicians prescribe the non-optimal pharmaceutical in 46.18% of the cases and in the stranger treatment in 17.88% of the cases. Independent of an accepted bribe, the number of non-optimal prescriptions is significantly higher in the partner treatment in comparison to the stranger treatment ($\chi^2 = 61.3847$, p = 0.000). Next, we focus on the prescriptions of Physicians who accepted a bribe: In the partner treatment, these Physicians prescribe the non-optimal pharmaceutical in 85.99% of all cases, and in the stranger treatment only in half of the cases, in 42.48%. The χ^2 -test shows a significant difference ($\chi^2 = 56.9557$, p = 0.000) and we cannot reject Hypothesis 3.3.D.

Result 3.3.D. *Physicians who accepted a bribe, prescribe the non-optimal pharmaceutical significantly more often in the partner treatment than in the stranger treatment.*

3.3.3 Analysis of Underlying Behavioral Motivations

Now we start analyzing our data with regard to the subjects' underlying behavioral motivations. In a first step we had to specify an altruistic, a positive and a negative reciprocal physician. Therefore, we calculated the mean values of each characteristic for each question from the Preference Survey Module of Falk et al. (2016) (see Table 3.5). In our experiment, a Physician is altruistically motivated if he has an above-average score in both of the questions regarding altruism. A Physician is positive reciprocally motivated if he has an above-average score in both questions regarding positive reciprocity and is negative reciprocally motivated if he has an above-average score in both questions regarding negative reciprocity. We use both measures, the qualitative and the quantitative, to consider

Characteristic	Briber	Physician	Total
Altruism	17	22	39
Positive Reciprocity	17	14	31
Negative Reciprocity	20	19	39

Table 3.10: Above-Average Behavioral Motivations

the subjective self-assessment and the observed quantitative result. Table 3.10 gives an overview of the above-average behavioral motivations of all participants.

First we take a look at the behavioral characteristics of the 67 Bribers: 25.37% of the Bribers have an above-average positive reciprocal motivation, 29.85% have an above-average negative reciprocal motivation and 25.37% have an above-average altruistic motivation. From the 67 Physicians, 20.89% show an above-average positive reciprocal motivation and 32.84% show an above-average altruistic motivation. The χ^2 -test shows no significant difference in the distribution of the characteristics between the two roles, Briber and Physician.

Table 3.11 shows that the 22 Physicians with an above-average altruistic motivation receive a bribe offer 91 times (41.36%). They accept the bribe in 90.11% of the cases. Physicians that do not have an above-average altruistic motivation accept it in 91.71% of the cases. Thus, we cannot find any significant difference in the bribe acceptance behavior for altruistic physicians ($\chi^2 = 0.2007$, p = 0.654).

		below-average altruism	above-average altruism	Total
Total Bribe	Bribe rejected	17	9	26
Acceptance	Bribe accepted	188	82	270
Total	Optimal	303	151	454
Prescriptions	Non-optimal	147	69	216
Prescriptions if	Optimal	58	29	87
Bribe accepted	Non-optimal	130	53	183

Tabl	le 3	3.1	1:	Be	havior	of	A	ltrui	istic	Ph	ysici	ians

Looking at the prescriptions of altruistic Physicians, we also do not find any significant difference between altruistic Physicians and other Physicians ($\chi^2 = 0.1148$, p = 0.735). 31.36% of the Physicians with an above-average altruistic motivations and 32.67% of the Physicians with a below-average altruistic motivation prescribe a non-optimal pharmaceutical. After accepting a bribe, the altruistic Physicians prescribe the non-optimal pharmaceutical in 64.63% of the cases and the non-altruistic Physicians in 69.15% of the cases. There is also no significant difference in the prescription behavior of these Physicians after accepting a bribe ($\chi^2 = 0.5329$, p = 0.465).
Result 3.4.A. There is no significant difference in the amount of accepted bribes for *Physicians with an above-average altruistic motivation and Physicians with a below-average altruistic motivation.*

Result 3.4.B. There is no significant difference in the prescription behavior of Physicians with an above-average altruistic motivation and Physicians with a below-average altruistic motivation.

Out of 67 Physicians, 14 Physicians show an above-average positive reciprocal motivation. In total, they decide 140 times about the Patients' prescriptions and prescribe a non-optimal pharmaceutical in 19.29% of the cases. We focus on the prescriptions in which a bribe was offered and accepted. Table 3.12 shows that these Physicians were bribed 49 times, accepted the bribe in 83.67% of the cases and rejected it in 16.33% of the cases. There is a significant difference in the bribe acceptance behavior between positive reciprocal Physicians and other Physicians ($\chi^2 = 4.1696$, p = 0.041).

		below-average positive reciprocity	above-average positive reciprocity	Total
Total Bribe	Bribe rejected	18	8	26
Acceptance	Bribe accepted	229	41	270
Total	Optimal	341	113	454
Prescriptions	Non-optimal	189	27	216
Prescriptions if	Optimal	72	15	87
Bribe accepted	Non-optimal	157	26	183

Table 3.12: Behavior of Positive Reciprocal Physicians

Next we look at the prescriptions of Physicians that accepted a bribe. Physicians with an above-average positive reciprocal motivation that accepted a bribe prescribe the non-optimal pharmaceutical in 63.41% of the cases. Physicians with a below-average positive reciprocal motivation prescribe the non-optimal pharmaceutical in 68.56% of the cases. There is no significant difference in the prescription behavior of these Physicians ($\chi^2 = 0.4214$, p = 0.516).

Result 3.5.A. *Physicians with an above-average positive reciprocal motivation accept fewer bribes than Physicians with a below-average positive reciprocal motivation.*

Result 3.5.B. There is no significant difference in the prescription behavior between Physicians who accepted a bribe and have an above-average positive reciprocal motivation or a below-average positive reciprocal motivation.

Table 3.13 shows that the 19 Physicians who have an above-average negative reciprocal motivation were bribed 82 times and accepted the bribe in 89.02% of the cases. Physicians with a below-average negative reciprocal motivation accepted a bribe in 92.06% of the

		below-average negative reciprocity	above-average negative reciprocity	Total
Total Bribe	Bribe rejected	17	9	26
Acceptance	Bribe accepted	197	73	270
Total	Optimal	321	133	454
Prescriptions	Non-optimal	159	57	216
Prescriptions if	Optimal	65	22	87
Bribe accepted	Non-optimal	132	51	183

Table 3.13: Behavior of Negative Reciprocal Physicians

cases. There is no significant difference in the amount of accepted bribes between these Physicians ($\chi^2 = 0.6801$, p = 0.410).

Now we shed light on the prescriptions of Physicians that accepted a bribe. Comparing the prescription behavior between Physicians with an above-average reciprocal motivation and Physicians with a below-average negative reciprocal motivation, we cannot find any significant difference. 67.01% of the Physicians with an below-average negative reciprocal motivation and 69.86% of the Physicians with an above-average negative reciprocal motivation prescribe a non-optimal pharmaceutical ($\chi^2 = 0.1992$, p = 0.655).

Result 3.6.A. There is no significant difference in the amount of accepted bribes for Physicians with an above-average negative reciprocal motivation and Physicians with a below-average negative reciprocal motivation.

Result 3.6.B. There is no significant difference in the prescription behavior of Physicians that accepted a bribe and have an above-average negative reciprocal motivation or a below-average negative reciprocal motivation.

Against our assumption, we do not find any differences in the behavior of the subjects with regard to their behavioral preferences. Neither the bribe acceptance nor the prescription behavior is significantly different for subjects with an above- or below-average altruistic or reciprocal motivation. Only Physicians with an above-average positive reciprocal motivation accept fewer bribes than other Physicians. The questions of the Preference Survey Module of Falk et al. (2016) do only measure a subject's general preferences. It is not possible to measure the relative preferences, especially the relative reciprocity between Physician and Briber compared to the relative reciprocity between Physician and Patient. But we do find differences between our treatments. A stronger reciprocity between Briber and Physician increases the number of successful corrupt acts. Bribery also influences the Physicians' prescriptions so that more non-optimal pharmaceuticals are prescribed.

3.4 Conclusion

We conducted an experiment to analyze the influence of reciprocity on a Physician's decision of medical treatment, using a partner design and a stranger design to vary the intensity of the relationships. Our results show that a change of the relative relationships between Physician and Briber has an influence on the Physician's prescription. In the partner treatment nearly all Physicians who accept a bribe prescribe the non-optimal pharmaceutical. In contrast, in the stranger treatment less than half of the Physicians that accept a bribe prescribe the non-optimal pharmaceutical. Comparing both treatments, in the partner treatment, the corrupt act is successful more often than in the stranger treatment.

Analyzing the Physician's relative relationships (and therefore his relative reciprocity) towards the Briber, we can say that in the partner treatment his relative relationship to the Briber is stronger than in the stranger treatment. In the partner treatment, a bribery relationship based on reciprocity can be established. Our treatments show the following: A stronger relationship to the Briber leads to more successful corrupt acts.

Across treatments, Physicians who accept a bribe are more likely to prescribe a patient-non-optimal pharmaceutical than Physicians to whom no bribe is offered. However, Physicians who reject an offered bribe will not prescribe a non-optimal pharmaceutical.

We also measured the behavioral characteristics of the participants. However, we find no significant differences in the participants' behavior with regard to their behavioral preferences. In our experiment we can only find differences in the behavior of the subjects between the partner treatment and the stranger treatment. Nevertheless, it is not possible to identify a different behavior of subjects that have a general reciprocal motivation measured with the Preference Survey Module of Falk et al. (2016). In our experiment we measure the relative reciprocity of a Physician towards a Patient and a Briber with the help of the different treatments. To our knowledge there does not exists a questionnaire to measure relative reciprocity.

Our experiment shows that the reciprocal relationship between a physician and a pharmaceutical company will increase the probability for non-optimal prescription. Therefore, a starting point to reduce corrupt behavior in the health care sector might be a regulation of the relationships between physicians and pharmaceutical companies. As the new law in Germany (§299a and §299b StGB, Germany) focuses not only on punishing physicians, now also pharmaceutical companies can be punished for offering a bribe. Future research can analyze the influence of penalties on a physician's treatment decision.

3.5 Appendix

3.5.A Questions from the Preference Survey Module

3.5.A.1 English Version

This is the English version of the questions of "The Preference Survey Module" from Falk et al. (2016) regarding the characteristics altruism, positive and negative reciprocity.

Altruism

- Imagine the following situation: You won 1,000 Euro in a lottery. Considering your current situation, how much would you donate to charity? (Values between 0 and 1,000 are allowed)
- 2. How do you assess your willingness to share with others without expecting anything in return when it comes to charity? Please use a scale from 0 to 10, where 0 means you are "completely unwilling to share" and a 10 means you are "very willing to share". You can also use the values in between to indicate where you fall on the scale.

Positive Reciprocity

- 1. Please consider the following situation:
 - You and another person, whom you do not know, both participate in a study where you can decide on how to assign a certain amount of money and thereby determine the outcome. The rules are as follows. Both participants get an account with 20 Euros. At the beginning, both participants thus own 20 Euros. The other person decides first. She can transfer money to your account. She can transfer any amount: 0, 1, 2 Euro, etc. up to 20 Euro. Each Euro that she transfers to you is tripled by the conductors of the study and booked to your account. After this first stage the other person therefore has 20 Euro minus the amount she transferred to you in her account. You have 20 Euro plus the tripled amount of the transfer of the other person on your account. Now you get to decide: you have the opportunity to transfer money back to the other person. You can transfer any amount up to 80 Euro, depending on how much you have in your account. This will be the end of the study and the account balances will be final. The other person has in her account 20 Euros minus the amount she transferred to you plus the amount you transferred back. You have 20 Euro plus the tripled amount of what the other person transferred to you minus the amount you transferred back to her. We would like to know how much you

would choose to transfer back to the other person, for a given transfer of her to you. Suppose the other person transfers 5(10/15/20) Euro to your account. After the first stage you then own 20+3*5(10/15/20)=35(50/65/80) Euro, the other person owns 20-5(10/15/20)=15(10/5/0) Euro. What amount do you choose to transfer back?

2. Imagine the following situation:

You are shopping in an unfamiliar city and realize you lost your way. You ask a stranger for directions. The stranger offers to take you with this car to your destination. The ride takes about 20 minutes and costs the stranger about 20 Euro in total. The stranger does not want money for it. You carry six bottles of wine with you. The cheapest bottle costs 5 Euro, the most expensive one 30 Euro. You decide to give one of the bottles to the stranger as a thank-you gift. Which bottle do you give? Respondents can choose from the following options: The bottle for (5, 10, 15, 20, 25, or 30 Euro).

Negative Reciprocity

- 1. How do you see yourself: Are you a person who is generally willing to punish unfair behavior even if this is costly? Please use a scale from 0 to 10, where 0 means you are "not willing at all to incur costs to punish unfair behavior" and a 10 means you are "very willing to incur costs to punish unfair behavior". You can also use the values in-between to indicate where you fall on the scale.
- 2. Imagine the following situation:

Together with a person, whom you do not know, you won 100 Euro in a lottery. The rules stipulate the following: One of you has to make a proposal about how to divide the 100 Euro between you two. The other one gets to know the proposal and has to decide between two options. He or she can accept the proposal or reject it. If he or she accepts the proposal, the money is divided according to the proposal. If he or she rejects the proposal, both receive nothing. How much must the other person offer you so that you accept the proposal?

3.5.A.2 German Version

This is the German version of the questions of "The Preference Survey Module" from Falk et al. (2016) regarding the characteristics altruism, positive and negative reciprocity.

Altruismus

- Wie schätzen Sie Ihre Bereitschaft mit anderen zu teilen, ohne dafür eine Gegenleistung zu erwarten, in Bezug auf den folgenden Bereich ein: Wenn es um gemeinnützige Zwecke geht? Bitte klicken Sie ein Kästchen auf der Skala an, wobei der Wert 0 bedeutet "gar nicht bereit zu teilen ohne eine Gegenleistung zu erwarten" und der Wert 10 bedeutet "sehr bereit zu teilen ohne eine Gegenleistung zu erwarten". Mit den Werten dazwischen können Sie ihre Einschätzung abstufen.
- Stellen Sie sich folgende Situation vor: Sie haben in einem Preisausschreiben 1.000 Euro gewonnen. Wie viel würden Sie in Ihrer momentanen Situation für einen gemeinnützigen Zweck spenden? (Werte zwischen 0 und 1000 Euro sind erlaubt)

Positive Reciprozität

- 1. Überlegen Sie bitte, was Sie in folgender Situation tun würden:
 - Sie und eine andere Person, die Sie nicht persönlich kennen, treffen beide eine Entscheidung über die Verwendung von Geld und erzielen zusammen ein Ergebnis. Die Regeln gehen so: Jeder Teilnehmer erhält ein Konto mit 20 Euro. Am Anfang haben Sie und die andere Person also jeweils 20 Euro auf dem Konto. Zuerst entscheidet die andere Person. Sie kann Ihnen Geld auf Ihr Konto überweisen. Sie kann Ihnen einen beliebigen Eurobetrag überweisen, also 0 Euro, 1 Euro, 2 Euro usw. bis 20 Euro. Jeder Euro, den die andere Person an Sie überweist, wird von den Leitern der Studie verdreifacht und Ihrem Konto gutgeschrieben. Nach dem ersten Schritt sind also auf dem Konto der anderen Person 20 Euro minus der Überweisung an Sie. Auf Ihrem Konto sind 20 Euro plus dem Dreifachen der Überweisung an Sie. Jetzt entscheiden Sie: Sie haben die Möglichkeit, der anderen Person Geld zurück zu überweisen. Sie können jeden beliebigen Eurobetrag zurück überweisen, also 0, 1, 2, 3, usw. bis 80 Euro, je nachdem, wie viel Geld Sie insgesamt auf Ihrem Konto gutgeschrieben haben, nachdem Sie die Überweisung der anderen Person erhalten haben. Damit ist die Studie beendet. Die endgültigen Kontostände sind erreicht. Auf dem Konto der anderen Person sind jetzt 20 Euro minus der Überweisung an Sie plus Ihrer Rücküberweisung. Auf Ihrem Konto sind jetzt 20 Euro plus das Dreifache der Überweisung an Sie minus Ihrer Rücküberweisung. Wir möchten nun von Ihnen wissen, welche Rücküberweisung Sie wählen würden, wenn die andere Person Ihnen einen bestimmten Betrag überweist. Angenommen, die andere Person überweist Ihnen 5(10/15/20) Euro. Sie haben dann nach dem

ersten Schritt 20+3*5(10/15/20)=35(50/65/80) Euro, die andere Person hat 20-5(10/15/20)=15(10/5/0) Euro. Wie hoch ist Ihre Rücküberweisung?

