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Can Collusion Promote Corporate Social Responsibility? Evidence from the Lab[a]

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Abstract. Market competition can erode socially responsible behavior, suggesting that allowing collusive agreements regarding corporate social responsibility (CSR) may promote public interest objectives such as fair trade and environmental standards. We study this idea in a vertical product differentiation model, extended with firms that partly internalize external effects, and laboratory experiments. Firms choose between offering a 'fair' and an 'unfair' product that imposes a negative externality on a third party. The treatment is to allow firms to coordinate on the type of good they sell, while remaining in price competition. We find that CSR collusion diminishes product variety and polarizes. More of the same product type, fair and unfair, is offered, without a significant impact on the fraction of fair goods traded. Instead, third-party preferences are the more important driver of socially responsible behavior. We highlight implications for competition policy, where cartels may be exempted on sustainability grounds.

Keywords: Corporate social responsibility; Sustainability; Collusion; Laboratory experiment; Competition policy

JEL classification: C92, D03, D62, L41, M14

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1. Introduction

Where government regulation fails, corporate social responsibility (CSR) is an alternative way to curb negative externalities such as pollution, poor labor conditions and resource depletion. Bénabou & Tirole (2010) discuss various reasons why firms may act responsibly, ranging from pure profit to intrinsic motivations. When CSR is a for-profit differentiation strategy, as in McWilliams & Siegel (2001), the response to stronger market competition would be more CSR.[1] On the other hand, intrinsically motivated ethical behavior can be undermined under increased competition and the need to cut costs, as Shleifer (2004) documents.[2] These findings suggest that encouraging CSR coordination, i.e., allowing firms to make anticompetitive agreements regarding CSR, may be effective in raising CSR standards. For example did the members of the US Business Roundtable jointly endorse stakeholder capitalism, in which they commit also to the interests of their workers, suppliers and wider communities.[3]

However, such agreements may come in conflict with the antitrust laws. The pursuit of wider public interests than competition is not a recognized defense under American antitrust law.[4] Instead, automakers that agreed with the State of California to adhere to higher than the Federal standards for tailpipe emissions were investigated for collusion.[5] In Europe coordinated CSR activities in restraint of trade can be considered for exemption from the cartel laws under the four conditions of Article 101(3) Treaty on the Functioning of the European Union, which include that consumers benefit. In *CECED* (1999), the European Commission allowed a horizontal agreement amongst producers of kitchen compliances to discontinue their cheapest line of washing machines and dishwashers, based on the argument that it would save on electricity and water use to environmental benefit.[6] Several Member State competition agencies have since considered making allowance for cartels with compensating benefits for sustainable production. The Netherlands' competition authority was a forerunner in assessing anticompetitive agreements between electricity producers for a reduction of CO2 emissions, shrimp fishermen claiming to have protected the seabed, and poultry farmers promising to

[1] Fernandez-Kranz & Santalo (2010) find that firms in more competitive U.S. industries invest more in CSR activities; Flammer (2015) sees an increase in CSR activities with increased competition following import tariff reductions; Zhang et al. (2010), using data from Chinese firms, find that corporations that spend more on advertising tend to donate more to charity, and more so in highly competitive markets; in experimental markets, Pigors & Rockenbach (2016) observe that when competition is introduced, socially responsible behavior is profit enhancing. See also Porter and Kramer (2006).

[2] Roth et al. (1991) observe that increased competition leads to fewer 'fair' outcomes in the lab. Cai & Liu (2009) report that firms in more competitive markets engage in more tax avoidance activities in China; Brekke et al. (2017) and Markussen & Røed (2017) discover that general practitioners in Norway are more lenient gatekeepers, the more competitive the market for their services is; Lee et al. (2018) observe less CSR activity in the more competitive markets in South Korea. While Falk & Szech (2013) and Bartling et al. (2015) observe that intrinsic CSR behavior may be eroded in market settings, they find no significant effects on CSR activities from varying the number of competing subjects.

[3] Business Roundtable, Statement on the Purpose of a Corporation, 19 August, 2019. https://opportunity.businessroundtable.org/ourcommitment/. For a critical review, see Stiglitz, J., "Can we trust CEOs' shock conversion to corporate benevolence?," *The Guardian*, 29 August 2019.

[4] Werden (2014).

[5] Hovenkamp (2019).

[6] Commission Decision, Case IV.F.1/36.718, *CECED*, 24 January 1999. The exemption was shortly after extended, see European Commission, "Commission approves agreements to reduce energy consumption of dishwashers and water heaters," IP/01/1659, Brussels, 26 November 2001.

improve the living conditions of chickens.[7] The European competition rules are currently reconsidered to encompass "sustainability factors" such as fair trade and environmental standards.[8] The intent is to possibly exempt coordination on standards, not collusion on prices and production.

In this paper, we study the effects of allowing firms to make horizontal agreements on their CSR activities. We derive predictions from the standard Shaked & Sutton (1982) vertical product differentiation model, extended with firms that partly internalize the external effects of their actions. That third-party preferences are a powerful predictor for CSR is in line with the 'upper echelons perspective' in the business literature, as in Hambrick & Mason (1984).[9] In our model, two firms and a continuum of consumers interact in a three-stage game that we label 'the market game'. In the first stage of the market game, the firms can choose between offering a 'fair' and an 'unfair' good. In the second stage, both firms post a price. In the third stage, consumers can choose between the two offers. When the unfair good is traded, a negative externality occurs. The consumers vary in the extent to which they 'care' about this externality.

To study the effect of CSR coordination, we examine the impact of allowing firms to reach a horizontal agreement regarding the kind of good each firm will offer in the first stage of the market game. They can do so on the basis of a coordination mechanism based on alternating-offers negotiation. In the standard setting where firms aim only at maximizing profits, collusion induces them to profitably differentiate their goods, at the expense of consumer surplus. However, with a fraction of the firms internalizing the externality, the opportunity to coordinate the product type may result in equilibria with less product variety, i.e., it is more likely that both firms will offer the same kind of good, fair or unfair. We also find that parameters exist for which consumers benefit from CSR coordination.

Ultimately, the question of which model is more relevant has to be answered empirically. As a first step in addressing this question, we conducted three laboratory experiments. Our experiments closely follow the experimental paradigm developed by Bartling et al. (2015) to study socially responsible behavior in markets. Participants playing the role of firms choose between offering a 'fair' and an 'unfair' good to a consumer participant, where they could or could not coordinate on the kind of goods offered, depending on the treatment. After that, the firms compete in prices. This setup allows us to study the effect of CSR coordination. Before participants interacted in the market games, we measured their 'third-party preferences' on the basis of a variant of Yang et al.'s (2016) social-preferences test.

[7] See Schinkel & Spiegel (2017) for references and an extensive discussion.

[8] See Competition Policy International, *EU: MEPs demands fundamental overhaul of competition policy*, February 4, 2019. Competition and Consumer Day, 25-26 September 2019 in Helsinki, panel on "Sustainability and EU competition law".

[9] For example, Agle et al. (1999) observe significant relationships between CEO values and corporate social performance. Chin et al. (2013) report that firms with liberal CEOs exhibit greater advances in CSR than firms with conservative CEOs. Marquis & Lee (2013) find that the presence of female senior managers positively affects corporate philanthropic contributions. Filistrucchi & Prüfer (2019) identify differences in strategic decisions between Catholic and Protestant nonprofit hospitals.

Laboratory experiments have several advantages over field studies to examine market behavior in general and the effect of CSR coordination in particular.[10] First, it is not yet possible to study this policy initiative on the basis of field data, since it is new and still debated. There are only a few preliminary cases worldwide. In general, cartel behavior is more readily studied in the lab than in the field, because of its (potentially) illegal nature. Moreover, in the laboratory it is easier to measure and control for several variables of interest, including consumer demand and third-party preferences concerning externalities.

Our experimental findings reject some of the standard predictions in favor of the alternative theory. First, the likelihood of firms offering the fair good (unfair good) depends positively (negatively) on firms' third-party preferences. Second, we find that CSR coordination leads to more symmetric offers, i.e, the firms coordinate on offering more of the same good (fair or unfair). It has no significant impact however on the fraction of fair goods traded. Third, we find no negative impact of CSR coordination on average prices and consumer surplus, even though the decrease in product variety should have intensified the subsequent price competition. In addition, the opportunity to coordinate does not help firms with strong third-party preferences to coordinate on fair production more frequently. None of these findings provides support for a lenient policy towards CSR coordination.

We contribute to the large experimental industrial organization literature examining horizontal agreements between firms in two ways. First, we consider agreements concerning product variety, while the literature so far has focused mainly on agreements regarding price, quantity, and market entry.[11] An important lesson from the existing literature is that the ability to make agreements makes markets less competitive at the expense of consumers. This motivated us to only allow for minimal coordination. We restrict attention to firms coordinating on only the kind of good offered and limit the ways in which firms can communicate with each other. The second contribution of our paper to the existing literature is that we have human consumers on the demand side, instead of a simulated aggregate demand function.[12]

The remainder of this paper is organized as follows. In Section 2, we examine the theoretical properties of the market game in both the standard and alternative frameworks. In Section 3, we present our baseline experiment in which the third party suffering from a negative externality in the event of the unfair good being traded is a participant in the laboratory. Sections 4 and 5 contain results from two additional and somewhat different experiments that establish robustness. In one, the externality is more diffused: offering the unfair good creates a carbon-emission into 'the world'. In the other experiment, the firms can only coordinate on both selling the fair good. With some notable exceptions, the findings in both additional experiments are qualitatively in line with the ones in the baseline experiment. Section 6 concludes.

