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Gender and Collusion

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Abstract

Many cartels are formed by individual managers of different firms, but not by firms as collectives. However, most of the literature in industrial economics neglects individuals' incentives to form cartels. Although oligopoly experiments reveal important insights on individuals acting as firms, they largely ignore individual heterogeneity, such as gender differences. We experimentally analyze gender differences in prisoner's dilemmas, where collusive behavior harms a passive third party. In a control treatment, no externality exists. To study the influence of social distance, we compare subjects' collusive behavior in a within-subjects setting. In the first game, subjects have no information on other players, whereas they are informed about personal characteristics in the second game. Results show that guilt-averse women are significantly less inclined to collude than men when collusion harms a third party. No gender difference can be found in the absence of a negative externality. Interestingly, we find that women are not sensitive to the decision context, i.e., even when social distance is small they hardly behave collusively when collusion harms a third party.

JEL classification: C92, D01, D43, J16, K21, L13, L41

Keywords: Collusion, Cartels, Competition Policy, Antitrust, Gender Differences

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1. Introduction

The determinants of cartel formation and the necessary conditions to guarantee their stability have been important questions in theoretical and empirical industrial economics and competition policy for almost one century (for surveys see Levenstein and Suslow, 2006, Connor and Bolotova, 2006). Somewhat surprisingly, the multitude of these works focuses almost exclusively on firms and their incentives as the unit of analysis. Even though economics portrays itself as being based on the paradigm of methodological individualism, most papers neglect the incentives of the very individuals involved in a cartel. Put differently, individuals' incentives to participate in cartels are set equal to firms' incentives. In this respect, the literature focuses on the role of market characteristics (e.g., the number of firms, market transparency, multi-market contacts, demand elasticities) and firm characteristics (e.g., individual cost functions, private information) to analyze the incentives to form and maintain collusion.

However, cartels are usually formed by individuals within the firm, such as product managers, sometimes even without knowledge of the firm's management board. The bulk of papers ignores the individual motivations to reach collusive agreements, though. A notable exception is the literature on oligopoly experiments (e.g., Huck et al., 1999, 2001, 2004), where subjects in the laboratory assume the role of firms. The experimental literature repeatedly emphasizes that individuals who act as if they were a firm may be not only motivated by classical payoff-maximizing behavior, but also by behavioral aspects, such as imitative behavior, refusal of payoff asymmetries, and trusting behavior (Armstrong and Huck, 2010). Furthermore, experiments on competition policy instruments such as leniency programs have highlighted the role of individual incentives to destabilize cartels. Leniency policies provide incentive structures that motivate whistleblowers to report cartels (Hinloopen and Soetevent, 2008, Bigoni et al., 2012, Clemens and Rau, 2019, Andres et al., 2021). Thus, cartels often break down, since trust is disrupted and cartel members face psychological costs of being betrayed by their partners (Marvão and Spagnolo, 2018). While this research highlights the importance of behavioral factors, most experiments nevertheless portray individuals and firms as interchangeable entities.

Even though oligopoly experiments study individual decisions, they largely ignore individual heterogeneity such as gender. Comparing the collusive behavior of men and women may be one promising avenue for research, since little is known about the effect of gender differences on managers' propensity to collude, most likely also because women are still under-represented in management positions (Santacreu-Vasut and Pike, 2019). Empirical research provides first evidence that women may reduce corruption and increase public good provision (Swamy et al., 2001, Chattopadhyay and Duflo, 2004). In the context of (unethical) behavior, such as collusion, laboratory experiments can generate controlled data obtaining new insights into gender differences with respect to pricing behavior in markets. This is of particular interest in light of gender inequality and the effectiveness of affirmative action policies (Grosch et al., 2020). Experimental research in economics has

repeatedly revealed gender differences in preferences that determine behavior (Croson and Gneezy, 2009). For example, women have been found to be less risk tolerant (Charness and Gneezy, 2012), less competitive (Niederle and Vesterlund, 2007), and sometimes less trusting than men (Rau, 2012). It was also found that women are more generous (Eckel and Grossman, 1998, Grosch and Rau, 2017) and more cooperative than men (Ortmann and Tichy, 1999). These differences represent key aspects that are relevant for collusive behavior and are highly relevant for competition policy.

Motivated by these findings, we run a laboratory experiment to conduct a comprehensive analysis on gender differences in collusive behavior, which is essential for several areas of antitrust. The novelty of our approach is that we study gender differences in a setting, where collusive behavior comes at the expense of a passive third party. Such a setting is typical for cartels, as price fixing harms consumers who face collusive prices. The bulk of oligopoly experiments simulates buyers with computers, where the costs for outsiders are effectively without consequence though (Engel, 2007, Potters and Suetens, 2013). Only few oligopoly experiments compare computerized buyers with human players who actively decide. These studies find that human players may affect strategic behavior of sellers, leading to lower prices (Ruffle, 2000, Potters and Suetens, 2013), or a change in price complexity (Kalaycı, 2015). The difference in our approach is that we use passive human consumers, following the assumption that consumers have no or hardly any possibility to sanction colluding firms. This also allows us to measure the direct effects of decision-makers' social preferences and their feelings of guilt when setting collusive prices that harm consumers, since we can rule out strategic motives.

Our experiment adopts a salami-slicing-approach to understand the complexity of gender differences in collusive behavior and how this is affected by external effects. We model collusion in a prisoner's dilemma, where it harms passive third players (Engel and Zhurakhovska, 2014). More precisely, we study a within-subjects setting, where subjects subsequently decide in two of these prisoner's dilemmas. First, subjects decide without information about their interaction partner, which yields insights on the pure gender differences in collusive behavior when third parties are harmed. Second, they receive information on the interaction partner (gender, age, duration of study) before deciding again. This step and the within-subjects design allow us to compare how collusive behavior changes when subjects are informed about characteristics of their interaction partner. We isolate the impact of harm to third parties with a control treatment, where collusive behavior has no negative externality. To shed light on the underlying mechanisms, we collect an extensive set of economic preferences (risk, patience, social value orientation) and psychological measures (betrayal-, guilt-, and shame aversion), which are of relevance in this context.

Results demonstrate that women behave significantly less collusively than men when third parties are harmed. The gender difference is driven by guilt- and shame-averse

women who are less likely to collude when it causes harm to third parties. The gender difference vanishes in the control treatment, where women cooperate significantly more compared to the treatment with negative externalities. Importantly, the results are robust when lowering social distance. In this case, women again show the same low degree of collusive behavior. Interestingly, men seem to be sensitive to the decision context, i.e., they significantly reduce cooperation when knowing that their interaction partner is male. Closer inspection reveals that this is driven by betrayal-averse men who apparently face psychological costs when cooperation is exploited.

Our results have important practical implications, suggesting an increase of women in management positions can reduce collusive behavior and increase compliance with antitrust laws. The finding that betrayal-averse men may behave less cooperatively when they are informed about some characteristics of the other active player is striking. It suggests that (old) boys' networks may only work when men manage to build up trust (e.g., in repeated meetings). This highlights the importance of monitoring business connections and the risk that close social relationships among men can pose for compliance programs.

2. Experimental Design

In this section, we present the experimental design. Our study consists of two main blocks, which consist of two parts each. In the first block, subjects participate in the main part of our within-subjects experiment, the cooperation games. In the second block, we focus on possible channels for subjects' behavior. Precisely, we elicit economic preferences and apply a set of psychological measures, which are relevant for cooperative behavior in this setting.

2.1. First Block: Cooperation Games

In the beginning of the experiment, subjects complete a basic sociodemographic questionnaire (gender, age, number of semesters studied). Next, they are informed that the experiment consists of four parts and that they receive new instructions before each part begins. When participating in a part, subjects do not know any details about the next part (see Appendix C). Participants are told that either part one or two will be randomly selected to determine their final payoff, while parts three and four are both paid with certainty. The resulting payoffs are not disclosed during the experiment and only communicated when the experiment is finished.

In the first block of the within-subjects experiment, subjects participate in two consecutive cooperation games (parts one and two), which are based on a symmetric two-person prisoner's dilemma extended by a third player who is a passive outsider and does not participate in the game.

Our design builds on Engel and Zhurakhovska (2014), but differs in three important respects. First, our setting models collusive behavior of firms. The two active players

(Player A and Player B) face the opportunity to collude in prices, i.e., we frame subjects' actions as setting a high vs. a low price. This approach is inspired by Cooper and Kühn (2014) who also model price collusion in simple matrix games. In our game, the passive player (Player C) can be regarded as a consumer. His payoff is only lowered when both active players collude, which is similar to a scenario where firms form a cartel. This stands in contrast to Engel and Zhurakhovska (2014), where the payoff of the third player is already reduced whenever at least one of the two active players cooperates. Second, we extend the one-shot prisoner's dilemma to a within-subjects design, where the same participants are re-matched and decide in an additional prisoner's dilemma (henceforth: cooperation game). The goal is to analyze how stable subjects' behavior is when we lower social distance of the players. More precisely, in this scenario, we disclose information on some personal characteristics of the active players (see below for details). Third, the main interest of our experiment are gender differences and their consequences on subjects' behavior when knowing the gender of the other active player.