2. Stellen Sie sich die folgende Situation vor:

Sie sind in einer Ihnen fremden Stadt einkaufen und haben sich verlaufen. Sie fragen einen Fremden nach dem Weg, der Ihnen anbietet, Sie in seinem Auto zu Ihrem Zielort zu fahren. Dafür bräuchten Sie 20 Minuten Fahrzeit und es würde den Fremden 20 Euro kosten. Der Fremde möchte kein Geld dafür. Sie haben 6 Flaschen Wein bei sich. Die günstigste Flasche kostet 5 Euro, die teuerste 30 Euro. Sie beschließen, dem Fremden als "Danke-Schön" eine Flasche Wein zu geben. Welche Flasche schenken Sie ihm? Die Flasche für 5, 10, 15, 20, 25, oder 30 Euro?

Negative Reciprozität

 Sind Sie jemand, der im Allgemeinen bereit ist, unfaires Verhalten zu bestrafen, auch wenn das für Sie mit Kosten verbunden ist? Bitte klicken Sie ein Kästchen auf der Skala an, wobei der Wert 0 bedeutet "gar nicht bereit Kosten auf sich zu nehmen um zu bestrafen", und der Wert 10 bedeutet "sehr bereit Kosten auf sich zu nehmen um zu bestrafen". Mit den Werten dazwischen können Sie ihre Einschätzung abstufen.

2. Stellen Sie sich folgende Situation vor:

Zusammen mit einer anderen Person, die Sie nicht persönlich kennen, haben Sie 100 Euro bei einem Preisausschreiben gewonnen. Die Regeln besagen nun Folgendes. Einer von Ihnen soll einen Vorschlag darüber machen, wie die 100 Euro aufgeteilt werden. Der andere erfährt den Vorschlag, und hat dann zwei Möglichkeiten. Er kann die Aufteilung annehmen oder ablehnen. Wenn er den Vorschlag annimmt, wird das Geld so aufgeteilt, wie die andere Person es vorgeschlagen hat. Wird die Aufteilung abgelehnt, gehen beide leer aus. Angenommen, die andere Person macht einen Vorschlag über die Aufteilung. Sie wiederum sollen entscheiden, ob Sie den Vorschlag annehmen oder ablehnen. Welchen Betrag muss die andere Person Ihnen mindestens anbieten, damit Sie bereit sind, den Vorschlag über die Aufteilung anzunehmen?

3.5.B Instructions

These are the original and translated instructions for the subjects that participated in our experiment. The instructions are different for the partner treatment and the stranger treatment as well as for the physician and pharmaceutical company. We marked it with (1) for partner treatment and (2) for the stranger treatment. All text without notation was presented in both treatments. The first two parts "General information" and "Experimental Setup" are equal in both treatments and for both roles.

3.5.B.1 English Instructions

Welcome to the experiment!

General information

- During the experiment all amounts are indicated by the fictive currency "Taler".
- The payoff depends on both your own decisions and the decisions of the other players.
- During the experiment you generate payments for the charity organization "*Doctors Without Borders*". These payments are donated once the session has ended. The donation receipt is accessible at the BaER-Lab homepage https://wiwi.uni-paderborn.de/forschung/ forschungszentren/baer-lab-business-and-economic-research-laboratory/ as from 08.02.2017. The total amount donated to the charity organization also depends on both your decisions and the decisions made by the other players throughout the experiment.
- Once the experiment has finished you are asked to fill in a questionnaire. You will receive a brief instruction beforehand. Your answers in the questionnaire do not impact the payoffs you generate during the experiment.
- The following instructions contain all necessary information for the implementation of the experiment. Please carefully read the instructions and raise your hand if there are any questions.
- Please be quiet, switch off your mobile phones, and do not talk to other participants throughout the course of the experiment.
- The currency Taler is exchanged at a rate of 10 Taler = 0.25 Euro. Your generated payoff and the show-up fee of 2.50 Euro is paid out to you in cash.

Experimental setup

- This experiment is about physicians' therapy decisions.
- Generally, there are three roles in this experiment: The role of the patient, the role of the pharmaceutical company representative and the role of the physician. Each participant is randomly assigned the role of the physician or company representative. The role of the patient will not be assigned during this laboratory based experiment. The patients' utility depends on the prescribed pharmaceutical and is represented by the donation made to the charity organization "Doctors Without Borders".
- During the experiment teams are randomly composed of one company representative and one physician each.
 - (1) Assigned teams play together over the entire session.
 - (2) Teams will be randomly recomposed after each round.
- The payoffs during the experiment are impacted by the decisions of the company representative and the physician.
- The experiment lasts at most 15 rounds of playing and is randomly terminated between rounds 10 and 15. The first 10 rounds will definitely be played. Afterwards, the experiment is terminated with a probability of 20% in each of the subsequent rounds.
- At the end of the experiment one participant is randomly selected to come forward and draw 2 numbers from a bag. These two numbers determine the periods that will be paid out at the end.

These are the instructions for the pharmaceutical agent.

Your role in the experiment

- You were randomly assigned the role of the **company representative** for the entire length of the experiment.
 - (1) Furthermore, you have been allocated to one physician with whom you will interact for the entire experiment.
 - (2) In every round of the experiment you will interact with another physician.
- The physicians' task is to prescribe pharmaceutical to the patient. He/She can choose between pharmaceutical A and pharmaceutical B. Both pharmaceuticals are produced by your company.
- For the patient the different pharmaceuticals differ in the length of healing process required. Pharmaceutical A promises a quicker recovery than pharmaceutical B. Therefore, the patients' utility from receiving pharmaceutical A is higher than that achieved through the prescription of pharmaceutical B.
- For your company the pharmaceuticals differ in their production costs. Pharmaceutical A is more cost-intensive than B. Hence, the utility achieved by your company is higher for the prescription of pharmaceutical B when compared to pharmaceutical A.
- You have a possibility to offer a present to the physician for the prescription of pharmaceutical B **before** the physician has decided which pharmaceutical to prescribe. If you offer a present, the physician may accept or reject it.
- The physicians' decision regarding which pharmaceutical to prescribe is **independent** of the acceptance of the present.

Experimental procedure

1. Decision - Pharmaceutical company representative:

- You decide whether to offer a present to the physician or not.
 - Offer a present
 - Do not offer a present

2. Decision - Physician:

- If you have offered a present to the physician, then he/she can decide whether to accept or reject the present.
 - Acceptance of the present
 - Rejection of the present
- If you have not offered a present to the physician, he/she proceeds directly with the following decision:

3. Decision - Physician:

- **Independent** of the first decision the physician now decides which pharmaceutical to prescribe to the patient.
 - Prescription of pharmaceutical A
 - Prescription of pharmaceutical B
- After each therapy decision (and hence after each round) the physician and you are informed regarding the decisions made by the other players. The physicians' payoff, your own payoff, and the patients' payoff for the respective round are also reported.
- (1) You interact with the same physician each round. He/She knows your decisions and your payoffs from the prior round.
- (2) Subsequently, you will be assigned to another physician. He/She does not know your decisions nor your payoffs from the prior round. In each round you will interact with a new physician.

Payoffs

Payoff for the patient:

• The patients' payoff is represented by a donation to *Doctors Without Borders* and depends on your decisions.

Summary for the patient:

- Prescription of pharmaceutical A: Donation amount of 20 Taler
- Prescription of pharmaceutical B: Donation amount of 15 Taler

Payoff for the physician:

- The physician receives a basic payment of 20 Taler for every patient he/she treats.
- Furthermore, you have the option to offer a present to the physician. If he/she accepts the present 15 Taler are credited to the physicians' account. The present has a cost of 5 Taler for your company.

Summary for the physician:

- No offer of a present or rejection of offered present: 20 Taler
- Acceptance of the offered present: 35 Taler

Payoff for the company representative:

- You always receive additional 15 Taler when pharmaceutical B is prescribed instead of pharmaceutical A. You receive 22 Taler if pharmaceutical A is prescribed and 37 Taler if pharmaceutical B is prescribed.
- You have the possibility to offer a present to the physician to increase influence his tendency to the prescription of pharmaceutical B.
- The present has an additional cost of 5 Taler for your company. Accepting the offered the present, 15 Taler are credited to the physician's account.

Summary for the company representative:

- No offer of a present or rejection of an offered present by the physician:
 - Prescription of pharmaceutical A: 22 Taler
 - Prescription of pharmaceutical B: 37 Taler
- Offer of a present and acceptance by the physician:
 - Prescription of pharmaceutical A: 17 Taler
 - Prescription of pharmaceutical B: 32 Taler

Thank you for your participation!

These are the instructions for the physician.

Your role in the experiment

- You were randomly assigned the role of the **physician** for the entire length of the experiment.
 - (1) Furthermore, you have been allocated to one company representative with whom you will interact for the entire experiment.
 - (2) In every round of the experiment you will interact with another company representative.
- Your task is to prescribe a pharmaceutical to the patient. You can choose between pharmaceutical A and pharmaceutical B. Both pharmaceuticals are produced by the company.
- For the patient the different pharmaceuticals differ in the length of healing process required. Pharmaceutical A promises a quicker recovery than pharmaceutical B. Therefore, the patients' utility from receiving pharmaceutical A is higher than that achieved through the prescription of pharmaceutical B.
- For the company the pharmaceuticals differ in their production costs. Pharmaceutical A is more cost-intensive than B. Hence, the utility achieved by the company is higher for the prescription of pharmaceutical B when compared to pharmaceutical A.
- There is a possibility that the company representative offers you a present for the prescription of pharmaceutical B **before** you have decided which pharmaceutical to prescribe. If you are offered a present by the company representative, you may accept or reject it.
- Your prescription decision is **independent** of the acceptance of the present.

Experimental procedure

1. Decision - Pharmaceutical company representative:

- The company representative decides whether to offer a present to the physician or not.
 - Offer a present
 - Do not offer a present

2. Decision - Physician:

- Possibly, you are offered a present by the company representative. Then, you can decide whether to accept or reject the present.
 - Acceptance of the present
 - Rejection of the present
- If you are not offered a present by the company representative, you should directly proceed to the following decision:
- **3. Decision Physician:**
- **Independent** of the first decision, you now decide which pharmaceutical to prescribe to the patient:
 - Prescription of pharmaceutical A
 - Prescription of pharmaceutical B
- After each therapy decision (and hence after each round) you and the company representative are informed regarding the decisions made by the other players. The company representative's payoff, your own payoff, and the patient's payoff for the respective round are also reported.
- (1) You interact with the same company representative each round. He/She knows your decisions and your payoffs from the prior round.
- (2) Subsequently, you will be assigned to another company representative. He/She does not know your decisions nor your payoffs from the prior round. In each round you will interact with a new company representative.

Payoffs

Payoff for the patient:

• The patients' payoff is represented by a donation to *Doctors Without Borders* and depends on your decisions.

Summary for the patient:

- Prescription of pharmaceutical A: Donation amount of 20 Taler
- Prescription of pharmaceutical B: Donation amount of 15 Taler

Your payoff:

- You receive a basic payment of 20 Taler for every patient you treat.
- Furthermore, the company representative may offer you a present. If you accept the present 15 Taler are credited to your account. The present has a cost of only 5 Taler for the company representative.

Summary for the physician:

- No offer of a present or rejection of offered present: 20 Taler
- Acceptance of offered present: 35 Taler

Payoff for the company representative:

- The company representative always receives 15 Taler more when pharmaceutical B is prescribed instead of pharmaceutical A. He/She receives 22 Taler if pharmaceutical A is prescribed and 37 Taler if pharmaceutical B is prescribed.
- The company representative has the possibility to offer you a present to increase your inclination towards the prescription of pharmaceutical B.
- The present has an additional cost of 5 Taler for the company representative. Accepting the offered the present, 15 Taler are credited to your account.

Summary for the company representative:

- No offer of a present or rejection of an offered present by the physician:
 - Prescription of pharmaceutical A: 22 Taler
 - Prescription of pharmaceutical B: 37 Taler
- Offer of a present and acceptance by the physician:
 - Prescription of pharmaceutical A: 17 Taler
 - Prescription of pharmaceutical B: 32 Taler

Thank you for your participation!

3.5.B.2 German Instructions

Herzlich Willkommen zum Experiment!

Allgemeine Informationen

- Während des Experiments werden alle Beträge in der fiktiven Währung "Taler" angegeben.
- Die Höhe der Auszahlungen ist abhängig von Ihren Entscheidungen und den Entscheidungen Ihrer Mitspieler.
- Außerdem generieren Sie Auszahlungen an die gemeinnützige Organisation Ärzte ohne Grenzen. Diese Auszahlungen werden nach Ende des Experiments direkt an Ärzte ohne Grenzen gespendet. Der Spendenbeleg ist auf der Homepage des BaER-Lab unter https://wiwi.uni-paderborn.de/forschung/ forschungszentren/baerlab-business-and-economic-research-laboratory/ ab dem 08.02.2017 einzusehen. Der Betrag, der an Ärzte ohne Grenzen überwiesen wird, ist ebenfalls von Ihren Entscheidungen und den Entscheidungen der Mitspieler im Experiment abhängig.
- Nach Ende des Experiments bitten wir Sie noch einen Fragebogen auszufüllen. Sie erhalten hierzu eine kurze Anleitung, sobald das Experiment beendet ist. Ihre Antworten in diesem Fragebogen haben keinen Einfluss auf Ihre Auszahlung in diesem Experiment.
- Die vorliegenden Instruktionen beinhalten alle notwendigen Informationen für das Experiment. Bitte lesen Sie die Instruktionen aufmerksam und heben Sie bei Fragen die Hand.
- Bitte verhalten Sie sich während des Experiments ruhig, schalten Sie Ihr Handy aus und kommunizieren Sie nicht mit anderen Teilnehmern.
- Die Währung "Taler" wird zu einem Wechselkurs von 10 Talern = 0,25 Euro umgetauscht und zusammen mit der Show-Up Fee von 2,50 Euro bar an Sie ausgezahlt.