[10] Engelmann et al. (2018) provide evidence that participants that act socially responsibly in experimental markets also reveal a preference for a fair-trade chocolate bar over a conventional one. Such evidence supports the external validity of laboratory experiments in which socially responsible behavior in markets is studied.

[11] Recent examples include Fonseca & Normann (2012), Gomez-Martinez et al. (2016), and Hinloopen et al. (2019). For an overview, see Potters & Suetens (2013).

[12] Other oligopoly experiments that have consumer participants, in altogether different settings, are Tyran & Engelmann (2005), Davis & Wilson (2008), and Orland & Selten (2016).

2. The Market Game

Our model extends the vertical product differentiation model in Shaked & Sutton (1982) by allowing for firms partly internalizing external effects. Consider a market consisting of two firms and a continuum of $\overline{\gamma} > 0$ consumers. The firms and the consumers interact in the following three-stage game ('the market game').

1. The firms simultaneously and independently choose whether to produce a fair good or an unfair good. The firms' decisions become common knowledge.
2. The firms simultaneously and independently set a price from the set $P = \{0, \varepsilon, 2\varepsilon, \dots\}$, where $\varepsilon > 0$ is the smallest currency unit.
3. Consumers buy at most one of the goods offered in the market. They can also decide not to buy at all.

To study the effect of CSR coordination, we analyze the 'extended market game', which proceeds as follows.

1. One firm is randomly chosen to become the first proposer. This firm makes a proposal that states the kind of good each firm will offer.
2. The other firm can accept or reject the proposal. If the proposal is accepted, proceed to stage 6.
3. The other firm makes a proposal that states the kind of good each firm will offer
4. The first firm accepts or rejects the proposal. If the proposal is accepted, proceed to stage 6.
5. The firms simultaneously and independently choose whether to produce a fair good or an unfair good. The firms' decisions become common knowledge.
6. The firms simultaneously and independently set a price from the set $P = \{0, \varepsilon, 2\varepsilon, \dots\}$, where $\varepsilon > 0$ is the smallest currency unit.
7. Consumers buy at most one of the goods offered in the market. They can also decide not to buy at all.

Comparing the outcomes between the market game and the extended market game allows us to make predictions regarding the effects of CSR coordination that we measure in our experiments.

Consumers are characterized by a parameter γ that measures how much additional utility they obtain when buying the fair good compared to buying the unfair good. We assume that γ is uniformly distributed over the interval $[0, \overline{\gamma}]$. A consumer of type γ's utility equals

$$U_\gamma = \begin{cases} 0 & \text{if the consumer does not buy} \\ v - p & \text{if the consumer buys the fair good at price } p \\ v - p - \gamma & \text{if the consumer buys the unfair good at price } p \end{cases}$$

where v is the good's consumption value, which is assumed to be the same for the fair good and the unfair good. A consumer's utility when not buying equals 0. The interpretation is that trade of the unfair good imposes a negative externality on a third party which decreases consumer type γ's utility by γ. In other words, γ is the consumer's 'moral costs' of buying the unfair good. The fair good is 'socially responsible' in that it does not result in a negative externality.

Firm i's marginal costs when selling the [un]fair good equal c^f, $0 < c^f < \overline{\gamma}$ [$c^u, 0 \leq c^u \leq c^f$]. We assume $v > \frac{2c^f+4\overline{\gamma}}{3}$ to guarantee that, in equilibrium, all consumers buy a good. We assume that $\overline{\gamma}$, c^u, and c^f are multiples of 3ε and that ε is 'small'. Firm i is characterized by a parameter φ_i, $i = 1,2$, which could be interpreted as the extent to which firm i incorporates the negative externality imposed by the unfair good being sold into its profit function, i.e., firm i's profit equals

$$\pi_i = \begin{cases} -\varphi_i 1\{\text{the unfair good is traded}\} & \text{if firm } i \text{ does not sell} \\ p - c^f & \text{if firm } i \text{ sells the fair good at price } p \\ p - c^u - \varphi_i & \text{if firm } i \text{ sells the unfair good at price } p \end{cases}$$

where $1\{X\}$ denotes the indicator function of an event X. The parameters γ and φ_i are naturally interpreted as consumer and managerial values respectively.

We first derive results under the standard assumption that neither firm internalizes the negative externality, i.e., $\varphi_i = 0$, $i = 1,2$.[13] The market game then boils down to a standard vertical product differentiation model. It has a symmetric mixed-strategy equilibrium, described in Proposition 1, in which both firms randomize over offering the fair good and the unfair good.

Proposition 1. *If $\varphi_i = 0$, $i = 1,2$, the market game has a symmetric subgame perfect Nash equilibrium in mixed strategies in which firm i produces the fair good with probability $q^f \equiv \frac{(c^u-c^f+2\overline{\gamma})^2}{(c^u-c^f+2\overline{\gamma})^2+(c^f-c^u+\overline{\gamma})^2}$, $i = 1,2$. If both firms produce the unfair good, then $p_1 = p_2 = c^u + \varepsilon$. If both firms produce the fair good then $p_1 = p_2 = c^f + \varepsilon$. If firm i produces the fair good and firm $j \neq i$ produces the unfair good then firm i's and firm j's equilibrium prices are*

$$p_i = p^f \equiv \frac{2c^f + c^u + 2\overline{\gamma}}{3} \quad (1)$$

$$p_j = p^u \equiv \frac{c^f + 2c^u + \overline{\gamma}}{3} \quad (2)$$

respectively.

Obviously, the market game has asymmetric equilibria as well, in which the two firms produce different kinds of goods. The firms might have to coordinate to reach such an equilibrium outcome. The extended market game facilitates such coordination, which is formalized in the following proposition.

Proposition 2. *If $\varphi_i = 0$, $i = 1,2$, the following strategies constitute a subgame-perfect equilibrium of the extended market game. When it is a firm's turn to make a proposal, it proposes offering the unfair [fair] good itself and the other firm offering the fair [unfair] good if $\pi^u \geq \pi^f$ [$\pi^u < \pi^f$]. The firms only accept asymmetric proposals in the first stage and reject all proposals in the second stage. If a proposal is accepted, firms choose prices according to Eqs. (1) and (2) in Proposition 1. If both proposals are rejected, the firms play the asymmetric equilibrium of the market game where the first mover offers the unfair [fair] good and the other firm offers the fair [unfair] good if $\pi^u \geq \pi^f$ [$\pi^u < \pi^f$].*

[13] Proofs of propositions are in Appendix A.

In equilibrium, the first proposer successfully proposes to divide the market in a way that is most beneficial to him. The second proposer accepts the proposal anticipating that the first proposer will reject any proposal in the second stage, after which the two firms coordinate on the equilibrium outcome of the market game in which the market is divided in a way that is most beneficial for the first proposer in any case. Obviously, other equilibrium outcomes exist too, e.g., where the market is divided in a way that is most beneficial for the second proposer.

What is the effect of CSR coordination, i.e., how do the outcomes of the market game and the extended market game differ in terms of socially responsible behavior, product variety, consumer surplus, and producer surplus? First, CSR coordination has an ambiguous effect on socially responsible behavior, as Examples 1 and 2 show. Second, CSR coordination yields more product variety in that in the equilibrium of the extended market game, the firms always offer a different kind of good. Third, the effect of CSR coordination on consumer surplus is unambiguously negative (Proposition 3). Consumers pay higher prices in the case the firms differentiate their products, which is not compensated by consumers being offered a greater product variety. Finally, CSR coordination positively affects producer surplus because it allows the firms to avoid symmetric outcomes in which they only earn ε profits.

Example 1. *Suppose $\varphi_i = 0$, $i = 1,2$, and $c^f = c^u$. If both the fair and the unfair good are offered to the market, in equilibrium, $\frac{2}{3}$ of the consumers buys the fair good. In the asymmetric equilibrium, $q^f = \frac{4}{5}$. The probability that the fair good is traded equals $\left(q^f\right)^2 + 2q^f\left(1 - q^f\right) \times \frac{2}{3} = \frac{64}{75} > \frac{2}{3}$. So, in the symmetric equilibrium, the fair good is traded more frequently.*

Example 2. *Suppose that $\varphi_i = 0$, $i = 1,2$, and $c^f - c^u = \overline{\gamma}$. If both the fair and the unfair good are offered to the market, in equilibrium, $\frac{1}{3}$ of the consumers buy the fair good. In the asymmetric equilibrium, $q^f = \frac{1}{5}$. The probability that the fair good is traded equals $\left(q^f\right)^2 + 2q^f\left(1 - q^f\right) \times \frac{1}{3} = \frac{11}{75} < \frac{2}{3}$. So, in the symmetric equilibrium, the fair good is traded less frequently.*

Proposition 3. *Suppose $\varphi_i = 0$, $i = 1,2$. If firms play according to the equilibria displayed in Propositions 1 and 2, consumer surplus is lower in the extended market game than in the market game.*

The result that CSR coordination yields more product variety is at odds with commonly observed CSR agreements between firms, which are typically of a more symmetric nature, like in the cases discussed in the introduction. A potential driver of this observation is that CSR coordination may allow firms that internalize the externality to coordinate on both selling the fair good. To scrutinize this intuition, assume that the φ_i's are private information and that they are independently drawn from the set $\{0, \varphi\}$ where $\varphi > 0$ and $P\{\varphi_i = \varphi\} = \alpha \in (0,1)$. In other words, a fraction α of the firms internalizes the externality. Let $\underline{\alpha} \equiv \frac{\left(c^u - c^f - \varphi/2 + 2\overline{\gamma}\right)^2}{\left(c^u - c^f + \overline{\gamma} - \varphi/2\right)^2 + \left(c^f - c^u - \varphi + \overline{\gamma}\right)^2}$. Propositions 4 and 5 establish that parameters exists for which CSR coordination unambiguously results in more socially responsible behavior.