We apply two treatments in block one. The general sequence is the same in both treatments, the only difference are the payoff consequences for the passive player. In the *baseline* treatment, consumers (i.e., the passive players) are not hurt by collusion, while in the *negative* treatment, mutual collusion between the active players harms the third player. The first block starts with the first of the two cooperation games. Here, players are randomly matched in groups of three, which consist of two active players (P_A and P_B) and one passive player (P_C). Roles are randomly allocated and remain constant throughout both cooperation games. Each subject is informed about their role and moves to the decision stage of the first cooperation game. In this game, players do not have information about each other's characteristics. All subjects receive an initial endowment of €6 and are shown the payoff matrix on their computer screens. Moreover, the on-screen instructions explain the payoff consequences of the possible active players' choices for all players. In the experiment, we call the actions of the two players "high price" and "low price". Next, the two active players (P_A and P_B) play the cooperation game, while the passive player (P_C) does not make a choice. We apply the following payoff parameters:

Table 1: The Payoff Matrix

		P_B	
		High Price	Low Price
P_A	High Price	P_A: €14, P_B: €14 P_C: €6 − U	P_A: €8, P_B: €16 P_C: €6
	Low Price	P_A: €16 , P_B: €8 P_C: €6	P_A: €10, P_B: €10 P_C: €6

If P_A and P_B cooperate and choose a high price, they can increase their payoff by €8 and earn €14 each including their endowment. If one player defects while the other player cooperates, the defector receives a total of €16, whereas the co-operator receives €8. If

both players chose the low price and defect, each one receives €10. The payoff of P_C is determined by the active players' choices, depending on the treatment. This externality is indicated by U:

(i) In the *baseline* treatment, P_C is not affected and receives his endowment of €6 ($U = 0$), independently of the active players' choices.

(ii) In the *negative* treatment, cooperation of P_A and P_B imposes a negative externality on the passive third party. If both active players choose the high price, P_C's endowment is reduced by €3 ($U = 3$) and he receives a total payoff of €3. Otherwise, active players' actions do not harm a passive third party's payoff. In a stylized way, an interpretation may be that only in the case of mutual cooperation a cartel is established, while the market is competitive if a firm deviates and chooses a low price.

After having submitted their choices, P_A and P_B are asked to indicate their beliefs on the choice of the other active player. We do not incentivize the belief elicitation of the active players to avoid hedging behavior of their stated beliefs against adverse outcomes of their decision in the game (Blanco et al., 2010). At the same time, we measure the beliefs of P_C regarding the behavior of insiders. That is, we ask them to guess whether both cooperate, defect or whether one cooperates while the other defects. We incentivized this measure: If passive players are correct, they receive €1.

Next, subjects receive new instructions for the second part. Groups are reshuffled, while the players' roles remain the same as in the first game. We then disclose information on the active players, i.e., P_A and P_B receive the following information about each other: gender, age and number of semesters studied. The characteristics of P_C are not revealed to the active players. Active players participate in the same version of the cooperation game as before. Again, we apply exactly the same belief elicitation. P_C is informed about the demographics of one of the active players and again has to predict the outcome of the game.[1]

A short questionnaire for the two active players concludes the first block of the experiment. In the questionnaire, we ask whether the active players focused more on the active players' payoffs or on the passive player's payoff.[2] We ask this question twice in a row for

[1]This disclosure of information is limited to only one of the two players to pin down P_C's belief on how this exact player will behave. The goal is to learn about passive players' average belief of players with such characteristics. Guessing the behavior of two players would require to anticipate interaction effects, which is more complex and biases this analysis.

[2]We asked them: "What was the payoff consequence you focused on when taking your decisions in part one?" They could choose one of the three answers: (i) The payoff consequences of the other active player and my own payoff consequences; (ii) The payoff consequences of the passive person (person C) and my own payoff consequences; (iii) Only my own payoff consequences.

each of the two cooperation games. After all subjects made their choices, they proceed to the second block of the experiment.

2.2. Second Block: Elicitation of Economic Preferences and Psychological Measures

In the second block of the experiment, we elicit a set of economic preferences and psychological measures to learn more about the underlying channels of subjects' behavior in the cooperation games. The elicitation of preferences is conducted in separate consecutive parts (parts 3 and 4), where subjects always receive new instructions (see Appendix A for detailed explanations). In the third part, we measure subjects' risk tolerance with the method of Eckel and Grossman (2002). Participants have to choose one of six lotteries, where higher choices correspond to lower risk aversion. In the fourth part, we measure social value orientation with the task of Murphy et al. (2011). Subjects are matched in pairs and have to decide about the monetary allocation between them and a passive player in six decision sets. Based on their replies, we compute a Social Value Orientation (SVO) angle. Higher (lower) angle values can be interpreted as more (less) prosocial.

Before we apply our verbal measures on psychological preferences, we inform subjects that they will participate in several questionnaires before the experiment concludes. First, we measure betrayal aversion with two slightly modified verbal questions initially introduced by Cubitt et al. (2017). The two questions focus on situations, where players can decide to trust and either face social or natural risk. Subjects have to state the lowest probability of their trust being reciprocated required to make them choose to trust in these situations. We measure betrayal aversion as the difference between the stated probabilities when facing social and natural risk. Betrayal aversion increases (decreases) in the difference.

In the next part, subjects complete some questions of the psychological TOSCA questionnaire introduced by Tangney et al. (2000) and used in experiments by Bellemare et al. (2019).[3] Subjects are presented with nine scenarios of everyday life and have to indicate how likely it is that they would react in certain ways. Based on the replies, we compute indices on: guilt-proneness, shame-proneness, externalization of blame, and detachment/unconcern. Finally, we measure time preferences following Müller and Rau (2021) and Rau (2021) by asking two questions, where subjects have to trade-off a monetary amount between two time points. First, they have to state the level of immediate compensation in Euros to forego a payment of €1000 in six months. Afterwards, they are asked about the required level of compensation in six months to forego a payment of €1000

[3]The Test of Self-Conscious Affect (TOSCA) (Tangney et al., 2000) has long been used by psychologists as an instrument for empirically distinguishing between trait emotions of guilt and shame. There are various versions of the TOSCA questionnaire, which consist of brief scenarios that respondents would be likely to encounter in day-to-day life. Each scenario is followed by a number of associated statements that includes phenomenological aspects of shame and guilt. For each statement, respondents rate on a 5-point scale, how likely they could react in the manner stated.

in twelve months. We compute the mean of both answers. The measure is interpreted as follows: more (less) patient subjects request a higher (lower) amount.

At the end of the experiment, the final payoffs are determined. The computer randomly picks one of the two cooperation games of block one and informs subjects about all player's choices and their individual earnings. All profits made in the preferences-elicitation stage (block two) are added. They result from the coin toss in the risk lottery and the randomly determined money allocation in the SVO elicitation task. Each subject is informed about the profits in the payoff-relevant parts and on the total profits of the experiment.

2.3. Procedure

The experiment was conducted online between January and March 2021 with the student subject pool of the Düsseldorf Institute of Competition Economics (DICE) in Germany. It was programmed in z-Tree unleashed (Fischbacher, 2007, Duch et al., 2020) and took place via participants' web browser. We recruited subjects from various study fields and age groups from the university's database for lab experiments using ORSEE (Greiner, 2015). In total, 408 subjects (*negative*: 234, *baseline*: 174) participated in the experiment. Due to technical problems during the online experiment (e.g., people dropping out or their internet connection being lost), we lost some observations and remain with the data of 382 subjects. Precisely, the data contains 223 subjects (54% female) that participated in the *negative* treatment and 159 subjects (58% female) that participated in the *baseline* treatment. We ran 25 sessions of varying size. A session lasted about one hour and subjects' mean earnings were €12.92 (*negative*: €12.61, *baseline*: €13.36) including the show-up fee of €6. The study was pre-registered on aspredicted.org under the number 56299: https://aspredicted.org/yz8uv.pdf.

3. Hypotheses

Next, we derive hypotheses based on the experimental literature on gender effects in cooperation. Our basic setting of the cooperation game is similar to Engel and Zhurakhovska (2014). The authors study a prisoner's dilemma game, where cooperation of active players may have a negative externality on a passive outsider. Results show that cooperation levels of active players decrease in the level of harm on the outsider. Based on this finding, we expect less collusion when negative externalities exist.

Hypothesis 1: Less cooperation is observed in the treatment with a *negative* externality than in *baseline*.

Regarding gender differences, the psychological literature finds mixed evidence for prisoner's dilemmas (Croson and Gneezy, 2009). Some studies report that men are more cooperative than women (e.g., Rapoport and Chammah, 1965, Kahn et al., 1971), whereas other studies find that women cooperate more often than men (e.g., Sibley et al., 1968). In line with the latter, economic experiments show that women are more cooperative than

men (Frank et al., 1993) and that this gender difference vanishes after repetitions (Ortmann and Tichy, 1999). In *baseline*, we focus on a one-shot setting, which is most closely related to economic prisoner's dilemma experiments. Therefore, we postulate that women cooperate more than men.

Hypothesis 2a: In the *baseline* treatment, women cooperate more often than men.

The main difference of *negative* is that the active player's action can (negatively) affect the passive player's payoff. Thus, the *negative* treatment additionally shares common characteristics of an experimental dictator game (Kahneman et al., 1986, Engel, 2011). In dictator games, it was found that that female dictators send higher amounts to the passive recipients than men (Eckel and Grossman, 1996). An explanation may be gender differences in guilt aversion (Plant et al., 2000, Else-Quest et al., 2012) as women may feel guiltier than men when not behaving altruistically towards passive players. Similar results are reported in the experimental literature on lying games focusing on "black lies", i.e., a person increasing their payoff at the expense of a passive other person. Results show that women engage significantly less often in such unethical behavior than men (Capraro, 2018, Grosch and Rau, 2017). Taken together, we expect that women behave less cooperatively in the *negative* treatment than men to avoid that the passive player receives a payoff that is lowered.

Hypothesis 2b: In the treatment with the *negative* externality, women cooperate less often than men.

Our analysis of the effects of disclosing active players' information is based on an exploratory basis. Therefore, we refrain from deriving and pre-registering hypotheses for this setting. Although, information may increase cooperation by creating a group identity (Goette et al., 2012, Chen and Li, 2009), the effect of disclosing gender is mixed. For instance, it was found that it may lower cooperation for same-gender pairings in the "power-to-take game" (Sutter et al., 2009). In a prisoner's dilemma setting, Cigarini et al. (2020) find that this only holds for men in all-male matchings, but not for women. In dictator games, some studies report that neither gender shows a behavioral change when gender is known (e.g., Dufwenberg and Muren, 2006), while Ben-Ner et al. (2004) find that only women show a behavior change when receiving gender information on the interaction partner, i.e., they give significantly less to other women compared to men.