Aufbau des Experiments

- Dieses Experiment beschäftigt sich mit der ärztlichen Therapieentscheidung.
- Generell gibt es drei Rollen in diesem Experiment: Die Rolle des Patienten, die Rolle des Unternehmensvertreters und die des Arztes. Jeder Teilnehmer im Labor wird zufällig in die Rolle des Arztes oder des Unternehmensvertreters eingeteilt. Der Patient ist keine im Labor anwesende Person. Der Nutzen des Patienten ist vom verschriebenen Medikament abhängig und wird als Spende an die Hilfsorganisation *Ärzte ohne Grenzen* ausgezahlt.
- Im Experiment werden zufällig Teams aus je einem Unternehmensvertreter und einem Arzt gebildet. Diese Teams
 - (1) spielen für die gesamte Dauer des Experiments miteinander.
 - (2) wechseln in jeder Runde.
- Die Auszahlungen im Experiment werden von den Entscheidungen des Unternehmensvertreters und des Arztes beeinflusst.
- Das Experiment dauert maximal 15 Runden. Es wird zufällig zwischen Runde 10 und 15 beendet. Die ersten 10 Runden werden definitiv gespielt, danach wird das Experiment pro Runde mit einer Wahrscheinlichkeit von 20% beendet.
- Am Ende des Experiments wird zufällig ein Teilnehmer ausgewählt. Dieser kommt nach vorne und zieht blind aus einem Beutel zwei Zahlen. Die Zahlen bestimmen die beiden Perioden die am Ende ausgezahlt werden.

Dies sind die Instruktionen für den Unternehmensvertreter.

Ihre Rolle im Experiment

- Für das komplette Experiment wurde Ihnen zufällig die Rolle des Unternehmensvertreters zugewiesen. Sie treffen im gesamten Experiment
 - (1) immer auf **denselben** Arzt.
 - (2) in jeder Runde auf einen neuen Arzt.
- Die Aufgabe des Arztes ist dem Patienten ein Medikament zu verschreiben. Er hat die Wahl zwischen Medikament A oder Medikament B. Beide Medikamente werden von Ihrem Unternehmen produziert.
- Für den Patienten unterscheiden sich die Medikamente nur in ihrer Heilungsdauer. Medikament A hat eine kürzere Heilungsdauer als Medikament B. Deshalb ist für den Patienten der Mehrwert bei der Verschreibung von Medikament A höher als bei der Verschreibung von Medikament B.
- Für Ihr Unternehmen unterscheiden sich die Medikamente in den Herstellungskosten. Medikament A ist kostenintensiver als Medikament B in der Herstellung. Deshalb ist für Sie der Nutzen bei der Verschreibung von Medikament B höher als bei der Verschreibung von Medikament A.
- Sie können dem Arzt **vor** der Behandlung des Patienten ein Geschenk anbieten, damit er Medikament B verschreibt. Falls Sie dem Arzt ein Geschenk anbieten, kann dieser es annehmen oder ablehnen.
- Die Entscheidung des Arztes über das zu verschreibende Medikament ist **unabhängig** von der Annahme des Geschenks.

Ablauf des Experiments

1. Entscheidung - Unternehmensvertreter:

- Sie entscheiden, ob Sie dem Arzt ein Geschenk anbieten.
 - Geschenkangebot
 - Kein Geschenkangebot

2. Entscheidung - Arzt:

- Wenn Sie dem Arzt ein Geschenk anbieten, kann dieser entscheiden ob er es annimmt oder ablehnt.
 - Annahme des Geschenks
 - Ablehnung des Geschenks
- Sollten Sie dem Arzt kein Geschenk anbieten, so trifft er direkt die folgende Entscheidung:

3. Entscheidung - Arzt:

- Unabhängig von der ersten Entscheidung entscheidet der Arzt nun welches Medikament er dem Patienten verschreibt:
 - Verschreibung von Medikament A
 - Verschreibung von Medikament B
- Nach jeder Therapieentscheidung, also nach jeder Runde, erhalten Sie und der Arzt eine Information über die Entscheidungen des anderen Spielers. Ihre Auszahlung, die Auszahlung des Arztes und die Auszahlung an den Patienten für die jeweilige Runde werden ebenfalls angezeigt.
- Sie treffen in jeder Runde auf
 - (1) **denselben** Arzt. Dieser kennt Ihre Entscheidungen und Ihre Auszahlungen aus der Vorrunde.
 - (2) einen **neuen** Arzt. Dieser kennt Ihre Entscheidungen und Ihre Auszahlungen aus der Vorrunde **nicht**.

Auszahlungen

Auszahlungen für den Patienten:

• Die Auszahlungen des Patienten werden an Ärzte ohne Grenzen gespendet und sind abhängig von Ihren Entscheidungen.

Zusammenfasung Patient:

- Verschreibung von Medikament A: Spende in Höhe von 20 Talern
- Verschreibung von Medikament B: Spende in Höhe von 15 Talern

Auszahlung für den Arzt:

- Der Arzt erhält ein Grundgehalt in Höhe von 20 Talern für jeden Patienten, den er behandelt.
- Außerdem können Sie dem Arzt ein Geschenk anbieten. Nimmt der Arzt es an, erhält er 15 Taler gut geschrieben. Das Geschenk verursacht für Sie Kosten in Höhe von 5 Talern.

Zusammenfassung Arzt:

- Kein Geschenkangebot oder Ablehnung des Geschenkangebots: 20 Taler
- Geschenkangebot und Geschenkannahme: 35 Taler

Ihre Auszahlung:

- Sie erhalten immer 15 Taler mehr wenn Medikament B verschrieben wird anstatt Medikament A. Sie erhalten 22 Taler wenn Medikament A verschrieben wird und 37 Taler wenn Medikament B verschrieben wird.
- Sie haben die Möglichkeit dem Arzt ein Geschenk anzubieten, damit er geneigt ist Medikament B zu verschreiben.
- Das Geschenk selbst verursacht weitere Kosten in Höhe von 5 Talern für den Unternehmensvertreter. Dem Arzt werden 15 Taler bei Geschenkannahme gut geschrieben.

Zusammenfassung Unternehmensvertreter:

- Kein Geschenkangebot oder Geschenkangebot und Ablehnung durch Arzt:
 - Verschreibung von Medikament A: 22 Taler
 - Verschreibung von Medikament B: 37 Taler
- Geschenkangebot und Annahme durch Arzt:
 - Verschreibung von Medikament A: 17 Taler
 - Verschreibung von Medikament B: 32 Taler

Vielen Dank für Ihre Teilnahme!

Dies sind die Instruktionen für den Arzt.

Ihre Rolle im Experiment

- Für das komplette Experiment wurde Ihnen zufällig die Rolle des Arztes zugewiesen. Sie treffen im gesamten Experiment
 - (1) immer auf denselben Unternehmensvertreter.
 - (2) in jeder Runde auf einen neuen Unternehmensvertreter.
- Ihre Aufgabe ist es, dem Patienten ein Medikament zu verschreiben. Sie haben die Wahl zwischen Medikament A oder Medikament B. Beide Medikamente werden vom zugewiesenen Unternehmen produziert.
- Für den Patienten unterscheiden sich die Medikamente nur in ihrer Heilungsdauer. Medikament A hat eine kürzere Heilungsdauer als Medikament B. Deshalb ist für den Patienten der Mehrwert bei der Verschreibung von Medikament A höher als bei der Verschreibung von Medikament B.
- Für das Unternehmen unterscheiden sich die Medikamente in den Herstellungskosten. Medikament A ist kostenintensiver als Medikament B in der Herstellung. Deshalb ist für das Unternehmen der Nutzen bei der Verschreibung von Medikament B höher als bei der Verschreibung von Medikament A.
- Es besteht die Möglichkeit, dass Ihnen der Unternehmensvertreter vor der Behandlung des Patienten ein Geschenk anbietet, damit Sie Medikament B verschreiben. Falls Ihnen der Unternehmensvertreter ein Geschenk anbietet, können Sie dieses annehmen oder ablehnen.
- Ihre Entscheidung über das zu verschreibende Medikament ist **unabhängig** von der Annahme des Geschenks.

Ablauf des Experiments

1. Entscheidung - Unternehmensvertreter:

- Der Unternehmensvertreter entscheidet, ob er Ihnen ein Geschenk anbietet. Er hat die Wahl zwischen:
 - Geschenkangebot
 - Kein Geschenkangebot

2. Entscheidung - Arzt:

- Möglicherweise bietet Ihnen der Unternehmensvertreter ein Geschenk an. Dann können Sie entscheiden, ob Sie dieses annehmen oder ablehnen.
 - Annahme des Geschenks
 - Ablehnung des Geschenks
- Sollte der Unternehmensvertreter Ihnen kein Geschenk anbieten, treffen Sie direkt die folgende Entscheidung:
- 3. Behandlungsentscheidung Arzt:
- Unabhängig von der ersten Entscheidung entscheiden Sie nun welches Medikament Sie dem Patienten verschreiben.
 - Verschreibung von Medikament A
 - Verschreibung von Medikament B
- Nach jeder Therapieentscheidung, also nach jeder Runde, erhalten Sie und der Unternehmensvertreter eine Information über die Entscheidungen des anderen Spielers. Ihre Auszahlung, die Auszahlung des Unternehmensvertreters und die Auszahlung an den Patienten für die jeweilige Runde werden ebenfalls angezeigt.
- Sie treffen in jeder Runde auf
 - (1) denselben Unternehmensvertreter. Dieser kennt Ihre Entscheidungen und Ihre Auszahlungen aus der Vorrunde.
 - (2) einen **neuen** Unternehmensvertreter. Dieser kennt Ihre Entscheidungen und Ihre Auszahlungen aus der Vorrunde **nicht**.

Auszahlungen

Auszahlungen für den Patienten:

• Die Auszahlungen des Patienten werden an Ärzte ohne Grenzen gespendet und sind abhängig von Ihren Entscheidungen.

Zusammenfasung Patient:

- Verschreibung von Medikament A: Spende in Höhe von 20 Talern
- Verschreibung von Medikament B: Spende in Höhe von 15 Talern

Ihre Auszahlungen:

- Sie erhalten ein Grundgehalt in Höhe von 20 Talern für jeden Patienten, den Sie behandeln.
- Außerdem kann Ihnen der Unternehmensvertreter ein Geschenk anbieten. Nehmen Sie dieses an, erhalten Sie zusätzlich 15 Taler gut geschrieben. Der Unternehmensvertreter hat Kosten für das Geschenk in Höhe von 5 Talern.

Zusammenfassung Arzt:

- Kein Geschenkangebot oder Ablehnung des Geschenkangebots: 20 Taler
- Geschenkangebot und Geschenkannahme: 35 Taler

Auszahlungen für den Unternehmensvertreter:

- Der Unternehmensvertreter erhält immer 15 Taler mehr, wenn Medikament B verschrieben wird anstatt Medikament A. Er erhält 22 Taler, wenn Medikament A verschrieben wird und 37 Taler, wenn Medikament B verschrieben wird.
- Der Unternehmensvertreter hat die Möglichkeit, Ihnen ein Geschenk anzubieten, damit Sie geneigt sind, Medikament B zu verschreiben.
- Das Geschenk selbst verursacht weitere Kosten in Höhe von 5 Talern für den Unternehmensvertreter. Ihnen werden 15 Taler bei Geschenkannahme gut geschrieben.

Zusammenfassung Unternehmensvertreter:

- Kein Geschenkangebot oder Geschenkangebot und Ablehnung durch Arzt:
 - Verschreibung von Medikament A: 22 Taler
 - Verschreibung von Medikament B: 37 Taler
- Geschenkangebot und Annahme durch Arzt:
 - Verschreibung von Medikament A: 17 Taler
 - Verschreibung von Medikament B: 32 Taler

Vielen Dank für Ihre Teilnahme!

3.5.C Overview of all Decisions

In our analysis we consider only the decisions in Periods 1-10. Here you can find an overview of all decisions in our experiments.

		Partner	Stranger	Total Sample
Bribing	No Bribe offered	51.39%	65.75%	58.62%
	Bribe offered	48.61%	34.25%	41.38%
Acceptance	Bribe accepted	88.11%	97.53%	92.03%
	Bribe not accepted	11.89%	2.47%	7.97%
Prescription	patient-optimal	58.67%	82.88%	70.85%
(Total)	patient - non -optimal	41.33%	17.12%	29.15%
Prescription	Optimal	88.33%	96.14%	92.74%
(no bribe offered)	Non -optimal	11.67%	3.86%	7.26%
Prescription	Optimal	100%	100%	100%
(bribe rejected)	Non -optimal	0%	0%	0%
Prescription	Optimal	17.50%	56.33%	34.64%
(bribe accepted)	Non -optimal	82.50%	43.67%	65.36%

Table 3.14: Overview of the Decisions Taken in all Periods

Chapter 4

The Influence of Penalties on Corrupt Behavior in the Context of Pharmaceutical Prescriptions - An Experiment

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Abstract

Under the new German anti-corruption law both physicians and pharmaceutical companies can be punished for corruption, whereas previously only physicians were liable for punishment. We designed and tested two different treatments. In the treatments we varied the punishment structures according to the change in legislation, with an additional baseline treatment with no punishment. We find that if the potential for punishment is introduced, it only affects the behavior of the newly liable party. However, the potential for punishment significantly decreases the number of successful corrupt acts. Overall, the new German anti-corruption law should be a step in the right direction to fight corruption in the health care sector.

Keywords: Corruption, Health Care, Prescriptions, Penalties, Pharmaceuticals *JEL*: 112, 118, D73

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4.1 Introduction

The health care sector is especially prone to corruption, due to its characteristics: a large market with a variety of actors that are widely distributed, asymmetric information, e.g., concerning a patient's health condition between physicians and patients and uncertainty, e.g., about the quality of treatment. Additionally, the sheer volume of the health care sector makes it an attractive target. In Germany an amount of 374.2 billion euros, 11.3% of the GDP, was spend on health services in 2017 (Statistisches Bundesamt, 2018).

However, as evidence of negative effects of corruption on the health of citizens is increasing (see, e.g., Rose 2006; Vian 2008), governments around the world have taken action to prevent corruption in the health care sector (Transparency International, 2006). In Germany the focus of government action against corruption in the health care sector targets the relationship between physicians and pharmaceutical companies, where it can be observed that physicians accept financial or other rewards from pharmaceutical companies for prescribing a certain pharmaceutical (Transparency International Deutschland e.V., 2008). While corruption occurs independently of the health system in different forms, between different actors, at all levels of the health care sector¹, this is a part of the health care sector where corruption occurs particularly often. Analyzing the impact of such government actions, however, is often difficult as corruption usually takes place unobserved (Andvig, 2006). In this paper, we therefore use an experiment to analyze the expected impact of a recent change in German legislation concerning corruption in the relationship between physicians and pharmaceutical companies. This new law introduces criminal liability for bribing delegates and doctors in private practices and the extension of criminal liability for bribery in the private and public sector (§299a and §299b StGB, Germany).

In Germany, as in most other European countries, corruption in the health care sector is forbidden by various legal regulations in the social, professional and penalty law (e.g. \$128 SGB V, \$299a and \$299b StGB, Germany). However, in 2012 the German Federal Supreme Court found that current legislation in Germany was not sufficient (BGH GSSt 2/11). Due to a loophole, resident physicians, unlike, e.g., hospital physicians, could not be punished for a accepting kickback payments (payments to prescribe a medication for unapproved or inappropriate uses) from pharmaceutical companies (Wienke and Kuball, 2015). Therefore, government action was taken which led to a new anti-corruption law being passed in June 2016. While before the new law only the physicians could be punished, now also everybody who offers a bribe, such as pharmaceutical companies for example, are liable to prosecution (§299b StGB, Germany). Instead of being a criminal offence, accepting bribes used to only be a violation of the professional and social law. Under the new law, however, everyone involved in the health care provision who accepts, asks for, or promises any kind of benefits for prescribing medication or transferring patients not in line with purely medical reasons in his professional capacity is liable to prosecution. The new paragraph includes financial penalties and imprisonment up to three years for

¹See Transparency International (2006), for a list of various forms of corruption in the health care sector.

healing professionals that accept a benefit for corrupt actions. While it is the stated goal of this change in legislation to diminish corruption (BT-Drs. 18/6446, 2015), its effects are not easily measured as detection of corruption is very low. According to a report by Transparency International, 90 - 95% of corruption remains undetected (Martiny, 2015). Consequently, it is difficult to measure the impact of the new law by simply observing less corruption.