Proposition 4. *If $\varphi \geq \frac{2}{5}\left(\overline{\gamma} + c^f - c^u\right)$, $c^f - c^u < 2\overline{\gamma} - \varphi$, and $\alpha \geq \underline{\alpha}$, the fair good is traded more often in the extended market game than in the market game.*

The intuition behind Proposition 4 is that the extended market game allows type-0 firms to differentiate their goods when both are present while any other realization of types ($0, \varphi$ or φ, φ) results in the same outcome in the two market games. A type-0 firm proposes offering the unfair [fair] good itself and the other firm offering the fair [unfair] good if $\pi^u \geq \pi^f$ [$\pi^u < \pi^f$]. A type-φ firm proposes both firms offering the fair good. A type-φ firm accepts proposals according to which it offers the fair good. Type-0 firms accept asymmetric proposals and reject symmetric proposals. It is readily verified that $\underline{\alpha} < 1$ so that there is indeed a non-empty set of parameters for which the equilibrium exists. Notice that in equilibrium, initial proposals are sometimes rejected, e.g., a type-0 firm will reject a type-φ firm's proposal that both firms offer the fair good. As a result, the second proposal stage is required to enhance coordination.

Because types are perfectly revealed in the coordination mechanism, when two type-0 firms interact, they choose equilibrium prices (1) and (2). Analogously to Proposition 3, consumer surplus is always lower in the extended market game compared to the market game.

Proposition 5. *If* $0 \leq \overline{\gamma} < c^f - c^u$ *and* $0 < \varphi < c^f - c^u$*, the fair good is traded more often in the extended market game than in the market game.*

The intuition behind Proposition 5 is the following. Given the parameters, the market game has an equilibrium in which both firms, regardless of the type, offer the unfair charging a price equal to $c^u + \varepsilon$, while in the extended market game, two type-φ firms manage to coordinate on both offering the fair good. In other words, Proposition 5 formalizes the argument discussed in the introduction that CSR coordination relaxes competition in favor of increased socially responsible behavior. Notice that the outcome of the extended market game could also be implemented in a simpler coordination mechanism in which firms can vote to whether or not to both sell the fair good. If, and only if, both firms decide to vote in favor of offering the fair good, they will offer the fair good. Otherwise, the firms interact in the market game. We will explore the properties of such simpler coordination mechanism in Experiment 3.

Under the parameters studied in Proposition 5, consumers are worse off because the additional amount they pay for the fair good compared to the unfair good is higher than the additional utility they obtain from buying it. Example 3 shows that parameters exist for which consumers benefit from CSR coordination. The reason is that they pay a lower price for the unfair good in the event that both firm types are present while the price is the same if the two firms are of the same type. Notice that CSR coordination negatively affects type-0 firms' profits because they face increased competition from type-φ firms. Under the parameters studied in Example 3, CSR coordination reduces product variety, i.e., it is more likely that both firms offer the same kind of good, fair or unfair.

Example 3. *If* $\varphi = \overline{\gamma} \leq \frac{c^f - c^u}{2}$*, the market game also has an equilibrium in which type-φ firms offer the fair good and type-0 firms offer the unfair good. In this equilibrium, type-φ firms always choose price* $c^f + \varepsilon$ *and type-0 firms offer the good at price* $c^u + \varepsilon$ *[*$c^f - \varphi$*] if the other firm offers the unfair [fair] good. Table 1 summarizes the resulting equilibrium outcome as well as the outcome of the equilibrium of the extended market game.*

Table 1: Equilibrium outcomes of the market game and the extended market game

Firm types	Market game		Extended market game	
	Goods offered	*Prices*	*Goods offered*	*Prices*
(0,0)	Unfair, unfair	$c^u + \varepsilon, c^u + \varepsilon$	Unfair, unfair	$c^u + \varepsilon, c^u + \varepsilon$
$(0, \varphi)$	Unfair, fair	$c^f - \varphi, c^f + \varepsilon$	Unfair, unfair	$c^u + \varepsilon, c^u + \varepsilon$
(φ, φ)	Fair, fair	$c^f + \varepsilon, c^f + \varepsilon$	Fair, fair	$c^f + \varepsilon, c^f + \varepsilon$

Note: $\varphi = \overline{\gamma} \leq \frac{c^f - c^u}{2}$.

We conclude that theoretically, CSR coordination has ambiguous effects on socially responsible behavior, product variety, consumer surplus, and producer surplus. In a setting where neither firm internalizes the externality, firms might manage to coordinate on profitably differentiating their goods, at the cost of consumers. However if some firms internalize the externality, CSR coordination can result in the same kind of good, fair or unfair, being offered more frequently, as Example 3 shows. All in all, our theory does not give rise to clear hypotheses regarding socially responsible behavior, product variety, consumer surplus, and producer surplus. As a result, we view our experiment as exploratory, aimed at studying the effects of CSR coordination and how such effects depend on the firms' 'third-party preferences'.

3. Experiment 1: Baseline Experiment

To identify which of the effects that are theoretically possible are empirically relevant, we ran three experiments at the CREED laboratory of the University of Amsterdam (UvA). The experiments were computerized and programmed in PHP/mySQL. We used control questions to test the participants' understanding of the instructions.[14] Payoffs in the experiments were denominated in 'francs.' The exchange rate was 1 euro for 10 francs. Each session lasted between 60 and 90 minutes. In this section we report the results from our baseline experiment (Experiment 1).

3.1. Design and Procedures Experiment 1

In Experiment 1, 136 students of a mandatory economics course in the PPLE (Politics, Psychology, Law and Economics) bachelor of the UvA participated. The participants did not receive a show-up fee. Their earnings ranged from €0 to €14.90 with an average of €7.70.

At the beginning of a session, participants were informed that the experiment consisted of two parts, and that the instructions to each part would be distributed at the start of that part. In part 1, we measured participants' 'third-party preferences' using a variant of a social preferences test developed by Yang et al. (2016) (see Table 2). The participants were randomly assigned into pairs. Each participant made 10 choices between options A and B. Each choice determined the payoffs for both the decision-maker and the participant she was paired with (the receiver). If one of the decisions in part 1 was chosen to determine payments at the end of a session, in each pair one of the participants was appointed decision-maker and his/her decision for the selected choice was implemented.

[14] The instructions are in Appendix B.

Table 2: The 10 choices in part 1

Nr.	Option A	Option B	Choose B iff
1	Yours: 125; Other's: 80	Yours: 130; Other's: 0	$\gamma \leq 4.375$
2	Yours: 120; Other's: 80	Yours: 130; Other's: 0	$\gamma \leq 8.75$
3	Yours: 115; Other's: 80	Yours: 130; Other's: 0	$\gamma \leq 13.125$
4	Yours: 110; Other's: 80	Yours: 130; Other's: 0	$\gamma \leq 17.5$
5	Yours: 105; Other's: 80	Yours: 130; Other's: 0	$\gamma \leq 21.875$
6	Yours: 100; Other's: 80	Yours: 130; Other's: 0	$\gamma \leq 26.25$
7	Yours: 95; Other's: 80	Yours: 130; Other's: 0	$\gamma \leq 30.625$
8	Yours: 90; Other's: 80	Yours: 130; Other's: 0	$\gamma \leq 35$
9	Yours: 85; Other's: 80	Yours: 130; Other's: 0	$\gamma \leq 39.375$
10	Yours: 80; Other's: 80	Yours: 130; Other's: 0	$\gamma \leq 43.75$

Notes: The 10 decisions between options A and B. "Yours" refers to the decision-maker's payoff and "Other's" to the receiver's payoff. The final column presents the values of γ that rationalize a choice of option B for a participant whose utility function is represented by Eq. (3). This column was obviously not shown to the participants.

In part 2, we let participants interact in 24 rounds of the market game using a variant of the experimental paradigm introduced by Bartling et al. (2015).[15] In each round, participants were randomly assigned to groups of four.[16] Two group members played the role of the firm, one group member was the consumer, and the remaining group member was the third party that suffered from a negative externality if the unfair good was traded. After each round, the groups were re-matched within matching groups of eight participants. The role of firms and consumers was randomly alternated to make it harder for firms to collude tacitly. Role switching also enlarges the pool where consumers and firms are drawn from, which results in a smoother distribution of consumer types within a matching group than without role switching. We chose to keep the role of third party fixed throughout part 2 to discourage participants from colluding on only trading the fair good (which maximizes the group's joint payoffs).