4. Results

In this section we present our results on collusive behavior in the two stages of our treatments. We report two-sided p-values throughout.

4.1. Collusive Behavior: Anonymous Setting (Stage One[4])

To obtain a general understanding on the impact of the negative externality on collusive behavior, we first focus on treatment effects between *negative* and *baseline*. In stage one, results show that a significant smaller share of players (38%) behave collusively when a third party is harmed, compared to the baseline treatment (52%) (Chi²-test, $p = 0.030$). This is in line with the findings of Engel and Zhurakhovska (2014). As less collusive behavior occurs when negative externalities exist, we find support for Hypothesis 1.

Next, we turn to our main results on gender differences with respect to collusive behavior. Figure 1 shows the share of cooperating subjects in the two treatments, *negative* (left panel) and *baseline* (right panel).

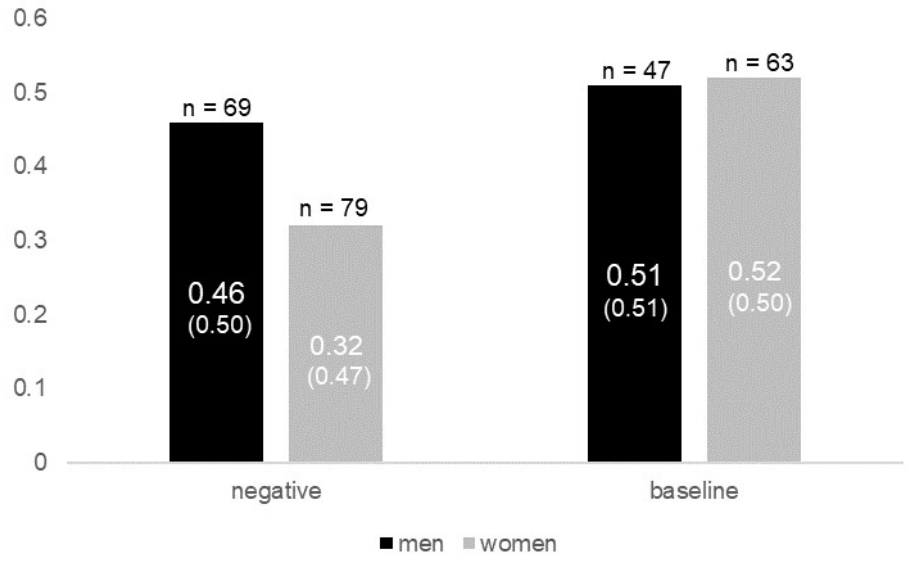

Figure 1: Share of cooperating subjects in *negative* (left panel) and *baseline* (right panel), conditional on gender (men: black bars; women: gray bars). Standard deviations in parentheses.

Figure 1 highlights that the lower rate of collusion in *negative* is driven by female subjects, who cooperate significantly less often (32%) when they exert a negative externality compared to the *baseline* treatment (52%) (Chi²-test, $p = 0.013$). By contrast, no treatment differences exist for men, who cooperate in 51% of all times in *baseline* and at a similarly high level (46%) in *negative* (Chi²-test, $p = 0.620$). Focusing on gender differences in the treatment with the negative externality, we find that women cooperate significantly less often than men (Chi²-test, $p = 0.066$), which provides first support for our directed Hypothesis 2b. Indeed, this gender difference does not occur in *baseline*. Since women in *baseline* do not cooperate more than men (Chi²-test, $p = 0.891$), we find

[4]Parts one and two are henceforth referred to as "stage one" and "stage two". Since the cooperation games are two sub stages of one part, which analyzes collusive behavior we refer to the two cooperation games as "stages" in our analysis.

no support for Hypothesis 2a.

The findings are confirmed by Probit regressions on cooperation rates. To study for the channels of collusive behavior, we include our data on preferences and psychological measures. For these measures, we conduct a Principal Component Analysis (PCA) to reduce the number of correlated variables. Factors were extracted based on the Kaiser criterion, i.e., components were dropped, for which the eigenvalues are less than one. We identified four components with eigenvalues exceeding one.[5] A loading of 0.50 or greater was used to identify items. In component one, two items of the TOSCA scales load positively and very strongly, namely detachment (0.65) and externalization of blame (0.67). This component presents an unemphatic person who is not aware of their mistakes. We call this component *PC1: unconcerned*. In component two, two further items of the TOSCA scales load positively and very strongly: proneness to shame (0.67) and proneness to guilt (0.63). Therefore, we call this component *PC2: shame & guilt*. Patience loads very strongly in component three (0.80) and svo (-0.53) loads negatively. We call this component *PC3: patient & individualistic*. In component four, betrayal aversion (0.74) and risk tolerance (0.67) load strongly. Thus, this component is labelled *PC4: betrayal & risk*.

Table 2 presents Probit regressions on cooperation rates. Models (1)-(3) focus on the aggregate data to analyze treatment effects. Models (4)-(6) present a closer look at the drivers of the treatment effect, i.e., gender differences in the *negative* treatment. All models include a gender dummy (*female*), which is 1 for women. In models (1)-(3), we include a treatment dummy (*negative*), which is 1 for the treatment with negative externality. In models (2)-(3) we control for the interaction effect (*negative x female*) of the treatment and gender. We include a dummy (*belief cooperation*), which is positive when players believe that the other active player is cooperative. Furthermore, the principal components of subjects' preferences ($PC3$ and $PC4$) are included in models (3), (5), and (6). To test for the impact of the psychological measures, we include $PC1$ and $PC2$ in model (6). In models (3), (5), and (6), we apply sociodemographic variables as controls (*age* and whether subjects are *econ* students). All regressions present average marginal effects and standard errors, clustered at the session level.[6]

Model (1) shows that the coefficient of the treatment dummy is significant with a negative sign, i.e., the likelihood of collusive behavior is about 14% smaller when negative externalities exist. Thus, we find support for Hypothesis 1. The treatment effect is also reflected by our questionnaire, where we asked active players whose payoffs they focused on. We find that in the *negative* treatment, a significantly smaller fraction of active players (48%) state that they focused on the payoffs of the active players compared to the *baseline*

[5] A varimax rotation was applied.

[6] We cluster the standard errors at the session level to control for session heterogeneity, i.e., the online sessions are relatively heterogenous regarding the number of participants, which reflects in the duration of the sessions.

Table 2: Probit regressions on cooperation rates. Average marginal effects reported.

	all data			negative		
	(1)	(2)	(3)	(4)	(5)	(6)
negative	-0.135**	0.013	0.014			
	(0.057)	(0.070)	(0.069)			
female	-0.080	-0.028	-0.024	-0.145**	-0.183***	-0.110
	(0.052)	(0.067)	(0.074)	(0.064)	(0.065)	(0.079)
negative x female		-0.159*	-0.163*			
		(0.091)	(0.096)			
belief cooperation		0.470***	0.468***		0.427***	0.422***
		(0.020)	(0.020)		(0.034)	(0.033)
PC1: unconcerned						-0.000
						(0.028)
PC2: shame & guilt						-0.076**
						(0.036)
PC3: patient & individ.			0.024		0.053***	0.046**
			(0.024)		(0.021)	(0.020)
PC4: betrayal & risk			0.018		0.024	0.021
			(0.026)		(0.041)	(0.042)
Controls	no	no	yes	no	yes	yes
Obs.	258	258	258	148	148	148

Standard errors in parentheses

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

treatment (70%) (Chi²-test, $p < 0.001$). Focusing on models (2)-(3), it can be seen that the coefficient of *negative x female* supports Hypothesis 2a. That is, women are 16% less likely to cooperate in *negative* than in *baseline*.[7]

Result 1:

(a) Subjects collude less often when negative externalities on third parties exist.

(b) The treatment effect is induced by women who are less likely to collude in the *negative* treatment.

Moreover, models (4)-(5) reveal that the coefficient of *female* is significantly negative in the treatment with negative externalities. This again emphasizes that collusive behav-

[7]The gender difference in collusive behavior is also reflected by our questionnaire on active players' payoff focus. We find that a significantly smaller share of women (48%) focuses on active players' payoffs in *negative* as compared to the *baseline* treatment (75%) (Chi²-test, $p = 0.001$). By contrast, no significant treatment difference can be found for men (*negative*: 49%; *baseline*: 64%; Chi²-test, $p = 0.122$).

ior is lower in *negative*, since particularly women are less likely to collude. In model (5), the positively significant coefficient of $PC3$ emphasizes that patient and individualistic subjects are more likely to collude when cooperation harms third parties. Interestingly, the gender difference vanishes, as soon as we control for our psychological measures of guilt and shame (model (6)). At the same time, the coefficient of $PC2$ is significantly negative, i.e., shame and guilt averse subjects are less likely to cooperate. A closer look shows that the effect of shame and guilt aversion particularly matters for women. Less guilt and shame averse women with a score below/equal the median of $PC2$ cooperate 52% of the time. By contrast, for an above median $PC2$ the share of collusive women (22%) is significantly smaller (Chi²-test, $p = 0.008$). The effect is less pronounced and insignificant for men (Chi²-test, $p = 0.113$). We find that $PC3$ is still significant, i.e., more patient and individualistic people are more likely to collude.

Result 2:
The gender effect is induced by shame and guilt averse women, who are less likely to collude when negative externalities exist on third parties.

Finally, we find that *belief cooperation* is positive and highly significant in all regression models, i.e., subjects are more likely to collude when they believe that the other player cooperates. Moreover, we run the same sub sample regression models for the *baseline* treatment, where we do not find gender differences (see Table B.5 in the Appendix). All regressors are insignificant except the highly significant positive coefficient of *belief cooperation*.