To analyze whether this change in legislation will indeed lead to a reduction in corruption we conducted a laboratory experiment with various penalty structures. Normally, corruption takes place secretly and in hiding. Therefore, it is difficult to observe an individual's corrupt behavior. With the help of an experiment we are able to analyze an individual's decision in a controlled environment. Our experimental setup builds on the paper by Abbink et al. (2002), which was the first interactive experiment on corruption. Just as Abbink et al. (2002) we use a two-player sequential game in which a briber (in our case a pharmaceutical company) can transfer money to a public official (in our case a physician), which the physician can accept or reject. Additionally, after the acceptance or rejection of the bribe, the physician has to decide which drug to prescribe to a patient in our experiment. The pharmaceutical company would benefit from the physician prescribing one type of medication, but another type of medication is patient-optimal. Whereas Abbink et al. (2002) focus on the influence of reciprocity, negative externalities and high penalties, we focus on the influence of a change in the punishment scheme on the likelihood of corruption.

With this paper we are adding to the stream of literature on experiments on corruption (for an overview of the first experiments on corruption, see, e.g., Andvig 2005, Dusek et al. 2005 and Bobkova and Egbert 2013), where so far, most of the experimental research focuses on the interaction between businesses and public officials, using gift-exchange games or ultimatum games (e.g. Abbink 2006). We use this as a basis and add the specific setting of the health care sector to this. Therefore, we also add to the general research on corruption in the health care sector (for an overview see, e.g., Mackey and Liang 2012 and Vian 2008), as well as to the rather recent field of experiments in health economics (for an overview, see the special issue on experiments in health economics in the Journal of Economics Behavior and Organization (Cox et al., 2016b)).

In the context of health economics, corruption has hardly been studied experimentally. One notable exception is Hilleringmann (2018). Still, experiments gain importance in health economics. Cox et al. (2016a) and Hansen et al. (2015), for example, stress the importance of economic experiments to analyze medical decision making. As physicians are the key decision makers in health care, an understanding of their behavior and motives with the help of experiments is a new, valuable approach. Experiments using students as subjects need to be carefully designed to capture the importance of professional ethics for physicians (Arrow, 1963) as well as the assumption of altruistic behavior of physicians. There are already several successful experiments in which students make decisions in the role of a physician (e.g. Hennig-Schmidt et al. 2011 or Brosig-Koch et al. 2013). While these previous experiments mostly focus on a physician's behavior under various payment schemes, to the best of our knowledge, so far the only laboratory experiment focusing on

corruption in the health care sector is Hilleringmann (2018) and there is no experimental research yet on the influence of punishment on corruption in the health care sector.

The paper is structured as follows. Section 4.2 introduces the setup of our experiment, the hypotheses and the experimental procedure. Results are presented in Section 4.3. Section 4.4 concludes.

4.2 Experiment

To analyze whether the new German anti-corruption law will have the desired effects, we designed three treatments implementing different punishment structures. As a basis for the experiment we use the trust game by Abbink et al. (2002). Unlike Abbink et al. (2002) who use a neutral framing for the instructions, we use a loaded framing for the instructions to emphasize the special relationship between physician, pharmaceutical company and patients.² However, we avoid any corruption related words such as "bribe" or "briber" in the instructions and instead use words such as "gift" and "pharmaceutical agent". To test the influence of different punishment schemes, we design three treatments, differing only in who is liable for punishment if corruption is detected. This allows us to test whether increasing the potential punishment, as well as changing who will be punished, will decrease corruption in the relationship between physicians and pharmaceutical companies, while taking into account the very low possibility of detection.

4.2.1 Experimental Design

At the beginning of the experiment subjects are allocated anonymously to the roles of either a physician or a pharmaceutical agent, acting as a briber.³ In line with other experiments in health economics (see, e.g., Hennig-Schmidt et al. 2011 or Brosig-Koch et al. 2013), there are no agents in the lab in the role of patients. Rather, the monetary equivalent of patient utility, which depends on the Physicians' prescriptions in the experiment, is donated to the medical charity organization "Doctors Without Borders".

We randomly match all subjects into groups of two persons and assign the roles of Physician and Briber for the whole experiment. The Physician and Briber stay in the same group throughout the experiment. The experiment then consists of up to 15 periods. To avoid endgame effects, there is no fixed final period. Instead the experiment ends randomly between Period 10 and 15. Each period consists of three stages in which the two players - the Physician and the Briber - act sequentially. In Stage I the Briber can decide whether he wants to bribe the Physician. The decisions taken in the three stages are shown schematically in Figure 4.1 and are explained in detail below. The three stages are repeated

²Abbink and Hennig-Schmidt (2006) find that there is no difference in this context between loaded and neutral framing for instructions.

³For ease of exposition, from now on we will refer to the subjects as *Physicians* and *Bribers*. However, in the experiment we used a neutral term for the Briber, simply referring to him as a representative of the pharmaceutical company.



Figure 4.1: Decisions in the Experiment

in each period. After the final period, detection of the potentially accepted bribes takes place and payoffs are calculated.

In Stage I, the Briber decides on whether he wants to bribe the Physician. Bribing implies that he pays 5 ECU⁴ as a bribe, if the Physician accepts the bribe. In Stage II the Physician decides on whether to accept the bribe, if it was offered. To reflect the difference in marginal utility between the Briber and the Physician, the offered amount is tripled: The physician receives 15 ECU when he accepts the bribe. If the Physician has not been offered a bribe, he does nothing in Stage II. Finally, in Stage III, the Physician decides on which pharmaceutical to prescribe to the patient. This decision is framed as follows: Both medications will heal the patient, but Pharmaceutical A is a very effective pharmaceutical with a short healing time, whereas Pharmaceutical B has a longer healing time. Therefore, the patient receives a payoff of 20 ECU if Pharmaceutical A is prescribed and of 15 ECU if Pharmaceutical B is prescribed. Additionally, Pharmaceutical B is framed as being more profitable to the pharmaceutical company. The Briber will receive an additional 15 ECU every time Pharmaceutical B is prescribed. Thus, while Pharmaceutical A is patient-optimal, Pharmaceutical B is optimal for the pharmaceutical company and thus, the Briber. The Physician decides which of the two pharmaceuticals to prescribe, knowing how it will affect the payoff of both the patient and the Briber. Note that the Physician's payoffs are not affected by his decision on which medication to prescribe and the decision is also independent of whether he received a bribe or not. A summary of the payoffs per period can be found in Table 4.1.

⁴ECU = Experimental Currency Units

	Payo	off per Perio	d for:
Case	Briber	Physician	Patient
Bribe-Reject-Prescribe A	22	20	20
Bribe-Reject-Prescribe B	37	20	15
Bribe-Accept-Prescribe A	17	35	20
Bribe-Accept-Prescribe B	32	35	15
No Bribe-Prescribe A	22	20	20
No Bribe-Prescribe B	37	20	15

Table 4.1: Payoff per Period in Case of No Detection

After the last period is completed, an investigation of the potentially accepted bribes in all periods takes place. In each period in which a bribe was offered and the Physician accepted the bribe, the corrupt act can be detected with a possibility of 0.3%. This investigation is presented only after the last period and displays the investigation results for each period separately. As in Abbink et al. (2002), we use a detection probability of 0.3% and design the detection mechanism as a sudden death mechanism: Thus, an accepted bribe in one period leads to a punishment for the whole experiment.

To test the influence of different punishment schemes, we design three treatments, differing only in who is liable for punishment if corruption is detected. In the *no-penalty* baseline treatment both, the Briber and the Physician, do not have to expect any penalty in case of detection. In the *old-law* treatment, only Physicians will receive a penalty in case of detection, representing the old German anti-corruption law, where only physicians were liable for punishment if corruption was detected. If they are detected they loose their complete payoff in the experiment and will only receive the show-up fee. In the *new-law* treatment both, the Briber and the Physician, are punished in case of detection, thus representing the new German law. Again, punishment implies that all payoffs are set to zero and only a show-up fee will be paid out. Note that detection can take place only if the bribe is accepted. The patient's payoff is not affected by detection. The overall payoffs are summarized in Table 4.2, where it needs to be noted that the donation to Doctors Without Borders is the sum of all Patient's payoffs in the experiment.

Role	No-Pe	enalty	Old-	Law	New	Law
	No Detection	Detection	No Detection	Detection	No Detection	Detection
Physician	\sum all Periods	\sum all Periods	\sum all Periods	0	\sum all Periods	0
Briber	\sum all Periods	0				
Patient	\sum all Periods					

Table 4.2: Overall Payoff per Treatmer
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4.2.2 Research Hypotheses

The aim of the experiment is to analyze the influence of penalties on corrupt behavior in the context of the health care sector. This translates to the Briber, in the role of a pharmaceutical company, who can decide on whether to send a bribe to a Physician who can accept or reject this bribe. In the next stage the Physician can decide on whether to return a favor by prescribing the briber-optimal Pharmaceutical B instead of the patientoptimal Pharmaceutical A. We assume that the Briber and the Physician have complete information about each other's payoffs in each round, as well as on how their decisions impact the patient.

By keeping the relationship between Briber and Physician constant throughout the game, we allow for the establishment of a reciprocal relationship between the two. The literature on games where reciprocity plays a role suggests that in such games an exchange of benefits takes place even if it does not maximize the players' own monetary payoff. Following Abbink et al. (2002), we conjecture that this reciprocal relationship is enough to establish cooperation in our game, even if the individual payoff is not maximized. To analyze the influence of punishment schemes on corrupt behavior in this setting, we thus use the three treatments of our experiment. The three treatments, varying only in the structure of the punishment for corruption, allow us to test various hypotheses by comparing the treatments to one another.

As a baseline, we use the no-penalty treatment that shows the investigation and possible detection results to the subjects but leads to no penalty. We compare this treatment to the old-law treatment, where only the Physicians can be punished in case of an accepted bribe being detected and the new-law treatment, where both subjects can be punished if the acceptance of a bribe is detected. As detection rates of corruption in reality are very low, we follow Abbink et al. (2002) and use a very low detection probability of 0.3%. Detection is implemented as a sudden death mechanism, as described above. Following the conjecture by Kirchgässner (1997) that small probabilities of detection in the context of corruption lead to severe reactions of the subjects, we expect that the existence of the chance to be punished and the severity of the punishment will lead to a reduction in the number of corrupt acts. This can be assumed as most individuals systematically overestimate the probability of the occurrence of events with a very low probability of occurrence.⁵

The hypotheses we derive from this experimental setup, can be split up in two different categories: Hypotheses on the behavior of the Briber and hypotheses on the behavior of the Physician. These will be described in Section i. and Section ii., respectively.

i. Hypotheses on the Behavior of the Briber

An individual's decision to act corruptly is influenced by the expected surplus, the costs for behaving corruptly and, of course, the expected penalty, consisting of detection probability and the penalty level (Becker, 1968). Therefore, we expect that there will only be a

⁵The analyses of Tversky and Kahneman (1973) show that the individuals' weighting of probabilities differs systematically from the actual probabilities.

significant difference in average corrupt behavior between those groups of subjects that are directly affected by a change in the punishment structure. Thus, we do not expect Bribers in the old-law treatment to behave differently from those in the no-penalty treatment, as there is no difference in the punishment scheme that directly affects Bribers. Consequently, we expect that the number of offered bribes in the old-law treatment will be equal to the number of offered bribes in the no-penalty treatment. The bribers will offer the same amount of bribes because there is no difference between the two treatments for the Briber. He cannot be punished in either treatment, independent of the detection of the corrupt act.

Hypothesis 4.1.A. *There is no significant difference between the number of offered bribes in the old-law treatment and the no-penalty treatment.*

In the new-law treatment the Briber can be punished as well as the Physician, in cases in which the Physician accepts the bribe and the corrupt act is detected. As compared to the other two treatments we thus expect a significant reduction in the number of bribes offered in the new-law treatment.

Hypothesis 4.1.B. In the new-law treatment significantly fewer bribes are offered than in the no-penalty treatment.

Hypothesis 4.1.C. *In the new-law treatment significantly fewer bribes are offered than in the old-law treatment.*

ii. Hypotheses on the Behavior of the Physician

Just as we assume that we can only observe a difference in the behavior of Bribers between those treatments where the punishment scheme of the Bribers is directly affected, we also assume that there will only be a significant difference in the behavior of the Physicians between those treatments where the punishment structure for Physicians changes. For the Physicians there is no difference in the punishment scheme between the old-law and the new-law treatment. However, in the new-law treatment both the Briber and the Physician are liable for punishment, whereas in the old-law treatment only the Physician can be punished. Therefore, we expect that in the new-law treatment fewer bribes will be offered (see Hypothesis 4.1.C). Consequently, we expect that overall fewer corrupt acts will take place in the new-law treatment than in the old-law treatment. Nevertheless, as nothing changes in the punishment structure for Physicians, we do not expect significant differences in the bribe acceptance rate of Physicians between the old-law and the new-law treatment. Hypothesis 4.2.A follows from this.

Hypothesis 4.2.A. *There is no significant difference in the bribe acceptance rate of the Physician between the old-law and the new-law treatment.*

In the old-law and the new-law treatment the detection of an accepted bribes is punishable for Physicians. Therefore, we expect that Physicians will accept fewer bribes in those two treatments as compared to the no-penalty treatment, where the detection of a corrupt act does not incur any punishment.
Hypothesis 4.2.B. *In the old-law treatment the bribe acceptance rate of the Physician is significantly lower than in the no-penalty treatment.*

Hypothesis 4.2.C. *In the new-law treatment the bribe acceptance rate of the Physician is significantly lower than in the no-penalty treatment.*

In a last step we can analyze the prescription behavior of Physicians. After the decision on whether to accept a bribe, if it was offered, the Physician also has to decide which pharmaceutical to prescribe. He has the choice of prescribing the patient-optimal pharmaceutical *A* and the briber-optimal pharmaceutical *B*. Note here again that even if a Physician accepted a bribe, he can still decide whether to prescribe pharmaceutical *A* or *B*. Additionally, the prescription decision does not influence whether he is liable for punishment or not. The detection of a corrupt act depends only on whether he accepted a bribe, independent of which pharmaceutical he later prescribes. Thus, while in the old-law treatment and the new-law treatment the Physician can be punished for the acceptance of a bribe, in none of the treatments can he be punished for prescribing the briber-optimal pharmaceutical. While the prescription behavior thus may depend on whether bribing took place, the punishment structure alone should not influence which pharmaceutical will be prescribed. Consequently, after controlling for differences in Stage I and Stage II of the experiment, the prescription behavior of the Physicians should not depend on treatment. Hypothesis 4.3 follows directly from this.

Hypothesis 4.3. Controlling for whether a bribe was offered and/or accepted, Physician prescription behavior is independent of the punishment structure.

4.2.3 Experimental Procedure

The experiment was conducted in the Business and Economics Research Laboratory at Paderborn University in November 2017. The experiment was computerized, using the software z-Tree (Zurich Toolbox for Readymade Economic Experiments, Fischbacher 2007). Subjects were invited via Email, using the Online Recruitment System ORSEE (Greiner, 2015), from a pool of approximately 2,800 voluntary students of Paderborn University from various fields of studies. Subjects were only allowed to participate in one session. Upon arrival each subject was seated randomly at a computer workplace in a cubicle, each detached from one another. All subjects were told not to communicate during the session.