We used the following parameters of the market game: The production costs were $c^u = 0$ for the unfair good and $c^f = 15$ for the fair good. The price set was $P = \{0,1,2,\dots,100\}$ and the corresponding smallest currency unit equaled $\varepsilon = 1$. The consumer's value for buying a good was equal to $v = 80$. All participants began a round with a starting capital of 70. The third party's payoff was reduced by $x = 70$ if the consumer bought the unfair good and remained unchanged if the consumer did not buy a good or bought the fair good. The resulting payoffs are:

$$\Pi^{firm} = \begin{cases} 70 + p & \text{if the firm sells the unfair good at price } p \\ 70 + p - c^f & \text{if the firm sells the fair good at price } p \\ 70 & \text{if the firm does not sell} \end{cases}$$

[15] Our set-up differs from Bartling et al.'s design in that firms do not simultaneously decide on the kind of good offered and the price. Instead, firms only decide on the price after observing the kind of good offered by the other firm. This sequential set-up follows the way product differentiation is modeled in the industrial organization literature of semi-collusion that is used to study the policy of allowing coordination on product quality. See Schinkel & Spiegel (2017).

[16] In Bartling et al. (2015), both the number of firms and the number of consumers is larger than in ours. For statistical reasons, we kept the number of participants in a market as low as possible. Bartling et al. (2017) find the number of affected third parties had no substantial effect on socially responsible market behavior.

$$\Pi^{consumer} = \begin{cases} 70 + v - p & \text{if the consumer buys a good at price } p \\ 70 & \text{if the consumer does not buy} \end{cases}$$

$$\Pi^{third\ party} = \begin{cases} 70 - x & \text{if the consumer buys the unfair good} \\ 70 & \text{otherwise} \end{cases}$$

The experimental design exploits two treatments that vary in the opportunity for the firms to coordinate on the kind of good sold. In treatment COORDINATION, participants interacted in the coordination mechanism before playing the market game in the same way as in the extended market game described in Section 2.[17] In treatment NO COORDINATION, the participants interacted in the market game right away. In the first experiment, 72 [64] participants were assigned to the COORDINATION [NO COORDINATION] treatment resulting in nine [eight] matching groups. One of the 10 decisions in part 1 or one of the 24 market rounds in part 2 was randomly chosen to determine payment at the end of a session.

3.2. Results Experiment 1

In this section, we present our experimental results. By 'the effect of CSR coordination,' we mean differences observed between the treatments COORDINATION and NO COORDINATION. In section 3.2.1, we examine whether CSR coordination has an impact on aggregate market outcomes. In section 3.2.2, individual behavior for both consumers and firms is analyzed and, in particular, linked with the third-party preferences measured in part 1 of the experiment.

Throughout the paper, we follow Bartling et al. (2015) by basing our statistical analysis on individual-level random-effects panel data regressions with robust standard errors clustered by subject, unless indicated otherwise.

3.2.1. The Effect of CSR Coordination on Aggregate Market Outcomes

We first examine the effect of coordination possibilities on market outcomes. As the second column in Table 3 shows, the fair good is traded in almost 2/3 of the market interactions for both treatments. There are no significant differences in the proportion of fair goods traded between treatments, nor in the share of unfair goods traded or in the likelihood that the transaction will occur.

Result 1. *CSR coordination does not affect the fraction of fair goods traded on the market.*

Table 3: Type of goods traded, market prices, and offer types in Experiment 1

Treatment	Fraction fair goods traded	Fraction unfair goods traded	No trade	Fraction Fair/Fair offers	Fraction Unfair/Unfair offers	Fraction Unfair/Fair offers	Price fair good	Price unfair good
NO COORDINATION	65.36%	25.78%	8.85%	43.49%	13.02%	43.49%	24.96	18.27
COORDINATION	63.66%	28.01%	8.33%	54.63%**	22.22%**	23.15%***	24.19	16.45

Notes: *p<0.1, **p<0.05, ***p<0.01. *Significance calculation based on individual level random effects regressions with robust standard errors clustered by subject. Only a dummy variable for the COORDINATION treatment is included as explanatory variable.*

[17] We chose to restrict communication in this way because free-form communication helps firms to increases prices in the lab, as in Isaac et al. (1984), Fonseca & Normann (2012), and Gomez-Martinez et al. (2016).

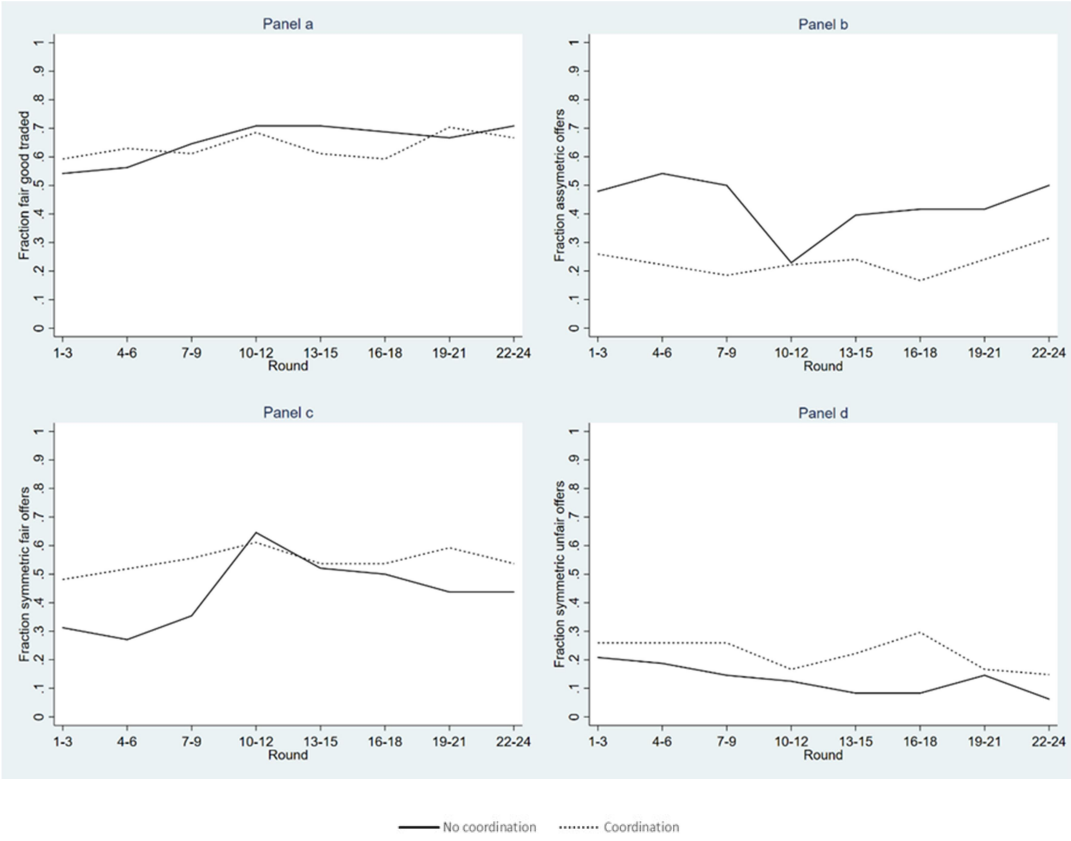
Figure 1, panel a, shows the evolution of the share of fair goods traded over time for both treatments. This figure suggests that the share of fair goods traded increases over time and that there is no treatment effect. This is confirmed in specification (1) in Table 4 where a time trend is introduced. Therefore, we obtain that allowing firms to coordinate on the type of good offered to consumers does not increase fair production.