4.2. Collusive Behavior: The Role of Information about Players' Characteristics (Stage One vs. Stage Two

In this section, we exploit the panel characteristic of our data set. We compare subjects' collusive behavior in the anonymous first stage to the second stage, where we inform subjects about some characteristics (age, gender, semesters studied) of the matched other active player. This sheds light to whether social information affects collusive behavior in our setting. In line with the previous findings, we also confirm our treatment effect in stage two, i.e., cooperation is significantly lower with the negative externality (30%) than in *baseline* (47%) (Chi²-Test, $p = 0.005$). Focusing on the dynamics, it turns out that subjects in *negative* collude insignificantly less often when receiving information on their interaction partners (stage two) as compared to the anonymous setting (stage one) (38%) (Wilcoxon matched-pairs test, $p = 0.111$). No difference can be found in *baseline* (Wilcoxon matched-pairs test, $p = 0.487$). Thus, for our further analyses on the stability of collusive behavior under social information, we focus on the *negative* treatment. Turning to gender effects, Figure 2 presents an overview on the dynamics of collusive behavior of men (left panel) and women (right panel) in the two stages of *negative* (see Figure B.4 in Appendix B for a diagram focusing on *baseline*). Black bars present cooperation under anonymity, whereas gray bars present cooperation when some characteristics of the

matched partner were known (info social).

Figure 2 highlights that women's behavior is not context dependent, as we find that their low rate of collusion in *negative* still holds when social distance is lowered. Thus, we find no significant difference between their cooperation levels of stages one and two (Wilcoxon matched-pairs test, $p = 0.839$). By contrast, introducing social information on the interaction partner significantly reduces collusive behavior of men (Wilcoxon matched-pairs test, $p = 0.003$). However, in stage two, results show that collusive behavior of women and men is not significantly different (Chi²-test, $p = 0.205$). The behavior of men is similar to the results of Cigarini et al. (2020) who study a classic prisoner's dilemma experiment and find that male pairs cooperate less often, when knowing that the interaction partner is male. In *baseline*, we do not observe these gender effects, i.e., the cooperation rates across stages are not significantly different for both men and women.[8]

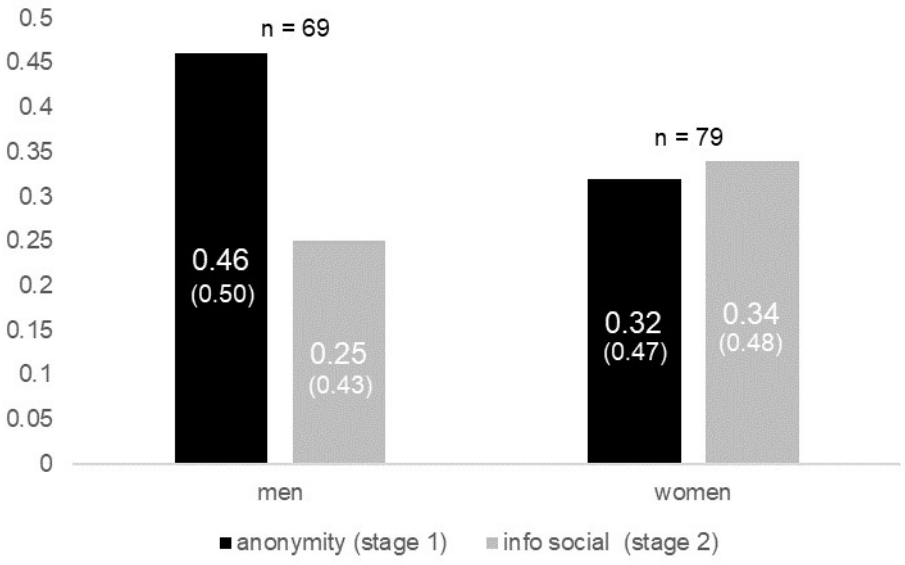

Figure 2: Impact of knowledge about personal characteristics (social information) in the *negative* treatment. The diagram presents the share of cooperating men and women in stage 1 (black bars) and stage 2 (gray bars) conditional on gender. Standard deviations in parentheses.

Our effects are confirmed by Probit random effects panel regressions using the sample of the *negative* treatment (Table 3) (see Table B.6 in Appendix B for the corresponding regressions using the sample of the *baseline* treatment).

Models (1)-(2) focus on the aggregate data of the *negative* treatment. To obtain deeper insights on the channels of gender-specific effects, models (3)-(4) focus on the male sample, whereas models (5)-(6) focus on the female sample. Models (1)-(2) include a gender dummy (*female*) and *info*, a dummy that is positive when subjects make their decision in stage two. Moreover, model (2) includes the interaction of *info* and *female* and con-

[8]Wilcoxon matched-pairs tests find for men: $p = 0.508$ and for women: $p = 0.152$.

Table 3: Random effects Probit regressions on cooperation rates in negative. Average marginal effects reported

	all data		male data		female data	
	(1)	(2)	(3)	(4)	(5)	(6)
info	-0.087*	-0.215***	-0.214***	-0.214***	0.027	0.028
	(0.045)	(0.064)	(0.059)	(0.059)	(0.061)	(0.062)
female	-0.025	-0.089				
	(0.062)	(0.080)				
info x female		0.242***				
		(0.086)				
info: men		-0.040	-0.153**	-0.149**	0.030	0.032
		(0.051)	(0.068)	(0.065)	(0.092)	(0.088)
info: age		-0.002	-0.011	-0.010	0.001	0.001
		(0.008)	(0.010)	(0.011)	(0.010)	(0.010)
info: semester		-0.000	-0.010	-0.011	0.006	0.009
		(0.016)	(0.024)	(0.024)	(0.025)	(0.026)
PC1: unconcerned		0.030	0.030	0.026	0.055**	0.052*
		(0.024)	(0.030)	(0.036)	(0.027)	(0.028)
PC2: shame & guilt		-0.052	0.000	0.002	-0.071*	-0.072*
		(0.036)	(0.048)	(0.053)	(0.041)	(0.038)
PC3: patient & individ.		0.027	0.102***	0.100***	-0.016	-0.019
		(0.031)	(0.027)	(0.029)	(0.044)	(0.047)
PC4: betrayal & risk		-0.025	-0.079**	-0.077**	0.023	0.015
		(0.028)	(0.036)	(0.038)	(0.036)	(0.033)
Controls	no	yes	no	yes	no	yes
Groups	148	148	69	69	79	79
Obs.	296	296	138	138	158	158

Standard errors in parentheses

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

trols for the information presented to the subject in the social information stage. More precisely, *info: men* is a dummy, which is 1 (0) when subjects were informed in stage two that the matched person is male (female). *Info: age* is the age in years of the matched partner, which was communicated to subjects in stage two. *Info: semester* is the matched partner's number of semesters studied, which was disclosed in stage two as well. Models (3)-(6) include the same variables, with the exceptions of *female* and *info x female*. All regressions focus on average marginal effects and standard errors clustered at the session level.

Models (1)-(2) confirm the findings displayed in Figure 2. The significant negative coefficients of info show that subjects are less likely to collude in *negative* when presented with information on the matched subject.[9] In line with Figure 2, this also holds for the male sample (models (3)-(4)), i.e., the coefficient of *info* is negative and highly significant. We do not find this decrease of cooperation for men[10] in the *baseline* treatment (see Table B.6 in Appendix B). With regard to women, results show that the *info* dummy is insignificant (models (5)-(6)), which confirms our observation that the low collusive behavior of women is not affected by social information.

Result 3:
Women's collusive behavior is robust to low social distance. By contrast, men collude less often when they have information on personal characteristics of the matched subject.

The results reveal two sources that drive men's decrease in collusive behavior. First, it turns out that *social: man* is significant and negative. Thus, men tend to cooperate less when they know that the other active subject is also male. Interestingly, this result is not driven by beliefs as men hold similar beliefs on collusive behavior of matched men (35%) and matched women (33%) (Chi²-Test, $p = 0.861$). Second, the results highlight that $PC4$ is significantly negative. Closer inspection reveals that this result is mainly driven by betrayal aversion, since the aggregate data reveal significant negative correlations between betrayal aversion and collusive behavior at stages one (Spearman's correlation coefficient, $\rho = -0.215$, $p = 0.076$) and two (Spearman's correlation coefficient, $\rho = -0.306$, $p = 0.011$).[11] Concentrating on men, we only find substantial correlation between betrayal aversion and collusive behavior when they are informed that the other player is male (Spearman's correlation coefficient, $\rho = -0.410$, $p = 0.038$), but not when they know that the other player is female ($\rho = -0.251$, $p = 0.105$).

Moreover, the positively significant coefficient of $PC4$ in models (3)-(4) shows that more patient and more individualistic men are significantly more likely to collude. For women we do not find that the matching partner or betrayal aversion have an impact. The negatively significant coefficient of $PC2$ shows again that shame and guilt averse women collude less often when negative externalities exist. Moreover, $PC1$ is significant, i.e., women who are not concerned by others are more likely to collude. We summarize our results as follows:

[9] The questionnaire data on subjects' payoff focus do not reflect the difference in cooperation between stage one and two. In both stages, a similar fraction of players focuses on active players' payoffs (stage one: 48%; stage two: 52%; Wilcoxon matched-pairs test, $p = 0.522$).

[10] In Table 6, model (2) shows that the coefficient of the interaction of *info x female* is negative and moderately significant, which even suggests an effect in the opposite direction, when no externalities exist.

[11] No significant correlations can be found between risk and collusive behavior in stages one (Spearman's correlation coefficient, $\rho = 0.093$, $p = 0.450$) and two (Spearman's correlation coefficient, $\rho = -0.136$, $p = 0.266$).

Result 4:

(a) In the social info condition, men are less likely to collude when matched with men, although they hold the same beliefs on collusive behavior of women and men.

(b) Betrayal-averse men collude less often when knowing that interacting with other men.

(c) Information on social characteristics has no effect on collusive behavior of women.