In each session the students were randomly assigned to the roles of either Briber or Physician. We started each session with a short introduction about the rules of the laboratory before handing out the written instructions. All subjects in the same role within a treatment received the same instructions before the experiment. The instructions informed the students about the structure of the experiment and the payoffs associated with their own decisions as well as their partner's decisions. The instructions also included information on their partner's and the patient's payoff. Translations of the instructions for both roles can be found in Appendix 4.5.A. The students had ten minutes to read the instructions, afterwards there was the possibility to ask questions. Before starting the experiment, all participants were asked to complete a control questionnaire consisting of four questions about the experiment to ensure their understanding.

During the experiment each decision was presented on a separate screen so that participants could take each decision independently. At the end of each round, the participants were informed about the decisions in this round, their own payoffs, their partner's payoffs as well as the donations to the charity. To guarantee complete understanding, the calculation of the payoffs was described and explained in detail. After informing the participants about their payoffs the next round started. On average 13 rounds were played. After the final round the corruption detection was conducted and subjects were informed for each round whether they were detected or not. After the experiment a short questionnaire followed. Each session took about 55 minutes, including time to read the instructions and receive the payoff. Overall 212 students took part in our experiment: 72 students in the no-penalty treatment, 70 in the old-law treatment and 70 in the new-law treatment. The exchange rate was 0.025 Euro for 1 ECU. Additionally, every participant received a show-up fee of 2.50 Euros. The subjects' payoffs varied in the no-penalty treatment between 8.00 Euro and 13.90 Euro, in the old-law treatment between 9.00 Euro and 15.70 Euro and in the new-law treatment between 8.00 Euro and 16.00 Euro. The average payoff per subject was 10.81 Euro in the no-penalty treatment, 11.35 Euro in the old-law treatment and 10.00 Euro in the new-law treatment.⁶ In total 634.40 Euro were donated to Doctors Without Borders.

4.3 Results

4.3.1 Descriptive Statistics

Table 4.3 provides an overview of our subjects' characteristics across all three treatments, as well as per treatment, concerning gender and age. Additionally, we provide information on the average amount of periods played in the experiment as determined by the random stopping rule between Period 10 and 15.

Variable	No-Penalty	Old-Law	New-Law	Total Sample
Participants	72	70	70	212
Male	33%	39%	37%	36%
Mean Age	21.82	24.11	23.34	23.08
Average Periods	12	14.33	13	13.1

Table 4.3: Summary Statistics

⁶Note that in the course of the experiment no corrupt act was detected, therefore we do not have a minimal payment of only the show-up fee.

Table 4.4 gives an overview of the decisions made by Bribers and Physicians. It depicts the share of offered bribes and the share of accepted bribes, as well as the prescription decisions of the Physicians.

Actor and Stage	Decisions	No-Penalty	Old-Law	New-Law	Total Sample
Stage I:	Offer Bribe	58.89%	56.86%	24.00%	46.70%
Briber	Don't offer Bribe	41.11%	43.14%	76.00%	53.30%
Stage II:	Accept	90.09%	48.24%	58.33%	67.88%
Physician	Don't Accept	9.91%	51.76%	41.67%	32.12%
Stogo III.	Bribe was accepted:				
Physician	Prescription: Patient-Optimal	13.09%	7.29%	26.53%	13.39%
	Prescription: Briber-Optimal	86.91%	92.71%	73.47%	86.61%
Store III.	Bribe was not accepted:				
Physician	Prescription: Patient-Optimal	80.95%	87.38%	82.86%	85.53%
	Prescription: Briber-Optimal	19.05%	12.62%	17.14%	14.47%
Stage III: Physician	Bribe was not offered:				
	Prescription: Patient-Optimal	87.84%	94.70%	89.47%	90.44%
	Prescription: Briber-Optimal	12.16%	5.30%	10.53%	9.56%

Table 4.4: Overview of the Decisions taken in Periods 1 - 10

To avoid an influence of endgame effects and effects between sessions due to the different amount of periods played, we analyze only decisions taken in Periods 1 to 10. Consequently, the data presented in Table 4.4 also only includes data from Periods 1 to 10. Unless explicitly stated, all future analysis is therefore also based only on data from Periods 1 to 10.⁷ Across all sessions and treatments, in Stage I of the experiment, Bribers had to decide 1060 times about offering a bribe to a Physician and they offered the bribe 495 times. In these 495 cases, Physicians could thus decide in Stage II of the experiment about accepting a bribe. If they were not offered a bribe, they did not have to make any decisions in Stage II. Across sessions and treatments, Physicians decided to accepted the bribe in 336 cases. After the decision on whether or not to accept the bribe, in Stage III of the experiment Physicians had to decide to prescribe the bribe and treatments, Physicians decided to physician and treatments, and treatments, Physicians decided to physicians for the experiment Physicians had to decide which pharmaceutical to prescribe. Across sessions and treatments, Physicians decided to physicians for the bribe and the patient-optimal pharmaceutical 692 times.

4.3.2 **Results on Corruption**

We start our analysis by looking at the hypotheses concerning the Briber's behavior, as derived in Section i.). To analyze the Briber's behavior we first present the amount of offered bribes per treatment in Table 4.5.⁸

⁷You can find summary statistics including all periods in Appendix 4.5.B.

⁸Note that in the no-penalty treatment, we had 72 participants, and thus 36 Bribers, whereas in the other two treatments we only had 70 participants each, and thus 35 Bribers.

	No-Penalty	Old-Law	New-Law
Bribe Offered	212	199	84
Bribe Not Offered	148	151	266

Table 4.5: Number of Bribes Offered per Treatment

We have seen in Table 4.4 that across treatments bribes were offered in 46.70% of the cases. However, there are decisive differences between treatments. In the no-penalty treatment as well as in the old-law treatment bribes are offered in more than half of the interactions. As in neither the no-penalty treatment nor the old-law treatment can the briber be punished, we do not expect to see any significant differences in the amount of bribes offered between these two treatments. Using a χ^2 -test, we indeed do not find any significant difference in the amount of bribes offered between the amount of bribes offered between the no-penalty and the old-law treatment ($\chi^2 = 0.3005$, p = 0.584). In line with Hypothesis 4.1.A, the Briber's behavior is not influenced by the chance of a penalty for the Physician. We can therefore state Result 4.1.A as follows.

Result 4.1.A. There is no significant difference between the number of offered bribes in the old-law treatment and the no-penalty treatment.

We expect, however, that the Briber will change his behavior if he faces the chance of getting punished in the new-law treatment. Consequently, in Hypothesis 4.1.B and Hypothesis 4.1.C we conjecture that the Briber will behave significantly differently in the new-law treatment as compared to the other two treatments. We assume that he will offer significantly fewer bribes, as only in the new-law treatment is the Briber liable for punishment. In the other two treatments a corrupt act may be detected but the Briber does not have to bear the consequences. Using a χ^2 -test, we find that this is indeed the case. As compared to the new-law treatment the Briber offers significantly more bribes in the no-penalty treatment ($\chi^2 = 88.8610$, p = 0.000) as well as in the old-law treatment ($\chi^2 = 78.4461$, p = 0.000). This is summarized in the following results.

Result 4.1.B. In the new-law treatment significantly fewer bribes are offered than in the no-penalty treatment.

Result 4.1.C. In the new-law treatment significantly fewer bribes are offered than in the old-law treatment.

The second set of hypotheses, derived in Section ii.), focuses on the behavior of the Physician. Thus, in Table 4.6 we present the total number of accepted bribes per treatment. We do not expect the Physician to change his behavior if his own chance of being punished for a corrupt act is not changed. Therefore, in Hypothesis 4.2.A we conjecture that there is no difference in the Physician's behavior between the new-law treatment and the old-law treatment. In both treatments there is a 0.3% chance for the Physician of being detected and punished.

Table 4.6 shows the total amount of accepted bribes and indicates that even though we did not expect any change in the behavior of the Physician between the old-law and the new-law treatment, fewer bribes are accepted in the new-law treatment. However, as fewer bribes are offered in the new-law treatment because of a change in behavior of the Briber (see Results 4.1.B and 4.1.C), we need to look at the acceptance rate instead of the total number of accepted bribes. The acceptance rates are 48.24% in the old-law treatment and 58.33% in the new-law treatment (an overview can be found in Table 4.4 in the previous section). Using a χ^2 -test to compare the acceptance rates between the old-law and the new-law treatment, we find that there is indeed no significant difference ($\chi^2 = 2.4079$, p = 0.121). Result 4.2.A directly follows.

Result 4.2.A. *There is no significant difference in the bribe acceptance rate between the old-law and the new-law treatment.*

	No-Penalty	Old-Law	New-Law
Bribe accepted	191	96	49
Bribe not accepted	21	103	35

Table 4.6: Number of Accepted Bribes per Treatment

The no-penalty treatment is the only treatment in which the Physician is not liable to be punished in case the acceptance of a bribe is detected. Therefore, in Hypothesis 4.2.B and Hypothesis 4.2.C we conjecture that in the no-penalty treatment the Physician will accept more bribes than in the other two treatments. Again, for the analysis we will use the acceptance rates to account for any differences in the behavior of the Briber between the treatments. As can be seen in Table 4.4, the Physicians accept 90.09% of the bribes in the no-penalty treatment, 48.24% in the old-law treatment and 58.33% in the new-law treatment. Comparing these, we find that in the no-penalty treatment the Physicians accepts significantly fewer bribes than in the old-law treatment ($\chi^2 = 85.3460$, p = 0.000), as well as in the new-law treatment ($\chi^2 = 39.5636$, p = 0.000). This is summarized in Result 4.2.B and 4.2.C.

Result 4.2.B. In the no-penalty treatment the bribe acceptance rate is significantly higher than in the old-law treatment.

Result 4.2.C. In the no-penalty treatment the bribe acceptance rate is significantly higher than in the new-law treatment.

Thus, looking purely at the decisions in Stage I and Stage II of the experiment, we find that a change in the punishment scheme influences the actors only if their own chance of punishment is changed. Consequently, only in the new-law treatment is the amount of bribes that are offered significantly reduced, as only in the new-law treatment can the Bribers be punished.

Finally, in Stage III of the experiment, Physicians have to decide which pharmaceutical to prescribe. Independent of whether they received a bribe or not, they can either prescribe the patient-optimal or the briber-optimal pharmaceutical. In Hypothesis 4.3, we have conjectured that, all else equal, a Physician's prescription behavior is independent of treatment. Detection and potential punishment are based only on the acceptance of a bribe and independent of the prescribed pharmaceutical. Table 4.7 shows how often the patient-optimal and the briber-optimal pharmaceutical were prescribed. Here we distinguish between three cases: a) no bribe was offered, b) a bribe was offered but rejected, and c) a bribe was offered and accepted.

Case	Prescription	No-Penalty	Old-Law	New-Law
No Briba offered	Patient-Optimal	130	143	238
No Bride offered	Briber-Optimal	18	8	28
Bribe rejected	Patient-Optimal	17	90	29
	Briber-Optimal	4	13	6
Briba accorted	Patient-Optimal	25	7	13
Bribe accepted	Briber-Optimal	166	89	36

Table 4.7: Prescription Decisions

We start by analyzing the cases in which no bribe was offered. Across treatments, Physicians then prescribe the patient-optimal pharmaceutical in 90.44% of the cases. Next we shed light on the prescription behavior when no bribe was offered within each treatment. Physicians that did not receive any offer of a bribe prescribe the patient-optimal pharmaceutical in 87.84% of the cases in the no-penalty treatment, in 94.70% of the cases in the old-law treatment and in 89.47% of the cases in the new-law treatment. We do not find any significant difference in the amount of patient-optimal prescriptions between the no-penalty and new-law treatment (χ^2 =0.2576, p = 0.612). However, we do find a significant difference in the amount of patient-optimal pharmaceutical prescriptions between the no-penalty and old-law treatment (χ^2 =4.4355, p = 0.035) and between the old-law and new-law treatment (χ^2 =3.3380, p = 0.068). Consequently, for the case of no bribe being offered, Physicians' prescription behavior is not independent of treatment.

Next we analyze the cases in which a bribe was offered by the Briber, but rejected by the Physician. In these cases Physicians decide to prescribe the patient-optimal pharmaceutical in 85.53% of the cases across treatments. Analyzing the prescription behavior within each treatment separately, we find that in the no-penalty treatment the patient-optimal pharmaceutical was prescribed in 80.95% of all cases, in the old-law treatment in 87.38% of all cases and in the new-law treatment in 82.86% of all cases. We do not find any significant difference in the amount of prescriptions of the patient-optimal pharmaceutical between the three treatments (no-penalty vs. old-law: χ^2 =0.6089, p = 0.435, no-penalty vs. new-law: χ^2 =0.0325, p = 0.857, old-law vs. new-law: χ^2 =0.4498, p = 0.502). Consequently, for the case of a bribe being rejected, Physicians' prescription behavior is independent of treatment.

Finally, we analyze the case in which a bribe was offered and accepted. Across treatments, we see that in 86.61% of all cases in which a Physician accepted a bribe, the briber-optimal pharmaceutical is prescribed. However, there are differences between the treatments. In the no-penalty treatment, the briber-optimal pharmaceutical is prescribed 86.91% of the time when a bribe was accepted. In the old-law treatment this holds in 92.71% of the cases and in the new-law treatment only in 73.47% of all cases. There is no significant difference in the amount of briber-optimal prescription decisions when a bribe was accepted between the no-penalty and old-law treatment (χ^2 =2.1675, p = 0.141). We do, however, find that there is a significant difference in the number of briber-optimal prescriptions when a bribe was accepted between the no-penalty and new-law treatment (χ^2 =5.2870, p = 0.021) and between the old-law and new-law treatment (χ^2 =10.0985, p = 0.001). Consequently, for the case of a bribe being offered and accepted, Physicians' prescription behavior is not independent of treatment.

Looking at all three cases we thus find that only in the case that a bribe was offered but rejected is there no difference in prescription behavior across treatments. In both other cases Physicians' prescription behavior differs significantly between treatments. Consequently, we need to reject Hypothesis 4.3.

Result 4.3. Controlling for whether a bribe was offered and subsequently accepted or rejected, Physicians' prescription decisions are not independent of treatment.

While we find support for all the hypotheses concerned directly with the behavior of the Bribers and Physicians, we have to reject the hypothesis dealing with the prescription behavior of Physicians. This is a surprising result as what they prescribe does not influence their chance of being punished. What may additionally be surprising about our results, even though it is in line with our hypotheses, is that Bribers do not take into account that Physicians are less likely to accept a bribe if they can be punished for this. We see no difference in Briber behavior between the no-penalty and the old-law treatment. As bribing is costly, had Bribers anticipated that their chance of successfully bribing a Physician is lower, they should have offered fewer bribes. However, it seems that Bribers indeed take only their own chance of being punished into account.

In a last step, we analyze whether the introduction of the new German anti-corruption law should not only lead to a reduction in corruption but also to an increase in patientoptimal prescriptions. To do this we look at the prescription behavior across treatments. In Table 4.8 the total amount of briber-optimal and patient-optimal prescriptions in each of the treatments is presented. We see that across treatments the briber-optimal pharmaceutical is prescribed in 34.72% of the cases. It is also directly obvious that the prescription of the briber-optimal pharmaceutical is reduced dramatically from 52.22% in the no-penalty treatment to 31.43% in the old-law treatment to only 20.00% in the new-law treatment. Using a χ^2 -test we find that these differences are indeed significant (no-penalty vs. old-law treatment χ^2 =31.5048, p = 0.000; old-law vs. new-law treatment χ^2 =11.9658, p < 0.001).