Table 4: Random effects regressions of type of goods traded, type of goods offered, and market prices in Experiment 1

	Fair good traded (1) Logit	Asymmetric offer (2) Logit	Fair/Fair offer (3) Logit	Unfair/Unfair offer (4) Logit	Price fair good (5)	Price unfair good (6)
Intercept	0.3545	-0.2787	-0.6579***	-1.9916***	32.6931***	24.2386***
	(0.2623)	(0.2092)	(0.2486)	(0.3657)	(1.3659)	(2.2685)
Coordination	-0.0649	-0.9910***	0.5442**	0.7812**	-1.3108	-1.5852
	(0.2807)	(0.2007)	(0.2832)	(0.3942)	(1.2446)	(2.1460)
Period	0.0328**	-0.0003	0.0263**	-0.0451***	-0.5885***	-0.4965**
	(0.0145)	(0.0119)	(0.0112)	(0.0174)	(0.0709)	(0.1300)
N	816	816	816	816	526	220

*Notes: The dependent variable in (1) takes value 1 if the fair good is traded and 0 otherwise (unfair good traded or no transaction). Period takes values from 1 to 24. The dummy variable Coordination takes value 1 for the COORDINATION treatment. The models allow for individual level random effects. Robust standard errors in parentheses (clustered by subject). *p<0.1, **p<0.05, ***p<0.01.*

Figure 1: Evolution of the share of fair goods traded and offers in Experiment 1

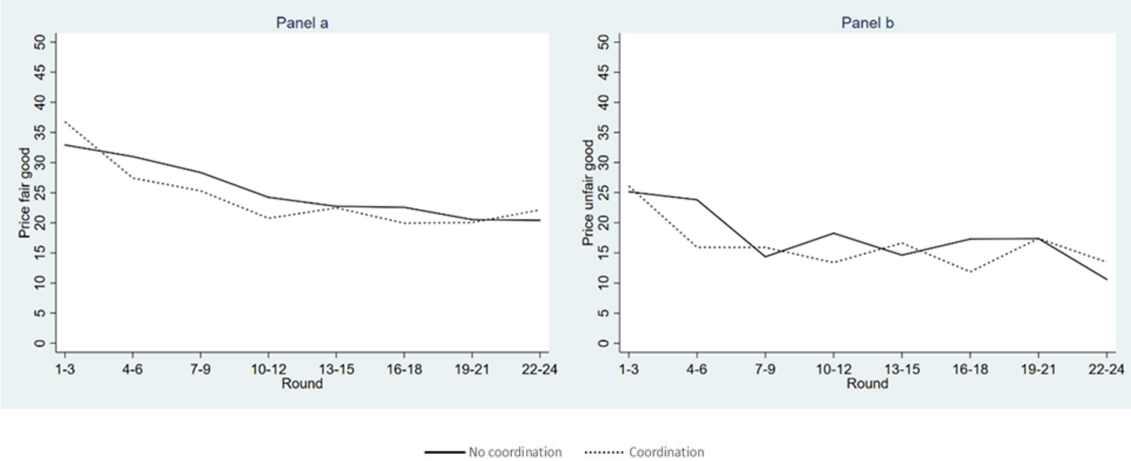


Notes: Solid and dashed lines refer to the NO COORDINATION and COORDINATION treatments respectively.

Our theoretical analysis indicates that the distribution of offers that consumers face may be affected by CSR coordination. In the remainder of this paper, we refer to 'symmetric offers' when firms offer the same kind of good and to 'asymmetric offers' when one firm offers the fair good and the other the unfair good. Table 3 shows that, under CSR coordination, the fraction of symmetric offers rises. This implies that CSR coordination increases product homogeneity. The evolution of offer types by treatment is represented in Figure 1, panels b–d, and estimated in specifications (2), (3), and (4) in Table 4. The proportion of asymmetric offers is constant over time and clearly lower when firms have the opportunity to coordinate. The fraction of symmetric fair offers is slightly increasing over time. The proportion of symmetric unfair offers is decreasing over time for both treatments. There are clearly more symmetric fair offers and symmetric unfair offers in the COORDINATION treatment than in the NO COORDINATION treatment. We conclude that when firms can coordinate on the type of goods sold, they tend to agree on offering the same good (fair or unfair), increasing product homogeneity in our experimental markets.[18]

Result 2. *CSR coordination increases the share of symmetric offers.*

Figure 2: Evolution of the prices of the fair and the unfair goods in Experiment 1**.**



Notes: Solid and dashed lines refer to the NO COORDINATION and COORDINATION treatments respectively.

Next, consider market prices. Table 3 and Figure 2 show average transaction prices for fair and unfair goods in both treatments. The average price for the fair good is 24.96 in the NO COORDINATION treatment and 24.19 in the COORDINATION treatment. These numbers are not significantly different. Prices for the unfair good are, on average, 18.27 in the NO COORDINATION treatment and 16.45 in the COORDINATION treatment; the difference is not significant. This result is confirmed by specifications (5) and (6) in Table 4. Figure 2 highlights a clear downward pressure on prices, mainly in the first rounds. Participants seem to have been engaged in a race to the bottom toward marginal cost pricing. All in all, we clearly observe no treatment effect in

[18] Firms are both more likely to make and more likely to accept symmetric offers than asymmetric offers. 67% of the offers made in the coordination mechanism are symmetric (46% fair/fair and 21% unfair/unfair). Symmetric offers are significantly more likely to be accepted than asymmetric offers (75% [56%] of the fair/fair [unfair/unfair] offers are accepted while only 35% of the asymmetric offers are accepted).

the average market price for either type of good. Introducing coordination possibilities on the type of goods offered by firms does not affect average market prices for fair and unfair goods.

Comparing market prices between the fair and the unfair good, we can clearly observe that firms and consumers cared about the negative externality that may have been inflicted on the third party in the lab. This is reflected by the market price premium for fair goods (average price gap between fair and unfair goods). The average market price premium for the fair good is 6.69 in the NO COORDINATION treatment and 7.74 in the COORDINATION treatment, a difference that is not statistically significant. Therefore, consistent with the assumptions underlying our theoretical analysis, consumers are willing to pay more for the fair good than for the unfair good. As the production costs for the fair good were 15 higher than for the unfair good, it turns out that firms are also willing to give up some profits to sell the fair good. In fact, firms and consumers approximately share the additional production costs of the fair good, as in Bartling et al. (2015).

We conclude that the introduction of coordination possibilities between firms does not affect the share of fair goods traded nor the price at which the fair and the unfair goods are sold. We observe a tendency from firms to coordinate on symmetric offers, increasing product homogeneity in our experimental markets. Still, the firms' ability to coordinate has no significant impact on either consumer surplus or producer surplus.[19]

Result 3. *CSR coordination does not affect prices of fair and unfair goods, consumer surplus, or producer surplus.*

3.2.2. Firms' and Consumers' Individual Behavior

To see what may explain the polarization in symmetric offerings that CSR coordination brings about, in this subsection we turn attention to the individual behavior of consumers and firms. In particular, we examine the relation between the third-party preferences measured in part 1 of the experiment, displayed in Table 2, and observed market behavior. We assume that a participant's utility function is given by

$$u(x,z) = x + \frac{\gamma}{70} z \tag{3}$$

where x is the own payoff and z is the other's payoff. Observe that we have normalized the utility function in such a way that γ can be interpreted as the highest price difference between the fair good and the unfair good for which the consumer would prefer to buy the fair good over the unfair good.[20] Under the assumption that participants' decisions are consistent between the market and non-market environments, participants' decisions in part 1 of the experiment allow us to measure γ. More precisely, the point where participants switch from option A to option B

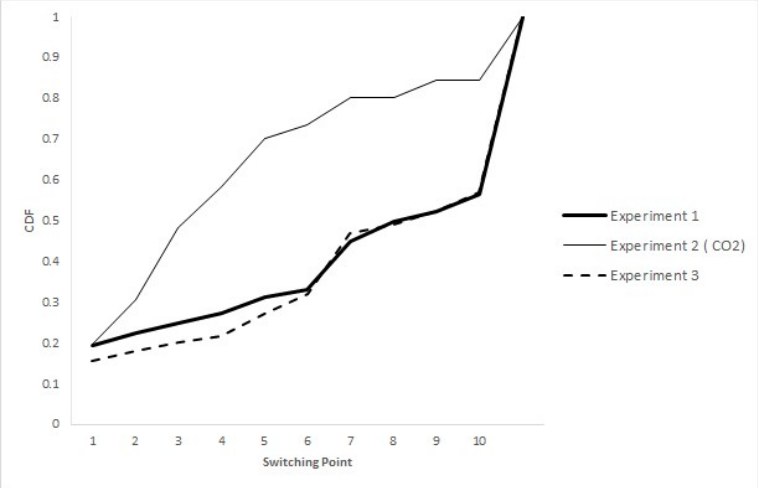
[19] Consumer surplus, based on the third-party preferences measured in part 1 of the experiment, equals 144.66 [145.38] in the NO COORDINATION [COORDINATION] treatment. Firm profits are equal to 75.61 [75.23] in the NO COORDINATION [COORDINATION] treatment. Producer surplus, based on third-party preferences, equals 96.32 [95.06] in the NO COORDINATION [COORDINATION] treatment.

[20] Notice that in all 10 options A and B in table 1, the decision-maker earned more than the other person. Therefore, the test could also be used to measure β in the Fehr and Schmidt (1999) model according to which the decision-maker's utility is given by $\tilde{u}(x,z) = x - \beta(x-z)$ for $z \leq y$. Indeed, model (1) is equivalent to the Fehr-Schmidt model for $z \leq y$ if $\beta = \frac{\gamma}{70+\gamma}$.

identifies the interval in which γ lies.[21] For example, if a participant chooses option A in decisions 1–4 and option B from decision 5 onwards, then $\gamma \in (17.5, 21.875]$.

In our statistical analysis, we approximate γ using the variable *3rdPartyPref*, which is the midpoint of the interval.[22] For firms' third-party preference φ_i, we use the same variable, assuming that the extent to which participants care about the third party does not depend on the role played in the experimental markets. Figure 3 plots the cumulative distribution of the switching points in the three experiments.