5. Discussion

Our paper started with the observation that the role of individuals and their characteristics has largely been ignored in the industrial economics literature on cartels and collusion, even though cartels are often formed by individual managers rather than firms as collectives. At the same time, the literature on experimental industrial organization explored the role of individual behavior and motives (e.g., imitation behavior, other regarding behavior) (Armstrong and Huck, 2010), but has typically not focused on cases where cooperation between individuals comes at a cost for passive third parties. However, this externality is common for cartels, where cooperation between firms regularly harms consumers. Moreover, the industrial organization literature points out the importance of trust and the psychological costs when it is betrayed in cartel contexts. It was emphasized that psychological measures, such as betrayal aversion and guilt aversion, play a central role in the analysis of individual incentives to form cartels, since trust is determined by these factors (Leslie, 2005, Bigoni et al., 2015). Nevertheless, no paper exists that controls for these measures to study their direct influence on individual motives to collude. Furthermore, the experimental industrial organization literature largely ignored individual heterogeneity (e.g., gender differences), although experimental evidence reports ample evidence for gender differences in behaviors (e.g., risk preferences, cooperation) relevant for antitrust (Croson and Gneezy, 2009). Laboratory experiments can investigate how these factors influence collusive behavior, which helps to better anticipate the consequences of policies regarding the impact of increasing the share of women in management positions.

The current paper sheds new light on these aspects. Starting with an in-depth analysis of gender differences in collusion, we focus on a simple stylized environment that abstracts from a market setting. On the one hand, this may come at the cost of losing external validity, as we focus on binary decisions. On the other hand, our analysis provides a very high degree of internal validity, as we exploit the advantages of laboratory experiments to achieve a high degree of control in terms of the impact of subjects' heterogeneity and their behavior. In a comprehensive experiment, we control one by one for several important personality factors when individuals decide to collude. First, we study the role of gender for collusion that comes at a cost for a third party. Second, we study economic preferences

and elicit psychological measures to identify what personal characteristics drive these differences.

Our results show that women are, in general, less inclined to engage in collusive behavior at the cost of somebody else than men. Importantly, this effect does not depend on knowing anything about the other potential cartelist. Instead, we find for female decision makers that lowering the social distance between interaction partners leads to same low rates of collusion when women decide. While male participants are more inclined to form cartels, our exploratory analysis of lowering social distance reveals that they also engage less in collusive behavior once they learn about the personal characteristics of the other potential cartelist. However, it remains to be explored how stable these effects are once the game is played repeatedly and players can develop more trust in each other, such as through communication (Fonseca and Normann, 2012, Cooper and Kühn, 2014, Andres et al., 2021).

Our current findings suggest that an increased female representation in management positions can have the benefit of making collusion less likely – or to put it positively – compliance with competition law more likely. Importantly, we show that this effect is not attenuated in situations characterized by lower social distance, which may be common in daily business life. For competition authorities the results can imply that diversity may be an additional factor that agencies could promote as part of both their competition advocacy work and their evaluation of firms' compliance programs, as more diverse management boards may help to foster compliance with antitrust laws. Moreover, competition agencies may also use these insights as part of their forensic cartel analysis, as traditional male-dominated industries may be more prone to collusion than industries with a more diverse set of managers. As resources are also scarce within competition agencies, enforcement priorities may be given to industries characterized by lower degrees of management diversity. Finally, to facilitate further research on the role of gender in collusion, competition authorities may also collect and report data on the sociodemographic characteristics of cartel participants.

With respect to further research on the role of gender for collusion, we have only analyzed a simple game with binary decisions so far. The setting served as a starting point to cleanly disentangle the basic effects of gender, economic preferences, and psychological measures in a salami-slicing approach. A strength of this approach is that we provide results of basic research with respect to gender differences in collusion and its determinants that are highly internally valid that can be universally applied to different settings, such as tacit collusion, explicit cartels, or the division of markets. In a next step, to study market outcomes, more experimental research is needed on repeated settings in market games, where subjects can choose among continuous market prices. In this respect, it will also be interesting to understand how men and women manage to overcome distrust over time when meeting repeatedly. Further extensions may also include communication

stages and focus on women's and men's reactions to antitrust policies such as leniency programs. Since females have regularly been found to be more risk averse (Charness and Gneezy, 2012) and loss averse (Rau, 2014) than men, the inclusion of fines and penalties in an experimental setting may possibly further strengthen our main finding that women are less likely to engage in collusive behavior.

Finally, future research should focus on the role of minorities or people characterized by cultural or educational differences for collusive behavior. In this respect, global evidence of preference heterogeneity in risk, trust, and altruism suggests country dependent variations (Falk et al., 2018), which may influence collusion and the design of antitrust policies.

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Appendix A. Detailed explanations of the preference elicitation

Elicitation of Risk Aversion

To measure risk aversion, we apply the lottery-choice task introduced by Eckel and Grossman (2002), where subjects choose one of six lotteries. These lotteries have a 50% chance of yielding either a high payoff (Event A) or a low payoff (Event B). Table A.4 overviews the choice set, i.e., the six lotteries, the corresponding expected payoffs, and the implied CRRA range. Higher lottery choices can be interpreted as lower risk aversion. After subjects selected their lottery, a random draw decides whether Event A or Event B materializes. At the end of the experiment, subjects are informed on the outcome.

Table A.4: Lottery choices of the risk elicitation

Choice	Event A	Event B	Expected Payoff	Impl. CRRA Range
1	€5.60	€5.60	€5.60	$3.46 < r$
2	€7.20	€4.80	€6.00	$1.16 < r < 3.45$
3	€8.80	€4.00	€6.40	$0.71 < r < 1.16$
4	€10.40	€3.20	€6.80	$0.50 < r < 0.71$
5	€12.00	€2.40	€7.20	$0 < r < 0.50$
6	€14.00	€0.40	€7.20	$r < 0$

Elicitation of Social Value Orientation (SVO)

We elicit Social Value Orientation (SVO) with the task of Murphy et al. (2011). In this setting, participants are matched in pairs. There are two roles, one active and one passive person. Each subject initially takes on the role of an active player, who is confronted with six different decisions on how to allocate points that are later converted to money between her and another individual. Subjects have to choose the preferred point allocation for themselves and their matched partner in each of the six decision sets. In the task, we make use of the original trade-offs used in Murphy et al. (2011). We present the six choice sets below. The following exchange rate is applied: 1 point = €0.03. Subjects know that at the end of the experiment, one player of the pair is randomly selected by the computer and becomes the active player, whereas the other player is passive. An SVO angle can be computed for each person by evaluating the participant's decisions during the six sets in the active role.[12] Higher (lower) angles represent more (less) pro-social subjects. In figure A.3 we present two representative choice scenarios.

Elicitation of Betrayal Aversion

We verbally measure betrayal aversion in a modified variant of two questions introduced by Cubitt et al. (2017). We present subjects with two scenarios of hypothetical taxi rides. In each of them, they have to choose between two taxi companies. Company A charges a

[12]The SVO angles are computed with the following formula: $SVO = arctan(\frac{(\bar{A}_O - 50)}{(\bar{A}_S - 50)})$, whereas $\bar{A}_O(\bar{A}_S)$ is the mean allocation, which a passive player allocated to himself (to the other passive player).

Figure A.3: Choice sets of the task. "Entscheidungssituation" = Decision situation; "Auswahl" = Choice; "Sie erhalten" = You receive; "Anderer erhält" = Other subject receives; "Ihre Auswahl"= Your choice

fixed fee, whereas company B charges a variable fee, which could either be low or high. In the first scenario, the variable fee is characterized by social risk, since the taxi driver may betray the subject by driving an expensive detour instead of a cheap direct route. In the second scenario, the variable fee is characterized by natural risk, since it depends on traffic conditions, i.e., bad (high fee) or good (low fee). For the first scenario, subjects have to state the minimum probability of honest drivers for them to choose the company with the variable fee. For the second scenario, they are asked about the minimum probability of good traffic conditions to pick said company. Participants' betrayal aversion is computed as the difference of the stated probabilities of scenario one and two. Subjects, who require a higher probability in the social risk scenario than in the neutral risk scenario, are classified as betrayal-averse subjects. The higher the probability premium they demand in the social risk case, the more betrayal averse are subjects.

Elicitation of Guilt- and Shame Aversion (TOSCA-3 Questionnaire)

We measure subjects' guilt- and shame aversion with a questionnaire common in psychology, i.e., TOSCA-3 (Tangney et al., 2000). Our questions are chosen from Bellemare et al. (2019) and relate to 16 scenarios. Out of these we picked nine TOSCA-3 questions

[13], which are most relevant to guilt- and shame aversion. In these questions, subjects are presented with daily life situations and common reactions of people in these situations. Subjects have to imagine themselves in these situations and indicate how likely they would react in each of the ways (a-d or a-e) described. They reply on a 5-point Likert scale (1 = not likely; 5 = very likely). Using the replies, four indices can be computed ((i) guilt-proneness; (ii) shame-proneness; (iii) externalization; (iv) detachment/unconcern). The scale scores are the sum of responses to relevant items (for the response, we count the number (1-5), which is selected in the Likert scale). The coding is the following:

Question 1: a) shame; b) detached; c) guilt; d) externalization
Question 2: a) guilt; d) externalization; e) shame
Question 3: a) externalization; b) detached; c) shame; d) guilt
Question 4: a) shame; b) externalization; c) detached; d) guilt
Question 5: a) externalization; b) shame; c) detached; d) guilt
Question 6: a) detached; b) shame; c) externalization; d) guilt
Question 7: a) externalization; b) shame; c) guilt; d) detached
Question 8: a) shame; b) externalization; c) guilt; d) detached
Question 9: a) detached; b) guilt; c) shame; d) externalization

[13]We picked questions: 1, 3, 5, 7, 9, 12, 13, 15, 16. For an overview of the questions, see the instructions.