Overall, we thus find that the change in punishment structure reduced the amount of corruption in our experiment, as fewer bribes were accepted and offered. As a direct effect of this, the amount of patient-optimal prescription decisions was increased. At the same

Prescription	No-Penalty	Old-Law	New-Law	Total
Patient-Optimal	172	240	280	692
Briber-Optimal	188	110	70	368

Table 4.8: Overall Prescription Decisions of the Physicians

time, a further increase in the prescription of the patient-optimal pharmaceutical is achieved by means of an indirect effect of punishment structure on the prescription decision of the Physicians. Even when controlling for the behavior of the Briber and their own decisions on whether to accept a bribe or not, Physicians prescribe significantly fewer briber-optimal pharmaceuticals in the new-law treatment as compared to both other treatments.

4.4 Conclusion

We conducted an experiment to analyze influence of penalties on a Briber's and Physician's behavior. We find that changing the punishment scheme from one where no punishment took place to one where only the Physician can get punished to the final case where both Briber and Physician can get punished leads to a reduction of corrupt acts. The results show that an actor's behavior is only influenced in cases in which his own punishment structure is changed. Consequently, comparing the number of offered bribes across treatments, only in the treatment in which the briber can get punished, less bribes are offered. Similarly, the number of accepted bribes is reduced as soon as the Physician faces the chance of getting punished.

Looking at our results in the context of the new anti corruption law in Germany, it can be deduced that adding a threat of punishment for the pharmaceutical companies should significantly reduce corruption in the health care sector. While neither Physicians nor Bribers in our experiment were influenced by a change in punishment structure for the other market side, both reacted strongly to a change in the treatment that impacted their own liability. As compared to the baseline case of no potential punishments at all, the introduction of a potential punishment to only the Physicians already significantly reduced corruption in the market. Introducing a potential punishment also for the Briber additionally reduced the number of offered bribes in the new-law treatment. Consequently, the amount of corrupt acts was reduced even further.

Remarkably, this effect was achieved with a detection rate of only 0.3%. While the sudden-death mechanism as a punishment - thus setting all payoffs to zero for being detected once - is rather severe, the chance of being detected was almost non-existent in our experiment. We observed in total just over 1000 decisions, thus even if each Briber in every period would have been corrupt, in expectation this would have only led to three detected cases of corruption.

4.5 Appendix

4.5.A Instructions

Below we first present a translation of the instructions given to the subjects in the role of the Physician and then a translation of the instructions given to the subjects in the role of the Briber. In both instructions information that was given only in a certain treatment are marked with (1) for the no-penalty treatment, (2) for the old-law treatment and (3) for the new-law treatment. All text without notation was the same in each treatment.

4.5.A.1 English Instructions

These are the Instructions for the Physician.

Welcome to the experiment!

General information

- During the experiment all amounts are indicated by the fictive currency "Taler".
- The payoff depends on both your own decisions and the decisions of the other players.
- Once the experiment has finished you are asked to fill in a questionnaire. You will receive a brief instruction beforehand. Your answers in the questionnaire do not impact the payoffs you generate during the experiment.
- The following instructions contain all necessary information for the implementation of the experiment. Please carefully read the instructions and raise your hand if there are any questions.
- Please be quiet, switch off your mobile phones, and do not talk to other participants throughout the course of the experiment.
- The currency Taler is exchanged at a rate of 10 Taler = 0.25 Euro. Your generated payoff and the show-up fee of 2.50 Euro is paid out to you in cash.

Experimental setup

- This experiment is about physicians' therapy decisions.
- Generally, there are three roles in this experiment: The role of the patient, the role of the pharmaceutical company representative and the role of the physician. Each participant is randomly assigned the role of the physician or company representative. The role of the patient will not be assigned during this laboratory experiment. The patient's utility depends on the prescribed pharmaceutical and is represented by the donation made to the charity organization *Doctors Without Borders*.
- During the experiment teams are randomly composed of one company representative and one physician each. Assigned teams play together throughout the **entire** session.
- The payoffs during the experiment are impacted by the decisions of the company representative and the physician.
- The experiment lasts at most 15 rounds of playing and is randomly terminated between rounds 10 and 15. The first 10 rounds will definitely be played. Afterwards, the experiment is terminated with a probability of 20% in each of the subsequent rounds.
- All played rounds will be paid out at the end of the experiment.

Your role in the experiment

- You were randomly assigned the role of the **physician** for the entire length of the experiment. Furthermore, you have been allocated to **one pharmaceutical agent** with whom you will interact for the **entire** experiment.
- Your task is to prescribe a pharmaceutical to the patient. You can choose between pharmaceutical A and pharmaceutical B. Both pharmaceuticals are produced by the assigned company.
- For the patient the different pharmaceuticals alter the length of healing process required. Pharmaceutical A promises a quicker recovery than pharmaceutical B. Therefore, the patients' utility from receiving pharmaceutical A is higher than that achieved through the prescription of pharmaceutical B.
- For the company the pharmaceuticals differ in their production costs. Pharmaceutical A is more cost-intensive than B. Hence, the utility achieved by the company is higher for the prescription of pharmaceutical B compared to pharmaceutical A.
- There is the possibility that the company representative offers you a present for the prescription of pharmaceutical B **before** you have decided which pharmaceutical to prescribe. Your decision regarding which pharmaceutical to prescribe is **independent** of the acceptance of the present.

- If you were offered a present by the company representative, then you can decide whether to accept or reject the present. The acceptance of the present can be detected
 - (1) but will not be punished.
 - (2) + (3) and will then be punished.
- Therefore, a computer-based control of all decisions during the experiment takes place subsequently, after the last round of playing. The chance of an acceptance being detected is 0.3% in each round, i.e., three out of 1000 acceptances are detected.
- (2) In case an acceptance is detected, you do not receive any payoff for the entire experiment. This means that if your acceptance of a present in one or more rounds is subsequently detected, the payoff is 0 Taler for all rounds of playing. The payoff of the company representative is not affected by the detection.
- (3) In case an acceptance is detected, you and the company representative both do **not** receive any payoff for the **entire** experiment. This means that if the acceptance of a present in one or more rounds is subsequently detected, the payoff of the company representative and your own payoff are both 0 Taler for all rounds of playing.
- Of course, in each round the detection can take place only if you accept the present offered by the company representative. The detection is independent of the prescribed pharmaceutical.

Experimental procedure

• You interact with **the same** company representative each round. He/She knows your decisions from the prior rounds.

1.Decision - Pharmaceutical company representative:

- The company representative decides whether to offer you a present. He/She chooses between:
 - Offer a present
 - Do not offer a present

2. Decision - Physician:

- If you are offered a present, then you can decide whether to accept or reject the present. You choose between:
 - Acceptance of the present

- Rejection of the present
- If you have not been offered a present, you directly proceed with the following decision:

3. Decision on treatment - Physician:

- **Independent** of the first decision you now decide which pharmaceutical to prescribe to the patient. You choose between:
 - Prescription of pharmaceutical A
 - Prescription of pharmaceutical B
- After each therapy decision (and hence after each round) the company representative and you are informed regarding the decisions made by the other players.
- (1) At this point, you also are informed of how much you have earned during this round.
- (2) + (3) At this point, you also are informed of the **potential** amount you could have earned in this round.
- After the **last round**, a control of **all** previously played rounds of the experiment takes place. Here, the acceptance of a present can be detected with a chance of 0.3% each round.

Payoffs

- (1) The depicted payoffs constitute the payoffs for each round. At the end of the experiment all rounds will be paid.
- (2) + (3) The depicted payoffs constitute the **potential** payoffs for each round. At the end of the experiment all rounds will be paid, unless at least one present acceptance is detected in the subsequent control. In this case
 - (2) you do not receive any payoff, i.e., you earn 0 Taler for all rounds.
 - (3) both the company representative and you do not receive any payoff, i.e., both of you receive 0 Taler for all rounds.

Payoff for the patient in each round:

- The patient's payoff is represented by a donation to *Doctors Without Borders* and depends on your decisions.
- (2) + (3) A subsequent detection of a present acceptance does **not** affect the payoff of the patient.

Summary for the patient:

- Prescription of pharmaceutical A: Donation amount of 20 Taler
- Prescription of pharmaceutical B: Donation amount of 15 Taler

Payoff for you as physician in each round:

- You receive a basic payment of 20 Taler for every patient you treat.
- Furthermore, the company representative may offer you a present. If you accept the present 15 Taler are credited to your account.

Summary for the physician:

- No offer of a present or rejection of an offered present: 20 Taler
- (1) Offer of a present and acceptance of the present: 35 Taler
- (2) + (3) Offer of a present and acceptance without detection: 35 Taler
- (2) + (3) Please note that if at least one present acceptance is detected you do not receive any payoff for the entire experiment.

Payoff for the company representative in each round:

- The company representative always receives 15 Taler more when pharmaceutical B is prescribed instead of pharmaceutical A. He/She receives 22 Taler if pharmaceutical A is prescribed and 37 Taler if pharmaceutical B is prescribed.
- The company representative has the possibility to offer you a present to increase your tendency to the prescription of pharmaceutical B.
- The present has an additional cost of 5 Taler for the company representative.

Summary for the company representative:

- No offer of a present **or** present offer and rejection by the physician:
 - Prescription of pharmaceutical A: 22 Taler
 - Prescription of pharmaceutical B: 37 Taler
- Offer of a present and acceptance by the physician:
 - Prescription of pharmaceutical A: 17 Taler
 - Prescription of pharmaceutical B: 32 Taler

- (2) + (3) At the end of the experiment **all** played rounds will be paid, except at least one present acceptance is detected. In this case,
 - (2) your payoff is 0 Taler. The payoff of the company representative is **not** affected by the detection, i.e., he/she will receive the above depicted payoffs.
 - (3) the payoff for the company representative and your own payoff is 0 Taler, i.e., both of you will **not** receive any payoff for the entire experiment.

Thank you for your participation!

These are the Instructions for the Pharmaceutical Agent.

Welcome to the experiment!

General information

- During the experiment all amounts are indicated by the fictive currency "Taler".
- The payoff depends on both your own decisions and the decisions of the other players.
- Once the experiment has finished you are asked to fill in a questionnaire. You will receive a brief instruction beforehand. Your answers in the questionnaire do not impact the payoffs you generate during the experiment.
- The following instructions contain all necessary information for the implementation of the experiment. Please carefully read the instructions and raise your hand if there are any questions.
- Please be quiet, switch off your mobile phones, and do not talk to other participants throughout the course of the experiment.
- The currency Taler is exchanged at a rate of 10 Taler = 0.25 Euro. Your generated payoff and the show-up fee of 2.50 Euro is paid out to you in cash.

Experimental setup

- This experiment is about physicians' therapy decisions.
- Generally, there are three roles in this experiment: The role of the patient, the role of the pharmaceutical company representative and the role of the physician. Each participant is randomly assigned the role of the physician or company representative. The role of the patient will not be assigned during this laboratory experiment. The patients' utility depends on the prescribed pharmaceutical and is represented by the donation made to the charity organization *Doctors Without Borders*.
- During the experiment teams are randomly composed of one company representative and one physician each. Assigned teams play together throughout the **entire** session.
- The payoffs during the experiment are impacted by the decisions of the company representative and the physician.
- The experiment lasts at most 15 rounds of play and is randomly terminated between rounds 10 and 15. The first 10 rounds will definitely be played. Afterwards, the experiment is terminated with a probability of 20% in each of the subsequent rounds.
- All played rounds will be paid out at the end of the experiment.

Your role in the experiment

- You were randomly assigned the role of the **company representative** for the entire length of the experiment. Furthermore, you have been allocated to **one** physician with whom you will interact for the **entire** experiment.
- The physician's task is to prescribe pharmaceuticals to the patient. He/She can choose between pharmaceutical A and pharmaceutical B. Bothpharmaceuticals are produced by your company.
- For the patient the different pharmaceuticals alter the length of healing process required. Pharmaceutical A promises a quicker recovery than pharmaceutical B. Therefore, the patient's utility from receiving pharmaceutical A is higher than that achieved through the prescription of pharmaceutical B.
- For your company the pharmaceuticals differ in their production costs. Pharmaceutical A is more cost-intensive than B. Hence, the utility achieved by your company is higher for the prescription of pharmaceutical B when compared to pharmaceutical A.
- You have a possibility to offer a present to the physician for the prescription of pharmaceutical B **before** the physician has decided which pharmaceutical to prescribe. The physician's decision regarding which pharmaceutical to prescribe is **independent** of the acceptance of the present.
- If you have offered a present to the physician, then he/she can decide whether to accept or reject the present. The acceptance of the present can be detected
 - (1) but will not be punished.
 - (2) + (3) and will then be punished.
- Therefore, a computer-based control of all made decisions during the experiment takes place subsequently, **after the last round** of playing. The chance of an acceptance being detected is **0.3% each round**, i.e., three out of 1000 acceptances are detected.
- (2) In case an acceptance is detected, the physician does **not** receive any payoff for the **entire** experiment. This means that if the acceptance of a present in one or more rounds is subsequently detected, the payoff of the physician is 0 Taler. Your own payoff is **not** affected by the detection.
- (3) In case an acceptance is detected, you and the physician both do **not** receive any payoff for the **entire** experiment. This means that if the acceptance of a present in one or more rounds is subsequently detected, the payoff of the physician and your own payoff are both 0 Taler for all rounds of playing.

• Of course, in each round the detection can take place only if you have offered a present, which is then accepted by the physician. The detection is independent of the prescribed pharmaceutical.

Experimental procedure

• You interact with **the same** physician each round. He/She knows your decisions from the prior rounds.

1. Decision - Pharmaceutical company representative:

- You decide whether to offer a present to the physician. You choose between:
 - Offer a present
 - Do not offer a present

2. Decision - Physician:

- If you have offered a present to the physician, then he/she can decide whether to accept or reject the present. He/She chooses between:
 - Acceptance of the present
 - Rejection of the present
- If you have not offered a present to the physician, he/she directly proceeds with the following decision:

3. Decision on treatment - Physician:

- **Independent** of the first decision the physician now decides which pharmaceutical to prescribe to the patient. He/She chooses between:
 - Prescription of pharmaceutical A
 - Prescription of pharmaceutical B
- After each therapy decision (and hence after each round) the physician and you get informed regarding the decisions made by the other players.
- (1) At this point, you also are informed of how much you have earned during this round.
- (2) + (3) At this point, you also are informed of the **potential** amount you could have earned in this round.

• After the **last round**, a control of **all** previously played rounds of the experiment takes place. Here, the acceptance of a present can be detected with a chance of 0.3% each round.

Payoffs

- (1) The depicted payoffs constitute the payoffs for each round. At the end of the experiment all rounds will be paid.
- (2) + (3) The depicted payoffs constitute the **potential** payoffs for each round. At the end of the experiment all rounds will be paid, unless at least one present acceptance is detected in the subsequent control. In this case
 - (2) the physician does not receive any payoff, i.e., he/she earns 0 Taler for all rounds.
 - (3) both the physician and you do not receive any payoff, i.e., both of you receive 0 Taler for all rounds.

Payoff for the patient in each round:

- The patient's payoff is represented by a donation to *Doctors Without Borders* and depends on your decisions.
- (2) + (3) A subsequent detection of a present acceptance does **not** affect the payoff of the patient.

Summary of the patient:

- Prescription of pharmaceutical A: Donation amount of 20 Taler
- Prescription of pharmaceutical B: Donation amount of 15 Taler

Payoff for the physician in each round:

- The physician receives a basic payment of 20 Taler for every patient he/she treats.
- Furthermore, you have the option to offer a present to the physician. If he/she accepts the present 15 Taler are credited to the physician's account. The present has a cost of 5 Taler for your company.