Figure 3: Cumulative distribution of switching points in Part 1



To check the accuracy of the way we measure γ in part 1, we first examine to what extent participants' choices in the role of consumer are consistent with their third-party preferences measured in part 1. As the choice between two fair goods is unaffected by a consumer's third-party preference, we restrict attention to instances in which consumers are offered both types of good or only unfair goods.[23] Excluding all participants who did not exhibit consistent third-party preferences in part 1 leaves us with 386 observations. In the case of asymmetric offers, buying the [un]fair good is consistent with third-party preferences if, and only if, $\gamma \geq p_f - p_u$ $[\gamma \leq p_f - p_u]$. For the case of symmetric offers of the unfair good, consumers can only avoid the externality if they decide not to buy any good. Not buying would be consistent with their third-party preferences if, and only if, $\gamma \geq 80 - p_{min}$, where p_{min} is the lower price among the two unfair goods offered.

[21] With consistent preferences, some consumers may always choose the altruistic option, others would always choose the selfish option, and the rest would switch from the altruistic option to the selfish option at some point and keep choosing the selfish option until the last dictator decision. We refer to other choice patterns as 'inconsistent preferences'. In the three experiments, 25 participants exhibited inconsistent preferences (6.7% of our participants). We excluded these participants' decisions from the analysis requiring third-party preferences.

[22] When a participant always chooses the altruistic option we just know that $\gamma \geq 43.75$. If this is the case we defined *3rdPartyPref*=43.75. This means this participant is willing to give up some payoffs if and only if her payoffs are at least as high as the receiver' payoffs.

[23] In the case of symmetric fair offers, theory predicts that the consumer will always choose the least expensive one regardless of her third-party preferences, provided that one of the prices is lower than 70.

Table 5 reports the frequency of all combinations of predicted and actual decisions made by consumers. To obtain a conservative prediction of a participant's socially responsible market decisions, we assume that an individual participant's γ is the minimum value in the interval in which γ lays according to the choices made in part 1 of the experiment. Third-party preferences revealed in part 1 of the experiment predict a share of 46.63% of social responsible market decisions. The externality was avoided in 46.63% of the market interactions where consumers could choose whether to avoid the harm to the third party. Obviously, there is no significant difference between these shares (Wilcoxon signed-rank test p=1.000). Consumers behaved in line with their third-party preferences in the vast majority of the cases (79.27%). In 10.36% of the cases, market decisions were not socially responsible in contrast with the prediction based on their third-party preferences. In the remaining 10.36% of the cases, consumer decisions were socially responsible when third-party preferences did not predict such behavior. Therefore, we do not observe systematic deviation towards or away from 'socially responsible' market decisions in the market, i.e., either buying the fair good or not buying the unfair good when being offered two unfair goods. We conclude that the measure for γ in part 1 is accurate.[24]

Table 5: Frequencies of all combinations of predicted and actual consumer choices

		Actual choice			
		Fair good	Unfair good	No good	N
Predicted choice	Fair good	129 (33.42%)	**38 (9.84%)**	10 (2.59%)	177 (45.85%)
	Unfair good	11 (2.85%)	166 (43.01%)	29 (7.51%)	206 (53.37%)
	No good	-	**2 (0.52%)**	1 (0.26%)	3 (0.77%)
	N	140 (36.27%)	206 (53.37%)	40 (10.36%)	386

Notes: The predicted choice is based on the lowerbound of the third-party preference measured in part 1. Underlined [bold] entries correspond to observations where participant decisions were [not] socially responsible in contrast with the predicted choice.

Table 6 contains regressions explaining firms' behavior. All models include the period and *3rdPartyPref* as explanatory variables. Specification (1) models the individual firms' decisions of which type of good to offer using data from both treatments. The results indicate that the greater participants' *3rdPartyPref* the more likely they are to offer the fair good when assuming the role of a firm. Moreover, introducing coordination possibilities does not affect the probability of offering the fair good. The likelihood of firms offering the fair good is increasing in time. Specification (2) studies the effect that firms reaching an agreement has on the likelihood of offering a fair good in the Coordination treatment. We find that it is more likely that a firm offers a fair good when an agreement is reached. In addition, *3rdPartyPref* becomes insignificant. Specifications (3) and (4) investigates the hypothesis of whether CSR coordination

[24] In Experiment 2 [3], consumers behaved in line with their third-party preferences in 89.54% [77.12%] of the selected observations. In Experiment 2, we observe a slight bias towards fewer socially responsible market decisions: consumers avoided the externality in 20.93% of the relevant market interactions, which is significantly less than the predicted 24.87% (Wilcoxon signed-rank test, p=0.009). In Experiment 3, third-party preferences revealed in part 1 predict a share of at least 52.70% of social responsible decisions while the externality was avoided in 46.79% of the market interactions. Like in Experiment 1, these differences are small and not statistically significant (Wilcoxon signed-rank test, p=0.184).

facilitates fair production among firms that internalize the negative externality. In particular, specifications (3) and (4) restrict the analysis for the case where both firms in the same market are not unconditionally selfish (*3rdPartyPref*>2.1875) and for the case where they are unconditionally altruistic (*3rdPartyPref*=43.75) respectively. We do not find evidence that the opportunity to coordinate helps firms with strong third-party preferences to coordinate more frequently on symmetric fair production. Specification (5) shows that the price offered for the fair good does not significantly depend on their third-party preferences.

Result 4. *When acting as a firm, the more a participant cares about the third party the more likely she is to offer the fair good. CSR coordination does not help altruistic firms to coordinate on fair production.*

Table 6: Firms' behavior in Experiment 1

	Fair good offered (1) Logit	Fair good offered (2) Logit	Fair/Fair offer (3) Logit	Fair/Fair offer (4) Logit	Price offered for the fair good (5)
Intercept	-0.3702 (0.3975)	-0.6978 (0.7109)	-0.0490 (0.3100)	0.5728 (0.4603)	40.1525 *** (2.5189)
Period	0.0283** (0.0214)	0.0143 (0.0169)	0.0080 (0.0118)	0.0322 (0.0291)	-0.8923*** (0.1012)
3rdPartyPref	0.0418*** (0.0122)	0.0292 (0.0204)	-	-	0.0581 (0.5940)
Coordination	-0.1798 (0.4285)	-	0.3570 (0.3562)	0.2866 (0.3727)	0.4443 (1.9483)
Agreement	-	0.9058*** (0.3102)	-	-	-
N	1487	734	1050	238	972

Notes: The dependent variable in (1) and (2) takes value 1 if the fair good is offered. Period takes values from 1 to 24. Agreement in (2) takes value 1 if firms reach an agreement in the COORDINATION *treatment. Coordination takes value 1 for the* COORDINATION *treatment. Specification (3) is restricted for observations where both firms in the same market are not unconditionally selfish i.e. 3rdPartyPref>2.1875. Specification (4) is restricted for observations where both firms in the same market are unconditionally altruistic i.e. 3rdPartyPref=43.75. Observations where participants revealed inconsistent third-party preferences are excluded. The models allow for individual level random effects. Robust standard errors in parentheses (clustered by subject). *p<0.1, **p<0.05, ***p<0.01.*

Table 7 displays the results for the behavior of the consumers. Specification (1) models the individual decisions about which good to buy (if any). The dependent variable takes value 1 if the consumer decides to buy the fair good or not to buy at all. Both decisions imply that the third party does not suffer the negative externality.[25] The share of transactions where consumers decide to avoid the externality is stable over time. In addition, the more participants care about the third party the more likely they are to avoid the externality of buying the fair good or not buying at all. Finally, CSR coordination does not affect the probability of a consumer avoiding the negative externality.

[25] Results are qualitatively the same when we restrict the analysis to the cases where buyers either buy the fair or the unfair good.

Table 7: Consumer behavior in Experiment 1

	Avoiding the externality (1) Logit	Fair good purchased (2) Logit	Price paid for the fair good (3)	Price paid for the fair good (4)
Intercept	0.1818	1.9510*	30.4068***	28.6984***
	(0.3817)	(1.0820)	(1.9580)	(3.1153)
Period	0.0252	-0.0532	-0.5155***	-0.4332***
	(0.0165)	(0.0426)	(0.0708)	(0.1120)
3rdPartyPref	0.0341***	0.0798***	0.0093	0.0387
	(0.0094)	(0.0287)	(0.0375)	(0.0652)
Coordination	-0.2598	-0.6958	-1.2280	-
	(0.3764)	(0.8415)	(1.2479)	
PricediffFU	-	-0.2366***	-	-
		(0.0687)		
Agreement	-	-	-	-1.0627
				(1.5142)
Asymmetric	-	-	2.5549***	-
			(1.0313)	
N	745	242	481	237

Notes: The dependent variable in (1) takes value 1 if the fair or no good is bought. Specification (2) restricts the analysis to observations where the consumer receives offers for both types of good. The dependent variable in (2) takes value 1 if the fair good is bought and 0 otherwise. PricediffFU is the difference in prices between the fair and unfair good when the consumer faces an asymmetric offer. Period takes values from 1 to 24. Coordination takes value 1 for the COORDINATION treatment. Asymmetric takes value 1 if the consumer faces different type of goods in a certain round. Agreement in (4) takes value 1 if firms reach an agreement in the COORDINATION treatment. Robust standard errors clustered by group in parenthesis. *Observations where participants revealed inconsistent third-party preferences are excluded. The models allow for individual level random effects. Robust standard errors in parentheses (clustered by subject). *p<0.1, **p<0.05, ***p<0.01.*

Specification (2) in Table 7 restricts the analysis to observations where the consumer receives offers for both types of good. The dependent variable here takes value 1 if the consumer buys the fair good and 0 if she buys the unfair good. Consistently with (1), there is a positive effect of *3rdPartyPref* on the choice of avoiding the externality. Again, there is no treatment effect on the type of good purchased. Finally, an increase in the price difference between the fair and the unfair good decreases the probability of buying the fair good.