Appendix B. Tables and Figures

Table B.5: Probit regressions on cooperation rates in the *baseline* treatment. Average marginal effects reported.

	baseline		
	(1)	(2)	(3)
female	0.013	-0.048	-0.064
	(0.084)	(0.073)	(0.071)
belief cooperation		0.454***	0.457***
		(0.033)	(0.037)
PC1: unconcerned			0.023
			(0.033)
PC2: shame & guilt			0.021
			(0.033)
PC3: patient & individualistic		-0.023	-0.021
		(0.045)	(0.049)
PC4: betrayal & risk		0.021	0.016
		(0.035)	(0.035)
Controls	no	yes	yes
Obs.	110	110	110

Standard errors in parentheses

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

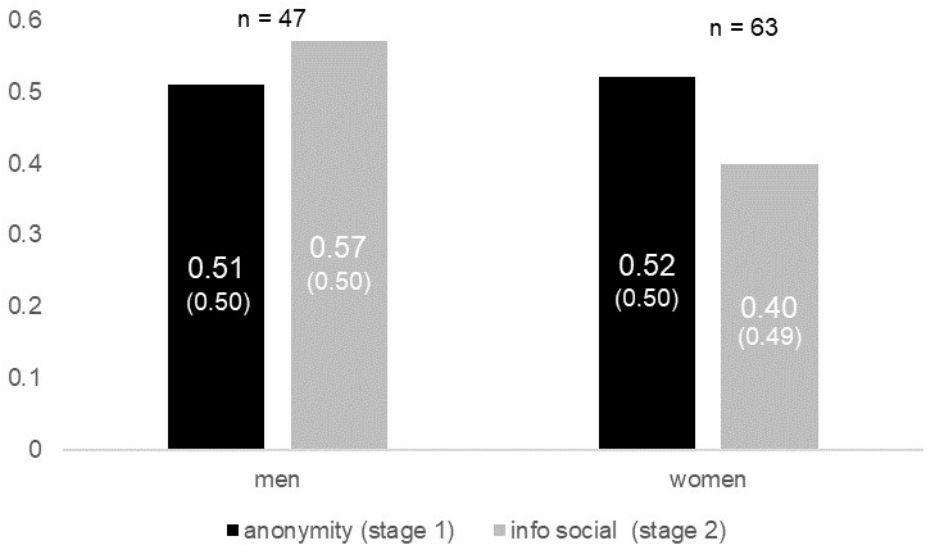

Figure B.4: Impact of information of social characteristics in the baseline treatment. The diagram presents the share of cooperating men and women in stage 1 (black bars) and stage 2 (gray bars) conditional on gender. Standard deviations in parentheses.

Table B.6: Random effects Probit regressions on cooperation rates in *baseline*. Average marginal effects reported.

	all data		male data		female data	
	(1)	(2)	(3)	(4)	(5)	(6)
info	-0.045	0.069	0.065	0.065	-0.126*	-0.126*
	(0.059)	(0.089	(0.085)	(0.083)	(0.066)	(0.066)
female	-0.082	-0.051				
	(0.070)	(0.073)				
info x female		-0.189*				
		(0.101)				
info: man		-0.065	0.009	-0.007	-0.078	-0.082
		(0.066)	(0.079)	(0.085)	(0.094)	(0.090)
info: age		-0.004	0.003	-0.004	-0.002	-0.006
		(0.005)	(0.007)	(0.008)	(0.007)	(0.006)
info: semester		0.002	0.018	0.013	-0.003	0.025
		(0.027)	(0.038)	(0.033)	(0.036)	(0.027)
PC1: unconcerned		0.043*	-0.013	-0.021	0.052	0.038
		(0.026)	(0.048)	(0.034)	(0.065)	(0.061)
PC2: shame & guilt		0.030	-0.041	-0.058	0.069	0.121***
		(0.023)	(0.054)	(0.047)	(0.046)	(0.042)
PC3: patient & individ.		-0.067*	-0.147**	-0.152**	-0.028	-0.024
		(0.040)	(0.069)	(0.063)	(0.044)	(0.046)
PC4: betrayal & risk		0.022	0.015	0.059*	-0.026	-0.043
		(0.036)	(0.042)	(0.034)	(0.030)	(0.032)
Controls	no	yes	no	yes	no	yes
Groups	110	110	47	47	63	63
Obs.	220	220	94	94	126	126

Standard errors in parentheses

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

Appendix C. Experimental Instructions (translated from German)

The instructions were shown on participants' screens. Comments that did not appear on the screens are written in cursive parentheses.

Appendix C.1. ***The Prisoner's Dilemma***

C.1.1. Questionnaire

Welcome to the Experiment!
Before we start, we'd like you to answer the following questions. Your information might be shown anonymously to other participants. At no point will your data be connected to your name.

1. What is your gender? [female/male/divers]
2. What is your age? [free input]
3. How many semesters have you been studying (total of Bachelor and Masters)? [0, 1, ..., 6 or higher]

C.1.2. General Instructions

The experiment consists of 4 parts, in which you can earn money. The computer will randomly decide whether part 1 or part 2 are paid out. Parts 3 and 4 will both be paid and are added to your earnings from the selected part (1 or 2). At the beginning of each part, you will receive new instructions on the screen.Your participation in the experiment is compensated with at least €6. Possible additional earnings from parts 1-4 are added at the end of the experiment.After finishing the experiment, you will need to fill in your ORSEE-ID. If you have any questions or trouble, please write a private message to the experimenter in Webex.

C.1.3. Instructions for Stage 1

In part 1, the computer will assign one of three possible roles to you (person A, person B, person C). The computer randomly matches groups that consist of three players (person A, person B, person C). In these groups, person A and B play an active part, while person C is passive and does not make choices. Players A and B take on the roles of firms on a market. In part 1 they simultaneously decide whether to set a high or a low price. While players decide, they do not know what the other person chose. Both players' payoffs depend on their own and the other person's decision.
If person A and B both set a high price, person C's payoff is reduced by half *(only in negative treatment, not shown in baseline).*

There are 4 possible cases:

1. Person A and person B both set a low price: Person A and B each receive €10; Person C receives €6.
2. Person A and person B both set a high price: Person A and B each receive €14; Person C receives €3 *(negative treatment, in baseline: Person C receives €6).*

3. Person A sets a low price, person B sets a high price: A receives €16, B receives €8, C receives €6.
4. Person A sets a high price, person B sets a low price: A receives €8, B receives €16, C receives €6.

All payoffs include a starting capital of €6. If part 1 is picked at the end to determine the final payoff, you will be informed about the other player's decision and the resulting payoff. If you click "okay", you will be informed about your role and which group you were allocated into. Afterwards, you will see an overview of all 4 cases. Part 1 begins, and you can make a choice if you a person A or B.

C.1.4. Information about Role and Group Allocation

The result of the random draw is: You are [person A/ person B/ person C]. You are in group [group number].

C.1.5. Decision 1

The following 4 payoff combinations are possible:

	Person A/B chooses: low price	Person A/B chooses: high price
You choose: low price	You: 10; Person A/B: 10; Person C: 6	You: 16; Person A/B: 8; Person C: 6
You choose: high price	You: 8; Person A/B: 16; Person C:6	You: 14; Person A/B: 14; Person C: 3 (in baseline: Person C:6)

- Please decide, what price you want to set: (*only shown to players A and B*) [high/low]
- How do you think players A and B will decide? If you are correct, you earn €1 extra. (*only shown to player C*) [both choose a high/low price; A/B chooses high/low]

C.1.6. Belief 1 (only shown to players A and B)

What price do you think did person A/B (the other player) choose? [high/ low]

C.1.7. Instructions for Stage 2

In part 2, you are in the same role as in part 1. The computer randomly assigns new groups that consist of three players (person A, person B, person C). In these groups, person A and B play an active part, while person C is passive and does not make choices. You will receive information about the active player that was assigned to you on the next screen. Persons A and B again take on the roles of firms on a market who simultaneously decide whether to set a high or a low price. While players decide, they do not know what the other person chose. Both players' payoffs depend on their own and the other player's decision. If person A and B both set a high price, person C's payoff is reduced by half.

(only in negative treatment, not shown in baseline)

There are 4 possible cases:

1. Person A and person B both set a low price: Person A and B each receive €10; Person C receives €6.
2. Person A and person B both set a high price: Person A and B each receive €14; Person C receives €3 *(negative treatment, in baseline: Person C receives €6).*
3. Person A sets a low price, person B sets a high price: A receives €16, B receives €8, C receives €6.
4. Person A sets a high price, person B sets a low price: A receives €8, B receives €16, C receives €6.

All payoffs include a starting capital of €6. If part 2 is picked at the end to determine the final payoff, you will be informed about the other player's decision and the resulting payoff. If you click "okay", you will again be informed about your role and which group you were allocated into. Afterwards, you will see an overview of all 4 cases. Part 2 begins, and you can make a choice if you are person A or B.

C.1.8. Information about Role and Group

You are still [Person A/B]. You are now in group [group number].

C.1.9. Decision 2

The following information about person [A/B] is available *(person C always receives information on player B)*: gender [male, female, divers], age [number], current semester [1, 2, ..., 6 or higher].

	Person A/B chooses: low price	Person A/B chooses: high price
You choose: low price	You: 10; Person A/B: 10; Person C: 6	You: 16; Person A/B: 8; Person C: 6
You choose: high price	You: 8; Person A/B: 16; Person C:6	You: 14; Person A/B: 14; Person C: 3 (in baseline: Person C:6)

- Please decide, what price you want to set:
  (*only shown to players A and B*) [high/low]
- How do you think players A and B will decide? [both choose a high/low price;
  If you are correct, you earn €1 extra. A/B chooses high/low]
  (*only shown to player C*)

C.1.10. Belief 2 (only shown to players A and B)

What price do you think did person A/B (the other player) choose? [high/ low]

C.1.11. Comparison (only shown to players A and B)

In part 1, what payoff did you consider?

[my payoff and the other active player's payoff/
my payoff and the passive player's (person C) payoff/
only my payoff]

In part 2, what payoff did you consider?