Summary of the physician:

- No offer of a present or rejection of offered present: 20 Taler
- (1) Offer of a present and acceptance of the present: 35 Taler
- (2) + (3) Offer of a present and acceptance without detection: 35 Taler

• (2) + (3) Please note that if at least one present acceptance is detected the physician does **not** receive any payoff for the entire experiment.

Payoff for you as company representative:

- You always receive 15 Taler more when pharmaceutical B is prescribed instead of pharmaceutical A. You receive 22 Taler if pharmaceutical A is prescribed and 37 Taler if pharmaceutical B is prescribed.
- You have the possibility to offer a present to the physician to increase the inclination towards the prescription of pharmaceutical B.
- The present has an additional cost of 5 Taler for your company. Following the acceptance of the present 15 Taler are credited to the physician's account.

Summary of the company representative:

- No offer of a present or present offer and rejection by the physician:
 - Prescription of pharmaceutical A: 22 Taler
 - Prescription of pharmaceutical B: 37 Taler
- Offer of a present and acceptance by the physician:
 - Prescription of pharmaceutical A: 17 Taler
 - Prescription of pharmaceutical B: 32 Taler
- (2) + (3) At the end of the experiment **all** played rounds will be paid, unless at least one present acceptance is detected. In this case,
 - (2) the payoff of the physician is 0 Taler. Your payoff is **not** affected by the detection, i.e., you will receive the above depicted payoffs.
 - (3) your payoff is 0 Taler, i.e., you will **not** receive any payoff for the entire experiment.

Thank you for your participation!

4.5.A.2 German Instructions

Instruktionen für das Pharmaunternehmen

Herzlich Willkommen zum Experiment!

Allgemeine Informationen

- Während des Experiments werden alle Beträge in der fiktiven Währung "Taler" angegeben.
- Die Höhe der Auszahlungen ist abhängig von Ihren Entscheidungen und den Entscheidungen Ihrer Mitspieler.
- Nach Ende des Experiments bitten wir Sie noch einen Fragebogen auszufüllen. Sie erhalten hierzu eine kurze Anleitung, sobald das Experiment beendet ist. Ihre Antworten in diesem Fragebogen haben keinen Einfluss auf Ihre Auszahlung in diesem Experiment.
- Die vorliegenden Instruktionen beinhalten alle notwendigen Informationen für das Experiment. Bitte lesen Sie die Instruktionen aufmerksam und heben Sie bei Fragen die Hand.
- Bitte verhalten Sie sich während des Experiments ruhig, schalten Sie Ihr Handy aus und kommunizieren Sie nicht mit anderen Teilnehmern.
- Die Währung Taler wird zu einem Wechselkurs von 10 Talern = 0,25 Euro umgetauscht und zusammen mit der Show-Up Fee von 2,50 Euro bar an Sie ausgezahlt.

Aufbau des Experiments

- Dieses Experiment beschäftigt sich mit der ärztlichen Therapieentscheidung.
- Generell gibt es drei Rollen in diesem Experiment: Die Rolle des Patienten, die Rolle des Unternehmensvertreters und die des Arztes. Jeder Teilnehmer im Labor wird zufällig in die Rolle des Arztes oder des Unternehmensvertreters eingeteilt. Der Patient ist keine im Labor anwesende Person. Der Nutzen des Patienten ist vom verschriebenen Medikament abhängig und wird als Spende an die Hilfsorganisation *Ärzte ohne Grenzen* ausgezahlt.
- Im Experiment werden zufällig Teams aus je einem Unternehmensvertreter und einem Arzt gebildet. Diese Teams spielen für die **gesamte Dauer** des Experiments miteinander.
- Die Auszahlungen im Experiment werden von den Entscheidungen des Unternehmensvertreters und des Arztes beeinflusst.
- Das Experiment dauert maximal 15 Runden. Es wird zufällig zwischen Runde 10 und 15 beendet. Die ersten 10 Runden werden definitiv gespielt, danach wird das Experiment pro Runde mit einer Wahrscheinlichkeit von 20% beendet.
- Es werden alle gespielten Runden am Ende des Experiments ausgezahlt.

Ihre Rolle im Experiment, Ihre Entscheidungen und die Auswirkungen auf die anderen Teilnehmer

- Für das komplette Experiment wurde Ihnen zufällig die Rolle des Unternehmensvertreters zugewiesen. Außerdem wurde Ihnen für das Experiment ein Arzt zugeteilt. Sie treffen im gesamten Experiment immer auf denselben Arzt.
- Die Aufgabe des Arztes ist dem Patienten ein Medikament zu verschreiben. Er hat die Wahl zwischen Medikament A oder Medikament B. Beide Medikamente werden von Ihrem Unternehmen produziert.
- Für den Patienten unterscheiden sich die Medikamente nur in ihrer Heilungsdauer. Medikament A hat eine kürzere Heilungsdauer als Medikament B. Deshalb ist für den Patienten der Mehrwert bei der Verschreibung von Medikament A höher als bei der Verschreibung von Medikament B.
- Für Ihr Unternehmen unterscheiden sich die Medikamente in den Herstellungskosten. Medikament A ist kostenintensiver als Medikament B in der Herstellung. Deshalb ist für Sie der Mehrwert bei der Verschreibung von Medikament B höher als bei der Verschreibung von Medikament A.

- Sie können dem Arzt **vor** der Behandlung des Patienten ein Geschenk anbieten, damit er Medikament B verschreibt. Die Entscheidung des Arztes über das zu verschreibende Medikament ist **unabhängig** von der Annahme des Geschenks.
- Falls Sie dem Arzt ein Geschenk anbieten, kann dieser es annehmen oder ablehnen. Die Geschenkannahme kann aufgedeckt,
 - (1) aber nicht bestraft werden.
 - (2) + (3) und bestraft werden.
- Dazu findet **nach der letzten Runde** im Experiment eine nachträgliche Kontrolle aller Entscheidungen im Experiment durch den Computer statt. Hierbei besteht die Möglichkeit, dass eine Geschenkannahme aufgedeckt wird. Die Aufdeckungswahrscheinlichkeit beträgt **0,3% pro Runde**, d.h. von 1.000 Geschenkannahmen werden drei aufgedeckt.
- (2) Sollte eine Geschenkannahme des Arztes aufgedeckt werden, erhält dieser keine Auszahlung für das gesamte Experiment. Das heißt, falls die Geschenkannahme in einer oder mehreren Runden nachträglich aufgedeckt wird, beträgt die Auszahlung des Arztes am Ende 0 Taler für alle Runden. Ihre Auszahlungen werden von einer Aufdeckung nicht beeinflusst.
- (3) Sollte eine Geschenkannahme des Arztes aufgedeckt werden, erhalten auch Sie **keine** Auszahlung für das **gesamte** Experiment. Der Arzt erhält ebenfalls **keine** Auszahlung für das **gesamte** Experiment. Das heißt, falls Ihre Geschenkannahme in einer oder mehreren Runden nachträglich aufgedeckt wird, beträgt Ihre Auszahlung und die Auszahlung des Arztes am Ende 0 Taler für alle Runden.
- In jeder Runde kann die Aufdeckung natürlich nur dann erfolgen, wenn Sie in dieser Runde ein Geschenk angeboten haben und dieses vom Arzt angenommen wurde. Die Aufdeckung ist unabhängig vom verschriebenen Medikament.

Ablauf des Experiments

• Sie treffen in jeder Runde auf **denselben** Arzt. Dieser kennt Ihre Entscheidungen aus der Vorrunde.

1. Entscheidung - Unternehmensvertreter:

- Sie entscheiden ob Sie dem Arzt ein Geschenk anbieten. Sie haben die Wahl zwischen:
 - Geschenkangebot
 - Kein Geschenkangebot

2. Entscheidung - Arzt:

- Wenn Sie dem Arzt ein Geschenk anbieten, kann dieser entscheiden ob er es annimmt oder ablehnt. Er hat die Wahl zwischen:
 - Annahme des Geschenks
 - Ablehnung des Geschenks
- Sollten Sie dem Arzt kein Geschenk anbieten, so trifft er direkt die folgende Entscheidung:

3. Behandlungsentscheidung - Arzt:

- Unabhängig von seiner ersten Entscheidung entscheidet der Arzt nun welches Medikament er dem Patienten verschreibt. Er hat die Wahl zwischen:
 - Verschreibung von Medikament A
 - Verschreibung von Medikament B
- Nach jeder Therapieentscheidung, also nach jeder Runde, erhalten Sie und der Arzt eine Information über die Entscheidungen des anderen Spielers.
- (1) Hier bekommen Sie auch Informationen darüber, wie hoch Ihre Auszahlung in dieser Runde ist.
- (2) + (3) Hier bekommen Sie auch Informationen darüber, wie hoch Ihre **potentielle** Auszahlung für diese Runde sein könnte.
- Nach der **letzten Runde** findet eine Kontrolle **aller** Runden des Experimentes statt. Bei der Kontrolle kann eine Geschenkannahme mit einer Wahrscheinlichkeit von 0,3% pro Runde aufgedeckt werden.

Auszahlungen

- (1) Die dargestellten Auszahlungen nach jeder Runde sind die Auszahlungen pro Runde. Am Ende des Experiments werden **alle** Runden ausgezahlt.
- (2) + (3) Die dargestellten Auszahlungen nach jeder Runde sind die **potentiellen** Auszahlungen pro Runde. Am Ende des Experiments werden alle Runden ausgezahlt, es sei denn mindestens eine Geschenkannahme wird im Anschluss an die letzte Runde aufgedeckt. In diesem Fall
 - (2) wird KEINE Runde ausgezahlt, d.h. der Arzt erhält 0 Taler für alle Runden.
 - (3) wird KEINE Runde ausgezahlt, d.h. Sie und der Arzt erhalten 0 Taler für alle Runden.

Auszahlungen für den Patienten pro Runde:

- Die Auszahlungen des Patienten werden an Ärzte ohne Grenzen gespendet und sind abhängig von Ihren Entscheidungen.
- (2) + (3) Eine nachträgliche Aufdeckung einer Geschenkannahme beeinflusst die Auszahlung an die Patienten **nicht!**

Zusammenfassung Patient:

- Verschreibung von Medikament A: Spende in Höhe von 20 Talern
- Verschreibung von Medikament B: Spende in Höhe von 15 Talern

Auszahlung für den Arzt pro Runde:

- Der Arzt erhält ein Grundgehalt in Höhe von 20 Talern für jeden Patienten, den er behandelt.
- Außerdem können Sie dem Arzt ein Geschenk anbieten. Nimmt der Arzt es an, erhält er 15 Taler gut geschrieben. Das Geschenk verursacht für Sie Kosten in Höhe von 5 Talern.

Zusammenfassung Arzt pro Runde:

- Kein Geschenkangebot oder Ablehnung des Geschenkangebots: 20 Taler
- (1) Geschenkangebot und Geschenkannahme: 35 Taler
- (2) + (3) Geschenkangebot und Geschenkannahme ohne Aufdeckung: 35 Taler

• (2) + (3) Beachten Sie: Bei Aufdeckung mindestens einer Geschenkannahme erhält der Arzt **keine** Auszahlung für das gesamte Experiment.

Ihre Auszahlungen als Unternehmensvertreter pro Runde:

- Sie erhalten immer 15 Taler mehr, wenn Medikament B verschrieben wird anstatt Medikament A. Sie erhalten 22 Taler wenn Medikament A verschrieben wird und 37 Taler wenn Medikament B verschrieben wird.
- Sie haben die Möglichkeit dem Arzt ein Geschenk anzubieten, damit er geneigt ist Medikament B zu verschreiben.
- Das Geschenk selbst verursacht weitere Kosten in Höhe von 5 Talern für Sie. Dem Arzt werden 15 Taler bei Geschenkannahme gut geschrieben.

Zusammenfassung Unternehmensvertreter:

- Kein Geschenkangebot oder Geschenkangebot und Ablehnung durch Arzt:
 - Verschreibung von Medikament A: 22 Taler
 - Verschreibung von Medikament B: 37 Taler
- Geschenkangebot und Annahme durch Arzt:
 - Verschreibung von Medikament A: 17 Taler
 - Verschreibung von Medikament B: 32 Taler
- (2) + (3) Am Ende des Experiments werden **alle** gespielten Runden ausgezahlt! Es sei denn mindestens eine Geschenkannahme wurde aufgedeckt. In diesem Fall
 - (2) beträgt die Auszahlung des Arztes 0 Taler. Ihre Auszahlung wird von einer Aufdeckung **nicht** beeinflusst
 - (3) beträgt Ihre Auszahlung und die des Arztes 0 Taler.

Vielen Dank für Ihre Teilnahme!

Instruktionen für den Arzt

Herzlich Willkommen zum Experiment!

Allgemeine Informationen

- Während des Experiments werden alle Beträge in der fiktiven Währung "Taler" angegeben.
- Die Höhe der Auszahlungen ist abhängig von Ihren Entscheidungen und den Entscheidungen Ihrer Mitspieler.
- Nach Ende des Experiments bitten wir Sie noch einen Fragebogen auszufüllen. Sie erhalten hierzu eine kurze Anleitung, sobald das Experiment beendet ist. Ihre Antworten in diesem Fragebogen haben keinen Einfluss auf Ihre Auszahlung in diesem Experiment.
- Die vorliegenden Instruktionen beinhalten alle notwendigen Informationen für das Experiment. Bitte lesen Sie die Instruktionen aufmerksam und heben Sie bei Fragen die Hand.
- Bitte verhalten Sie sich während des Experiments ruhig, schalten Sie Ihr Handy aus und kommunizieren Sie nicht mit anderen Teilnehmern.
- Die Währung Taler wird zu einem Wechselkurs von 10 Talern = 0,25 Euro umgetauscht und zusammen mit der Show-Up Fee von 2,50 Euro bar an Sie ausgezahlt.

Aufbau des Experiments

- Dieses Experiment beschäftigt sich mit der ärztlichen Therapieentscheidung.
- Generell gibt es drei Rollen in diesem Experiment: Die Rolle des Patienten, die Rolle des Unternehmensvertreters und die des Arztes. Jeder Teilnehmer im Labor wird zufällig in die Rolle des Arztes oder des Unternehmensvertreters eingeteilt. Der Patient ist keine im Labor anwesende Person. Der Nutzen des Patienten ist vom verschriebenen Medikament abhängig und wird als Spende an die Hilfsorganisation *Ärzte ohne Grenzen* ausgezahlt.
- Im Experiment werden zufällig Teams aus je einem Unternehmensvertreter und einem Arzt gebildet. Diese Teams spielen für die **gesamte Dauer** des Experiments miteinander.
- Die Auszahlungen im Experiment werden von den Entscheidungen des Unternehmensvertreters und des Arztes beeinflusst.
- Das Experiment dauert maximal 15 Runden. Es wird zufällig zwischen Runde 10 und 15 beendet. Die ersten 10 Runden werden definitiv gespielt, danach wird das Experiment pro Runde mit einer Wahrscheinlichkeit von 20% beendet.
- Es werden alle gespielten Runden am Ende des Experiments ausgezahlt.

Ihre Rolle im Experiment, Ihre Entscheidungen und die Auswirkungen auf die anderen Teilnehmer

- Für das komplette Experiment wurde Ihnen zufällig die Rolle des Arztes zugewiesen. Außerdem wurde Ihnen für das Experiment ein Unternehmensvertreter zugeteilt. Sie treffen im gesamten Experiment immer auf denselben Unternehmensvertreter.
- Ihre Aufgabe ist es, dem Patienten ein Medikament zu verschreiben. Sie haben die Wahl zwischen Medikament A oder Medikament B. Beide Medikamente werden vom zugewiesenen Unternehmen produziert.
- Für den Patienten unterscheiden sich die Medikamente nur in ihrer Heilungsdauer. Medikament A hat eine kürzere Heilungsdauer als Medikament B. Deshalb ist für den Patienten der Mehrwert bei der Verschreibung von Medikament A höher als bei der Verschreibung von Medikament B.