Specification (3) shows that the price participants pay for the fair good does not significantly depend on their third-party preferences. The price paid for the fair good is not affected by *3rdPartyPref* or by the coordination possibilities of firms. Moreover, on average, the price paid for the fair good increases by 2.55 units when consumers face asymmetric offers. Finally, the fact that firms reach an agreement does not affect the prices that consumers pay for the fair good.

Result 5. *In the role of consumer, the more a participant cares about the third party, the more likely she is to avoid the externality either by buying the fair good if one is offered or by not buying at all.*

4. Experiment 2: Carbon Emission Compensation Certificates

In Experiment 1, the negative externality was only imposed on a single third party present in the lab. In many market settings, externalities are more abstract and impersonal, in the sense

that they have a small impact on a large number of people, like carbon emission does. We ran Experiment 2 to check the robustness of the findings in the previous section with a different subject pool in a setting where the externality was imposed to a charity.

4.1. Design and Procedures Experiment 2

In part 2 of Experiment 2, we informed the participants that we would buy €7 worth of carbon emission compensation certificates from a charity called Carbonfund.org when the fair good (or no good) was traded.[26] If the unfair good was traded, we would not buy any carbon emission compensation certificates. Similarly, in part 1, the payoffs for the receiver would be donated to Carbonfund.org. In the instructions, we gave the following details about the charity: "CarbonFund.org is an organization that allows individuals to offset their carbon footprint, which includes the emissions from their homes, cars, and air travel. In particular, for every 10 francs retained for CarbonFund.org, we will donate 1 euro to CarbonFund.org, which allows offsetting about 110 kg of CO2." To enhance the credibility of our commitment to donate to CarbonFund.org, we announced in the instructions that we would publicly donate the total amount raised at the end of each session.

A total of 96 participants were recruited from the general student population of the University of Amsterdam. The participants were equally split over the COORDINATION and NO COORDINATION treatments resulting in eight matching groups per treatment. The average earnings were €16.98, including a show-up fee of €7.50, with a minimum of €14.50 and a maximum of €22.40. We donated €84 to CarbonFund.org.

4.2. Results Experiment 2

In this section we highlight differences in findings between Experiments 1 and 2 by only indicating where they differ in the numbered result summaries; we add an apostrophe to the corresponding result. Before we discuss the results, we wish to highlight a marked difference between the two experiments (and Experiment 3). Figure 3 clearly shows that third-party preferences are weaker in Experiment 2 than in Experiment 1. In fact, the empirical distribution of third-party preferences in Experiments 1 and 3 first-order stochastically dominates the one in Experiment 2. The difference is statistically significant (two-sample combined Kolmogorov-Smirnov test, p=0.023). As Experiments 1 and 2 differ in three dimensions (the nature of the externality, the distribution of third-party preferences, and the subject pool), we cannot attribute observed differences to one or the other change. As it turns out, the two experiments qualitatively yield the same main results.

4.2.1. The Effect of CSR Coordination on Aggregate Market Outcomes

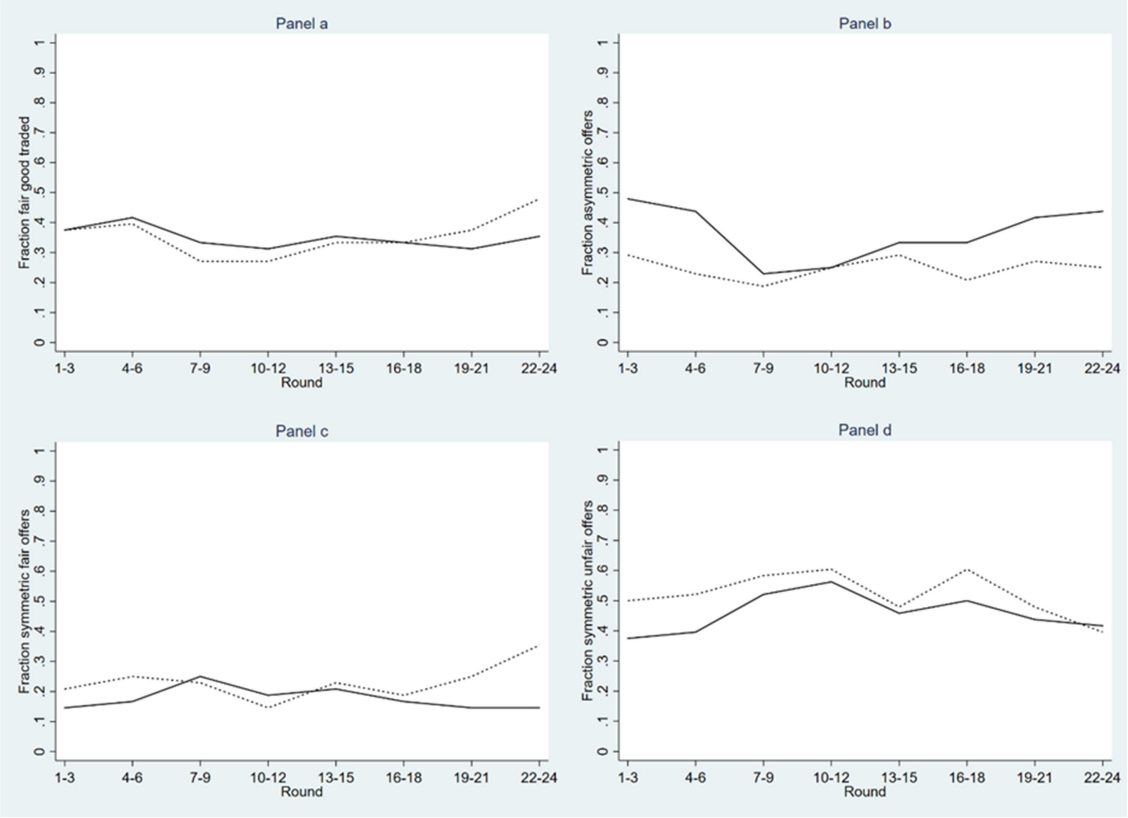
The fraction of fair goods traded per treatment is displayed in Table 8, second column, and its evolution over time in Figure 4, panel a. As in Experiment 1, the introduction of coordination possibilities does not significantly affect the share of fair goods traded.[27] On the other hand, the fraction of fair goods traded is significantly lower than in Experiment 1. In only about 1/3 of the

[26] Other experimental papers linking 'fair trade' to donations to a charity include Rode et al. (2008), Kirchler et al. (2016), Soetevent et al. (2016), and Sutter et al. (2019).

[27] Similarly, there are no significant differences in the share of unfair goods traded nor in the likelihood that the transaction will not occur.

cases, the fair good was traded, while this happened in almost 2/3 of the cases in Experiment 1.[28] Like in Experiment 1, participants tend to coordinate more on symmetric offers if they have the opportunity to coordinate.[29]

Figure 4: Evolution of the share of fair goods traded and offers in Experiment 2



Notes: Solid and dashed lines refer to the NO COORDINATION and COORDINATION treatments respectively.

Table 8: Type of goods traded, market prices, and offer types in Experiment 2

Treatment	Fraction fair goods traded	Fraction unfair goods traded	No trade	Fraction Fair/Fair offers	Fraction Unfair/Unfair offers	Fraction Unfair/Fair offers	Price fair good	Price unfair good
NO COORDINATION	34.90%	61.98%	3.14%	17.71%	45.83%	36.46%	34.11	19.44
COORDINATION	35.42%	63.54%	1.04%	23.18%	52.08%	24.74%***	27.51***	19.55

Notes: *p<0.1, **p<0.05, ***p<0.01. *Significance calculation based on individual level random effects regressions with robust standard errors clustered by subject. Only a dummy variable for the COORDINATION treatment is included as explanatory variable.*

[28] Bartling et al (2017) find that the share of fair products traded is not significantly different when the harm is diffused over several third parties, compared to when it is concentrated in one person. The reason for our finding of a lower share of fair products may be that in Experiment 2 the harm is even more diffused, and/or because the third party is not present in the lab.

[29] The fraction of symmetric fair or symmetric unfair offers individually are not significantly different across treatments.