[my payoff and the other active player's payoff/
my payoff and the passive player's (person C) payoff/
only my payoff]

Appendix C.2. ***Elicitation of Preferences***

C.2.1. Risk Preferences

Instructions

In part 3 you have to pick out of six lotteries. Your payoff is determined by state A or B. After you have submitted your choice, the computer tosses a coin. If the outcome is head, state A is realized. If the outcome is tails, state B is realized. If you click "okay", you see an overview of the six lotteries. You can then choose one of the lotteries. At the end of the experiment, you are informed about the coin toss and your corresponding payoff from part 3.

Decision

States A and B are both realized with a 50% change. Please choose one of the lotteries:

Lottery	Payoff State A	Payoff State B
1	€1.40	€1.40
2	€1.80	€1.20
3	€2.20.	€1.00
4	€2.6	€0.80
5	€3.00	€0.60
6	€3.50	€0.10

C.2.2. Social Value Orientation

Instructions

In part 4, the computer randomly matches you with one other person. You and this person simultaneously make several choices. At no point in the experiment will the identities be revealed. Your decisions are made in Thalers will the following exchange rate: 1 Thaler = €0.02. You will face 6 different decision situations. These situations represent your payoff and the matched player's payoff. At the bottom of the page, you find an exemplary situation. In the upper row you see your payoff, in the lower row you see the other person's payoff. You can choose between 9 different allocation of Thalers between you and the other person. In each of the 6 situations, you have to pick one out of 9 allocations.

Choice No.	1	2	3	4	5	6	7	8	9
You receive	50	54	59	63	68	72	76	81	85
Other player receives	100	89	79	68	58	47	36	26	15

Example 1: If you pick "Choice No. 2", you receive 54 Thalers. The matched person receives 89 Thalers.
Example 2: If you pick "Choice No. 6", you receive 72 Thalers. The matched person receives 47 Thalers.

Roles A and B: The person who is player A has to choose an allocation between herself and the person who is player B. Player A is active and makes a choice, while player B is passive and has to accept player A's decision. Each person decides as player A. At the end of the experiment, the computer randomly allocates the two roles between you and your matched player. If you are player A, your choice is relevant and the other person is passive. If you are player B, the other person is active while you are passive. In this case, the matched player's decision is relevant for your payoff.

Payment: At the end of the experiment, the computer will randomly pick one of the 6 decisions, which will then determine your payoff. Additionally, the roles A and B are randomly assigned, and it will be decided if yours or the other player's choice determines the allocation of Thalers, which are then converted to Euro according to the exchange rate. We will inform you which of the 6 situations was randomly chosen and whose decision determined the payoff at the end of the experiment. You will also be informed about your resulting earnings from part 4.

Decisions

Players are presented 6 situations similar to the example with varying allocations and are asked to choose one of the allocations.

C.2.3. Betrayal Aversion

Decision 1

Please read the following text thoroughly and answer the question.

You have to travel to a larger city for personal reasons. Upon arrival at the airport, you can choose between two cab companies to reach your final destination. Cab company A sets a fixed price of €12. Cab Company B uses a taximeter. X% of the cab drivers are honest and take the direct route. The trip then costs €8. It is also possible that you get a driver who takes a detour to get more money out of you. The trip then costs €16.

How many percent of the drivers X have to be honest for you to pick company B? Please use the slider to make a choice. [Input between 0% and 100%]
Your choice indicates that you would pick company B if at least [input] % of the drivers are honest.

Decision 2

Please read the following text thoroughly and answer the question.

You have to travel to a larger city for personal reasons. Upon arrival at the airport, you can choose between two cab companies to reach your final destination. Cab company A sets a fixed price of €12. Cab Company B uses a taximeter. In X% of the time, the traffic conditions are good. The trip then costs €8. It is also possible that the conditions are bad. The trip then costs €16.

How many percent of the conditions X have to be good for you to pick company B? Please use the slider to make a choice. [Input between 0% and 100%]
Your choice indicates that you would pick company B if at least [input] percent of the traffic conditions are good.

C.2.4. Guilt and Shame Aversion (TOSCA)

Below are situations that people are likely to encounter in day-to-day life, followed by several common reactions to those situations.

As you read each scenario, try to imagine yourself in that situation. Then indicate how likely you would be to react in each of the ways described. We ask you to rate all responses because people may feel or react more than one way to the same situation, or they may react different ways at different times

Questionnaire

Subjects were asked to indicate their answer on the following scale (the scale was printed beside each item): not likely 1 – 2 – 3 – 4 – 5 very likely

1. You make plans to meet a friend for lunch. At 5 o'clock, you realize you stood your friend up.

a) You would think: "I'm inconsiderate"

b) You would think: "Well, my friend will understand"

c) You'd think you should make it up to your friend as soon as possible

d) You would think: "My boss distracted me just before lunch."

2. You are out with friends one evening, and you're feeling especially witty and attractive. Your best friend's spouse seems to particularly enjoy your company.

a) You would think: "I should have been aware of what my best friend was feeling."

b) You would feel happy with your appearance and personality.

c) You would feel pleased to have made such a good impression.

d) You would think your best friend should pay attention to his/her spouse

e) You would probably avoid eye contact for a long time

3. You make a mistake at your student job and find out a co-worker is blamed for the error.

a) You would think the company did not like the co-worker.

b) You would think: "Life is not fair."

c) You would keep quiet and avoid the co-worker.

d) You would feel unhappy and eager to correct the situation.

4. While playing around, you throw a ball, and it hits your friend in the face

a) You would feel inadequate that you can't even throw a ball

b) You would think maybe your friends needs more practice at catching.

c) You would think: "It was just an accident."

d) You would apologize and make sure your friend feels better.

5. You are driving down the road, and you hit a small animal

a) You would think the animal shouldn't have been on the road.

b) You would think: "I'm terrible."

c) You would feel: "Well, it was an accident."

d) You'd feel bad you hadn't been more alert driving down the road

6. While out with a group of friends, you make fun of a friend who's not there.

a) You would think: "It was all in fun; it's harmless."

b) You would feel small...like a rat.

c) You would think that perhaps that friend should have been there to defend him/herself.

d) You would apologize and talk about that person's good traits

7. You make a big mistake on an important project at work. People were depending on you, and your boss criticizes you.

a) You would think your boss should have been more clear about what was expected of you.

b) You would feel like you wanted to hide.

c) You would think: "I should have recognized the problem and done a better job."

d) You would think: "Well, nobody's perfect."

8. You are taking care of your friend's dog while your friend is on vacation, and the dog runs away.

a) You would think, "I am irresponsible and incompetent."

b) You would think your friend must not take very good care of the dog or it wouldn't not likely very likely have run away.

c) You would vow to be more careful next time.

d) You would think your friend could just get a new dog.

9. You attend a student's housewarming party, and you spill red wine on a new cream-colored carpet, but you think no one notices.

a) You think the student should have expected some accidents at such a not likely very likely big party.
b) You would stay late to help clean up the stain after the party.
c) You would wish you were anywhere but at the party.
d) You would wonder why the student chose to serve red wine with the new light carpet.

C.2.5. Patience

Decision 1

How much money would you need to receive today in order to forgo a safe payment of €1000 in 6 months? (Please enter an amount between 0 and 1000) [free input]

Decision 2

How much money would you need to receive today in order to forgo a save payment of €1000 in 12 months? (Please enter an amount between 0 and 1000) [free input]

Appendix C.3. Final Questions

What subject do you study? [business administration/economics/industrial chemistry /philosophy/politics and ethics/other]

Please enter your ORSEE-ID [free input]

Appendix C.4. Payoff Information

The following part was picked as relevant for your payoff:	[part1/ part 2]
You chose:	[high price/ low price]
The other player chose:	[high price/ low price]
Your earnings in this part are:	[payoff part 1/ 2]
In part 3 the coin toss resulted in:	[state A/ state B]
Your earnings in part 3 are:	[payoff part 3]
In part 4 you were:	[the active player/ the passive player]
Your earnings in part 4 are:	[payoff part 4]
Your total payoff in this experiment is:	[total payoff]

Thank you for your participation!

Appendix C.5. Screenshots of the Decision Screens in the Cooperation Games

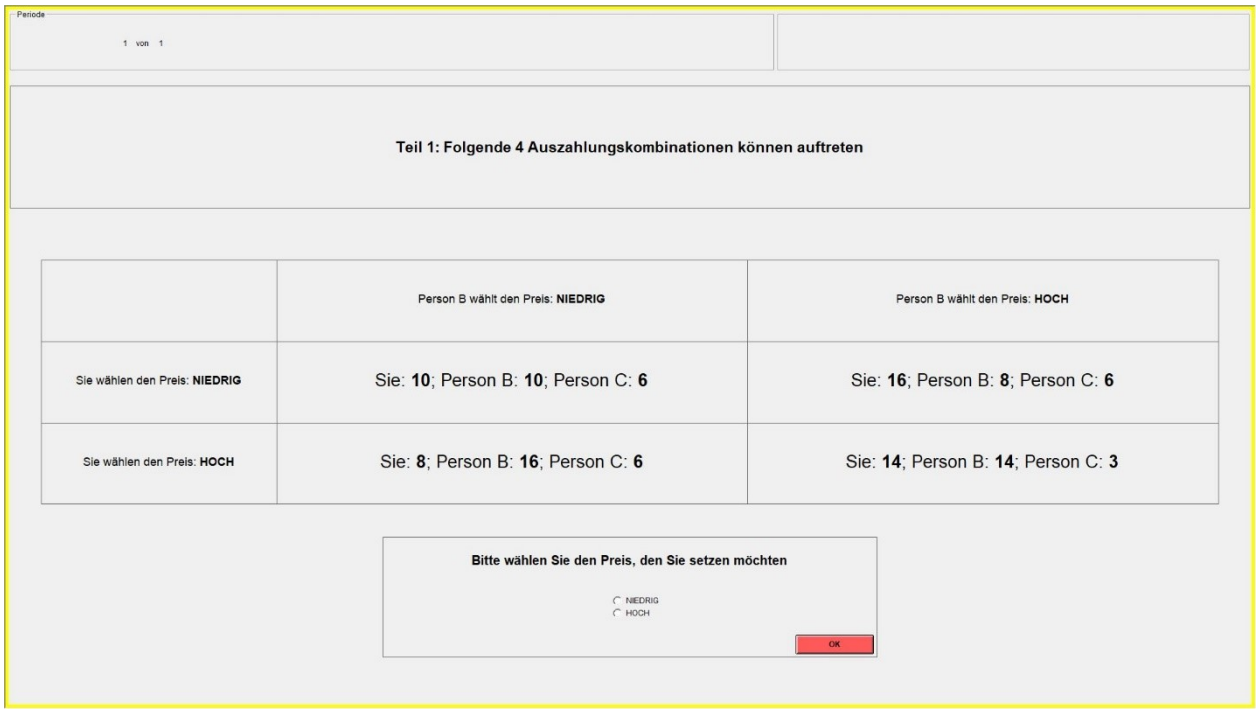

Figure C.5: Stage 1 (Negative)