- Für das Unternehmen unterscheiden sich die Medikamente in den Herstellungskosten. Medikament A ist kostenintensiver als Medikament B in der Herstellung. Deshalb ist für das Unternehmen der Mehrwert bei der Verschreibung von Medikament B höher als bei der Verschreibung von Medikament A.
- Es besteht die Möglichkeit, dass Ihnen der Unternehmensvertreter vor der Behandlung des Patienten ein Geschenk anbietet, damit Sie Medikament B verschreiben. Ihre Entscheidung über das zu verschreibende Medikament ist unabhängig von der Annahme des Geschenks.
- Falls Ihnen der Unternehmensvertreter ein Geschenk anbietet, können Sie dieses annehmen oder ablehnen. Die Geschenkannahme kann aufgedeckt,
 - (1) aber nicht bestraft werden.
 - (2) + (3) und bestraft werden.
- Dazu findet nach der letzten Runde im Experiment eine nachträgliche Kontrolle aller Entscheidungen im Experiment durch den Computer statt. Hierbei besteht die Möglichkeit, dass eine Geschenkannahme aufgedeckt wird. Die Aufdeckungswahrscheinlichkeit beträgt 0,3% pro Runde, d.h. von 1.000 Geschenkannahmen werden drei aufgedeckt.
- (2) Sollte eine Geschenkannahme aufgedeckt werden, erhalten Sie **keine** Auszahlung für das **gesamte** Experiment. Das heißt, falls Ihre Geschenkannahme in einer oder mehreren Runden nachträglich aufgedeckt wird, beträgt Ihre Auszahlung am Ende 0 Taler für alle Runden. Die Auszahlungen des Unternehmensvertreters werden davon nicht beeinflusst.
- (3) Sollte eine Geschenkannahme aufgedeckt werden, erhalten Sie keine Auszahlung für das gesamte Experiment. Der Unternehmensvertreter erhält ebenfalls keine Auszahlung für das gesamte Experiment. Das heißt, falls Ihre Geschenkannahme in einer oder mehreren Runden nachträglich aufgedeckt wird, beträgt Ihre Auszahlung und die Auszahlung des Unternehmensvertreters am Ende 0 Taler für alle Runden.
- In jeder Runde kann die Aufdeckung natürlich nur dann erfolgen, wenn in dieser Runde auch ein Geschenk angenommen wurde. Sie ist unabhängig vom verschriebenen Medikament.

Ablauf des Experiments

• Sie treffen in jeder Runde auf **denselben** Unternehmensvertreter. Dieser kennt Ihre Entscheidungen aus der Vorrunde.

1. Entscheidung - Unternehmensvertreter:

- Der Unternehmensvertreter entscheidet, ob er Ihnen ein Geschenk anbietet. Er hat die Wahl zwischen:
 - Geschenkangebot
 - Kein Geschenkangebot

2. Entscheidung - Arzt:

- Möglicherweise bietet Ihnen der Unternehmensvertreter ein Geschenk an. Dann können Sie entscheiden, ob Sie dieses annehmen oder ablehnen. Sie haben die Wahl zwischen:
 - Annahme des Geschenks
 - Ablehnung des Geschenks
- Sollte der Unternehmensvertreter Ihnen kein Geschenk anbieten, treffen Sie direkt die folgende Behandlungsentscheidung:

3. Behandlungsentscheidung - Arzt:

- Unabhängig von Ihrer ersten Entscheidung entscheiden Sie nun welches Medikament Sie dem Patienten verschreiben. Sie haben die Wahl zwischen:
 - Verschreibung von Medikament A
 - Verschreibung von Medikament B
- Nach jeder Therapieentscheidung, also nach jeder Runde, erhalten Sie und der Unternehmensvertreter eine Information über die Entscheidungen des anderen Spielers.
- (1) Hier bekommen Sie auch Informationen darüber, wie hoch Ihre Auszahlung in dieser Runde ist.
- (2) + (3) Hier bekommen Sie auch Informationen darüber, wie hoch Ihre potentielle Auszahlung für diese Runde sein könnte.
- Nach der **letzten Runde** findet eine Kontrolle **aller** Runden des Experimentes statt. Bei der Kontrolle kann eine Geschenkannahme mit einer Wahrscheinlichkeit von 0,3% pro Runde aufgedeckt werden.

Auszahlungen

- (1) Die dargestellten Auszahlungen nach jeder Runde sind die Auszahlungen pro Runde. Am Ende des Experiments werden **alle** Runden ausgezahlt.
- (2) + (3) Die dargestellten Auszahlungen nach jeder Runde sind die **potentiellen** Auszahlungen pro Runde. Am Ende des Experiments werden alle Runden ausgezahlt, es sei denn mindestens eine Geschenkannahme wird im Anschluss an die letzte Runde aufgedeckt. In diesem Fall
 - (2) wird KEINE Runde ausgezahlt, d.h. Sie erhalten 0 Taler für alle Runden.
 - (3) wird KEINE Runde ausgezahlt, d.h. Sie und der Unternehmensvertreter erhalten 0 Taler für alle Runden.

Auszahlungen für den Patienten pro Runde:

- Die Auszahlungen des Patienten werden an Ärzte ohne Grenzen gespendet und sind abhängig von Ihren Entscheidungen.
- (2) + (3) Eine nachträgliche Aufdeckung einer Geschenkannahme beeinflusst die Auszahlung an die Patienten **nicht!**

Zusammenfasung Patient:

- Verschreibung von Medikament A: Spende in Höhe von 20 Talern
- Verschreibung von Medikament B: Spende in Höhe von 15 Talern

Ihre Auszahlungen als Arzt pro Runde:

- Sie erhalten ein Grundgehalt in Höhe von 20 Talern für jeden Patienten, den Sie behandeln.
- Außerdem kann Ihnen der Unternehmensvertreter ein Geschenk anbieten. Nehmen Sie dieses an, erhalten Sie zusätzlich 15 Taler gut geschrieben.

Zusammenfassung Arzt pro Runde:

- Kein Geschenkangebot oder Ablehnung des Geschenkangebots: 20 Taler
- (1) Geschenkangebot und Geschenkannahme: 35 Taler
- (2) + (3) Geschenkangebot und Geschenkannahme ohne Aufdeckung: 35 Taler
- (2) + (3) Beachten Sie: Bei Aufdeckung mindestens einer Geschenkannahme erhalten Sie **keine** Auszahlung für das gesamte Experiment.

Auszahlungen für den Unternehmensvertreter pro Runde:

- Der Unternehmensvertreter erhält immer 15 Taler mehr, wenn Medikament B verschrieben wird anstatt Medikament A. Er erhält 22 Taler, wenn Medikament A verschrieben wird und 37 Taler, wenn Medikament B verschrieben wird.
- Der Unternehmensvertreter hat die Möglichkeit, Ihnen ein Geschenk anzubieten, damit Sie geneigt, Medikament B zu verschreiben.
- Das Geschenk verursacht weitere Kosten in Höhe von 5 Talern für den Unternehmensvertreter.

Zusammenfassung Unternehmensvertreter:

- Kein Geschenkangebot oder Geschenkangebot und Ablehnung durch Arzt:
 - Verschreibung von Medikament A: 22 Taler
 - Verschreibung von Medikament B: 37 Taler
- Geschenkangebot und Annahme durch Arzt:
 - Verschreibung von Medikament A: 17 Taler
 - Verschreibung von Medikament B: 32 Taler
- (2) + (3) Am Ende des Experiments werden **alle** gespielten Runden ausgezahlt! Es sei denn mindestens eine Geschenkannahme wurde aufgedeckt. In diesem Fall
 - (2) **beträgt Ihre Auszahlung 0 Taler.** Die Auszahlung des Unternehmensvertreters wird davon **nicht** beeinflusst.
 - (3) beträgt Ihre Auszahlung und die des Unternehmensvertreters 0 Taler.

Vielen Dank für Ihre Teilnahme!

4.5.B Overview of all Decisions

In our analysis we consider only the decisions in Periods 1-10. Here you can find an overview of all decisions in our experiments.

Actor and Phase	Decisions	No-Penalty	Old-Law	New-Law	Total Sample
Phase I:	Offer Bribe	57.87%	54.69%	24.06%	45.67%
Briber	Don't offer Bribe	42.13%	45.31%	75.94%	54.33%
Phase II:	Accept	91.60%	50.73%	48.62%	66.35%
Physician	Don't Accept	8.40%	49.27%	51.38%	33.65%
Phase III: Physician	Bribe was accepted:				
	Prescription: Patient-Optimal	13.10%	8.89%	23.21%	13.39%
	Prescription: Briber-Optimal	86.90%	91.11%	76.79%	86.61%
Dhaca III.	Bribe was not accepted:				
Phase III: Physician	Prescription: Patient-Optimal	80.95%	87.05%	79.25%	84.51%
	Prescription: Briber-Optimal	19.05%	12.95%	20.75%	15.49%
Phase III: Physician	Bribe was not offered:				
	Prescription: Patient-Optimal	86.26%	94.71%	89.83%	90.44%
	Prescription: Briber-Optimal	13.74%	5.29%	10.17%	9.56%

Table 4.9: Overview of the Decisions Taken in all Periods

Chapter 5

Summary of the Results and Outline for Future Research

This thesis focuses on the influence of bribery on a physician's treatment decision. Therefore, we present a theoretical model to study the behavioral characteristics that lead to a physician's corrupt behavior and two experiments that shed light on the influence of reciprocity and the effect of different punishment structures. In this chapter, we sum up the findings and add possibilities for future research.

In our introduction we show that corruption in the health care sector is an up-to-date topic. Especially the bribing of physicians by pharmaceutical companies is a common practice. Thus, in our research papers we focused on the influence of pharmaceutical companies on a physician's prescription behavior.

First we set up a theoretical model to analyze the influence of bribery and reciprocity on a physician's pharmaceutical prescription behavior. By applying the assumptions of different behavioral models, such as rationality, altruism and reciprocity, we find that only the reciprocally motivated physician who has a stronger relationship to the briber than to the patient will accept an offered bribe and prescribe a patient-non-optimal treatment. Altruistically and rationally motivated physicians will not prescribe a patient-non-optimal pharmaceutical, even though they accept an offered bribe.

We designed our theoretical model as a one-shot game with two stages. As reciprocal relationships establish with time, future research can model the participant's behavior in a game with repeated interactions in several rounds. In addition, a detection probability leading to a penalty could be included in an extension of our model.

On the basis of the results of our theoretical model, we set up an experiment to analyze the relationship between reciprocity and a physician's corrupt behavior. With the help of two treatments we vary the reciprocal relationships between the subjects in the role of either a briber or a physician. We find that participants in the stranger treatment, who are re-matched to a new partner in every period, act corruptly less often than the participants in the partner treatment, who play together for the whole experiment. Overall we find more successful corrupt acts in the partner treatment than in the stranger treatment.

Nevertheless, we do not find any significant differences between subjects that are reciprocally motivated and subjects that are altruistically motivated, based on the Preference Survey Module of Falk et al. (2016). Alternatively, another questionnaire to analyze the subject's characteristics could be used, for example the questions of the German Socio-

Economic Panel (SOEP; Richter et al. 2013). In 2005 and 2010, the SOEP included six questions regarding positive and negative reciprocity. However, it might not be necessary to add a questionnaire to analyze a subject's reciprocal behavior. By using a trust game, the reciprocal motivation of the participants could be measured. But in our experiment we measure the relative reciprocity of a physician that has a relationship to a briber and to a patient. Therefore, we need to measure the relative strength of reciprocity, comparing the physician's relationships to both other participants. To our knowledge there is no questionnaire to measure this kind of relative reciprocity.

As we find that a partner treatment and therefore a reciprocal relationship leads to more corrupt acts, we conduct a second experiment in which we analyzed the influence of different punishment structures on corrupt behavior. We use a detection probability of 0.3% combined with a sudden death mechanism. This means that in case a bribe was offered and the physician accepts the offered bribe, detection of corrupt behavior can take place. Depending on the treatments, different punishment schemes were implied: in the no-penalty treatment, a detection leads to no punishment for both participants; in the old-law treatment only the physician gets punished; in the new-law treatment both participants get punished in case of detection. Overall we find the highest number of successful corrupt acts in the no-penalty treatment. By implementing the physician's possibility of getting punished the number of accepted bribes is reduced in the old-law treatment. Adding the chance of punishment for the briber, decreases the number of offered bribes. In the end, the fewest successful corrupt acts take place in the new-law treatment. However, we find a change in the participants' behavior only if they directly face the chance of getting punished. They do not consider the other participant's punishment in their own behavior.

In our experiment, we assume a detection probability of 0.3%, following the design of Abbink et al. (2002). The consequences of detection are severe as a detection leads to a sudden death, meaning zero payoffs in case of detection. It would be interesting to analyze the effect of different detection probabilities combined with a sudden death consequence to find the threshold where corruption is not taking place anymore. Thereby, a suitable detection level to fight corruption could be determined. Schulze and Frank (2003), Schildberg-Hörisch and Strassmair (2010) and Christöfl et al. (2017) change the detection probability and also the penalties in their experiments so that the severity of the consequences due to corrupt behavior is varied. In our experiment, we look only at the case in which a detection leads to sudden death, meaning no payoff. Effects of different penalties, such as financial fines or exclusions from the game for some periods, could be analyzed in additional experiments.

Next to the mentioned extensions to the existing research, there is still room for further research. Lambsdorff and Frank (2010) shed light on the influence of whistle blowing on corrupt behavior. The set-up for our experiment allows for testing the influence of whistle blowing in combination with a penalty reduction. The effect of leniency programs as anti-corruption measures can be first tested in an experimental set-up before implementing it into the real world.

Only students of Paderborn University participated in our laboratory experiments. As Paderborn University has no medical faculty, no medical students participated in our experiments. Hennig-Schmidt and Wiesen (2014) find a significant difference between medical and non-medical students in their decisions to provide medical services under different payment schemes. It is straightforward to conduct these experiments with medical students or, if possible, even with real physicians.

Overall we believe that experimental studies are a suitable way to analyze corrupt behavior. As corruption normally appears secretly and in hiding, experiments can give researchers interesting insights into an individual's corrupt behavior, even though the results cannot be transferred directly and without sacrifices to real-world situations. Nevertheless, only in an experiment can there be controls for detection probabilities and potential corrupt cooperations. This can help to understand determinants that lead to corrupt behavior. On the basis of experimental results, new concepts for fighting corruption can be generated and improve anti-corruption policies.

In the presented research papers, we focus on reasons for a physician to prescribe a patient-non-optimal treatment in cases in which he is bribed. Our results show that reciprocal concerns are the key factor to explain a physician's corrupt behavior. After accepting a bribe, feelings of indebtedness and the wish to reciprocate a beneficial behavior of a briber influence a physician's treatment decision. A close relationship to the pharmaceutical industry will enhance the reciprocal concerns of physicians. Therefore, pharmaceutical companies focus on measures to create close and frequent relationships to physicians. Even though pharmaceutical marketing and sponsoring in cases of medical research is necessary, it should not influence a physician's therapeutic freedom. As shown in our last experiment, penalties that focus not only on the physician but also on the pharmaceutical companies can significantly reduce the number of successful corrupt acts. Therefore, the new law that includes punishment for pharmaceutical companies that bribed a physician as well as for physicians that accepted an offered bribe is a step in the right direction.

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