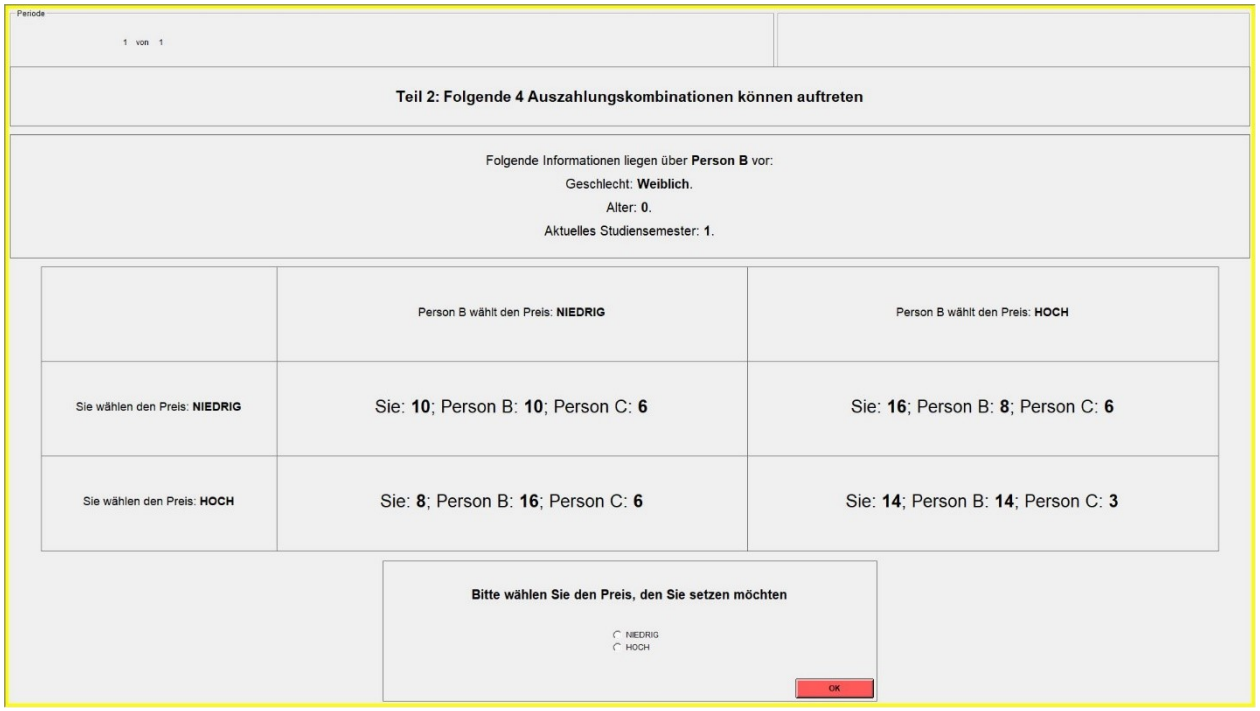

Figure C.6: Stage 2 (Negative)

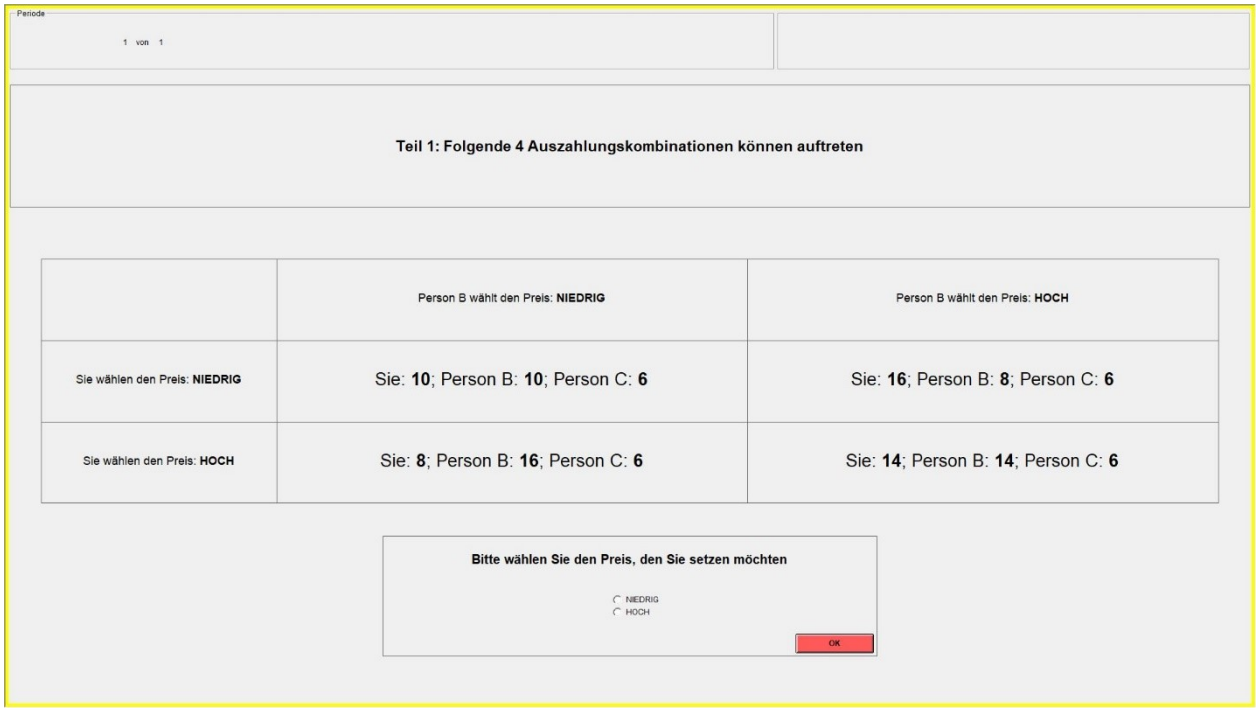

Figure C.7: Stage 1 (Baseline)

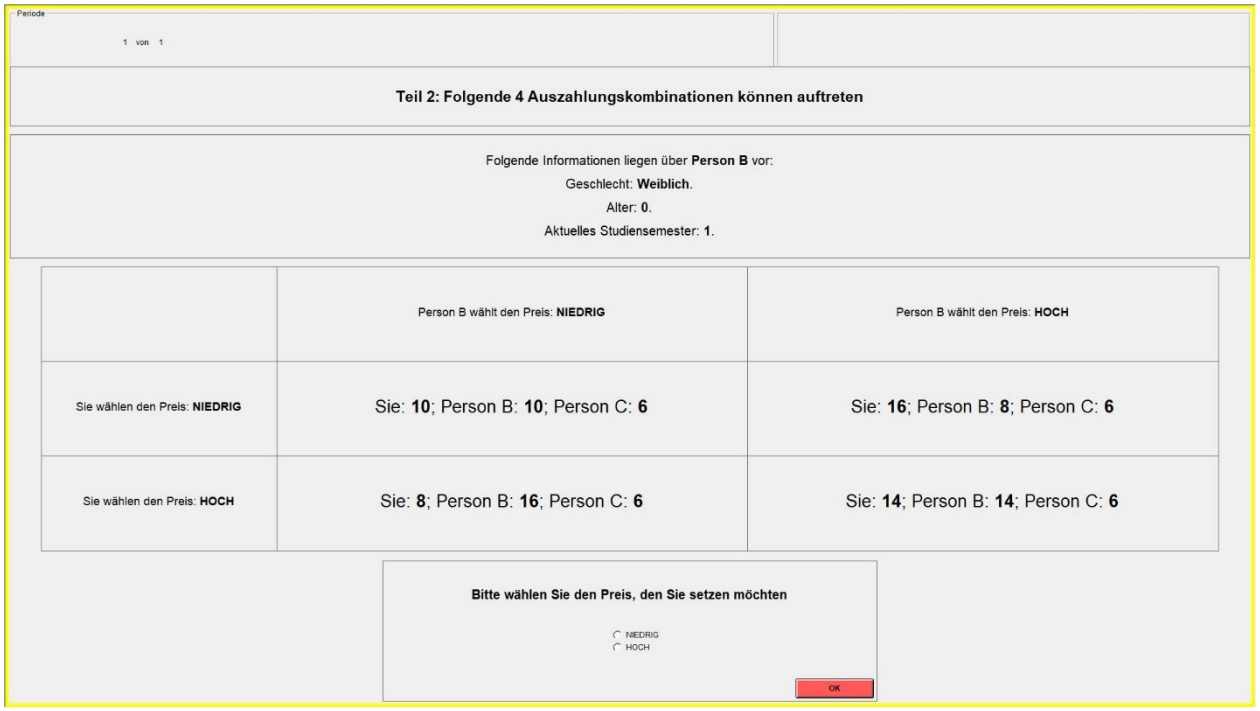

Figure C.8: Stage 2 (Baseline)

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