A remarkable departure from our results from Experiment 1 is that the price for the fair good decreases when coordination possibilities are introduced. When firms can coordinate on the type of good that they offer, market price for the fair good is, on average, 6.6 units lower. This pattern is clearly seen in Figure 5, panel a, and in the econometric analysis using model (5) reported in Table 9. As in Experiment 1, the price for the unfair good is not significantly different when coordination possibilities are introduced. On the aggregate, we do not find that the firms' ability to coordinate has a significant impact on consumer surplus or producer surplus.[30]

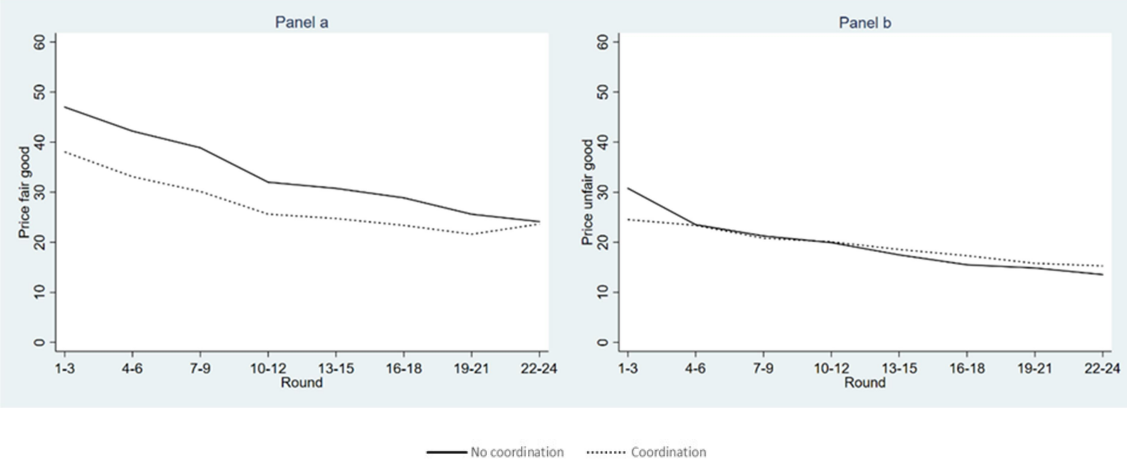
Result 3'. *CSR coordination yields a lower price for the fair good. It does not affect the price of the unfair good, consumer surplus or producer surplus.*

Table 9: Random effects regressions of type of goods traded, type of goods offered, and market prices in Experiment 2

	Fair good traded (1) Logit	Asymmetric offer (2) Logit	Fair/Fair offer (3) Logit	Unfair/Unfair offer (4) Logit	Price fair good (5)	Price unfair good (6)
Intercept	-0.9221*** (0.3268)	-0.6248*** (0.2551)	-2.3043 (0.4206)	-0.1552 (0.2758)	44.3812*** (1.5713)	27.7443*** (1.7091)
Coordination	0.1229 (0.3252)	-0.6394*** (0.0147)	0.6150 (0.3941)	0.3309 (0.3069)	-5.4594*** (1.1135)	-0.6179 (1.6692)
Period	0.0034 (0.0137)	-0.0013 (0.0147)	0.00718 (0.0185)	-0.0041 (0.2758)	-0.8823*** (0.0829)	-0.6186*** (0.0551)
N	768	768	768	768	270	482

*Notes: The dependent variable in (1) takes value 1 if the fair good is traded and 0 otherwise (unfair good traded or no transaction). Period takes values from 1 to 24. The dummy variable Coordination takes value 1 for the COORDINATION treatment. The models allow for individual level random effects. Robust standard errors in parentheses (clustered by subject). *p<0.1, **p<0.05, ***p<0.01.*

Figure 5: Evolution of the prices of the fair and the unfair goods in Experiment 2



Notes: Solid and dashed lines refer to the NO COORDINATION and COORDINATION treatments respectively.

[30] Consumer surplus, based on the third-party preferences measured in part 1 of the experiment, equals 133.52 [133.49] in the NO COORDINATION [COORDINATION] treatment. Firm profits are equal to 79.36 [78.43] in the NO COORDINATION [COORDINATION] treatment. Producer surplus, based on third-party preferences, equals 88.64 [85.72] in the NO COORDINATION [COORDINATION] treatment.

4.2.2. Firms' and Consumers' Individual Behavior

Table 10 presents regressions explaining firms' behavior in Experiment 2. Consistently with Experiment 1, the stronger participants' third-party preferences, the more likely they are to offer the fair good. Again, the price at which the fair good is offered is not affected by *3rdPartyPref*. Like in Experiment 1, we find no significant treatment effect on the type of good offered: The ability of firms to coordinate does not affect the likelihood of offering the fair good. Moreover, CSR coordination does not induce firms that have strong third-party preferences to both offer the fair good. The only difference from experiment 1 is that the likelihood that a firm offers a fair product does not increase over time and it is not affected by weather firms reach an agreement or not.

Table 10: Firms' behavior in Experiment 2

	Fair good offered (1) Logit	Fair good offered (2) Logit	Fair/Fair offer (3) Logit	Fair/Fair offer (4) Logit	Price offered for the fair good (5)
Intercept	-3.4699*** (0.5702)	-3.3275 (0.6918)	-2.4129*** (0.5199)	-0.7639 (0.7728)	47.4624 *** (2.0765)
Period	0.0131 (0.0158)	0.0365* (0.0194)	0.0155 (0.0161)	-0.0125 (0.0399)	-0.9689*** (0.0915)
3rdPartyPref	0.1094*** (0.0214)	0.0917*** (0.0267)	-	-	0.0530 (0.0484)
Coordination	0.5115 (0.5163)	-	0.5156 (0.5594)	-0.2968 (1.0746)	-5.2270*** (1.5064)
Agreement	-	0.4905 (0.5092)	-	-	-
N	1458	720	1008	176	518

*Notes: The dependent variable in (1) and (2) takes value 1 if the fair good is offered. Period takes values from 1 to 24. Agreement in (2) takes value 1 if firms reach an agreement in the COORDINATION treatment. Coordination takes value 1 for the COORDINATION treatment. Specification (3) is restricted for observations where both firms in the same market are not unconditionally selfish i.e. 3rdPartyPref≠2.1875. Specification (4) is restricted for observations where both firms in the same market are unconditionally altruistic i.e. 3rdPartyPref=43.75. Observations where participants revealed inconsistent third-party preferences are excluded. The models allow for individual level random effects. Robust standard errors in parentheses (clustered by subject). *p<0.1, **p<0.05, ***p<0.01.*

Table 11 contains the results for consumer behavior in Experiment 2. Consistently with Experiment 1, the more participants care about the third party, the more likely they are to avoid the externality when acting as consumers. Again, the ability of firms to coordinate does not affect the probability that the consumer will avoid the externality. We have two main divergences. Consistently with table 8, the introduction of coordination possibilities causes a decrease in the price of the fair product paid by the consumers. Second, contrary to experiment 1, consumers are willing to pay more for the fair product the stronger their third party preferences are.

Result 5'. The price participants pay for the fair good increases the stronger their third-party preferences are.

Table 11: Consumer behavior in Experiment 2

	Avoiding the externality (1) Logit	Fair good purchased (2) Logit	Price paid for the fair good (3)	Price paid for the fair good (4)
Intercept	-1.7033***	0.7904	42.0567***	34.3768***
	(0.4120)	(1.0424)	(1.7958)	(1.9197)
Period	0.0031	-0.0328	-0.8863***	-0.7093***
	(0.0143)	(0.0460)	(0.0856)	(0.0747)
3rdPartyPref	0.0475***	0.1542**	0.0851**	0.0509
	(0.0138)	(0.0661)	(0.0362)	(0.0512)
Coordination	0.1012	-0.6818	-5.1721***	-
	(0.3456)	(0.8415)	(1.1190)	
PricediffFU	-	-0.3438***	-	-
		(0.0958)		
Agreement	-	-	-	1.2515
				(1.9070)
Asymmetric	-	-	0.6043	-
			(1.1360)	
N	726	225	250	124

Notes: The dependent variable in (1) takes value 1 if the fair or no good is bought. Specification (2) restricts the analysis to observations where the consumer receives offers for both types of good. The dependent variable in (2) takes value 1 if the fair good is bought and 0 otherwise. PricediffFU is the difference in prices between the fair and unfair good when the consumer faces an asymmetric offer. Period takes values from 1 to 24. Coordination takes value 1 for the COORDINATION treatment. Asymmetric takes value 1 if the consumer faces different type of goods in a certain round. Agreement in (4) takes value 1 if firms reach an agreement in the COORDINATION treatment. *Observations where participants revealed inconsistent third-party preferences are excluded. The models allow for individual level random effects. Robust standard errors in parentheses (clustered by subject). *p<0.1, **p<0.05, ***p<0.01.*

5. Experiment 3: Alternative Coordination Mechanism

In the theory section, we show that the firms could coordinate on the kind of goods offered by using a simpler coordination mechanism than the one studied in Experiments 1 and 2. In Experiment 3, we employed the same framework as in Experiment 1, with the exception that the firms were only allowed to coordinate on both offering the fair good, and not the unfair good. It is this type of coordination that might justify an exemption from the cartel laws. The purpose of Experiment 3 is to test the robustness of the results obtained in the first two experiments regarding the coordination mechanism. While we expect the same main results, CSR coordination may induce less unfair trade because by construction, firms cannot directly coordinate on both offering the unfair good. In this section we analyze any differences.

5.1. Design and Procedures Experiment 3

In Experiment 3, in the COORDINATION treatment, the two firms interacted in a one-stage coordinating mechanism in which both independently voted on whether or not to both sell the fair good. If both voted in favor, each offered the fair good to the consumer. If one or two firms voted against it, both firms chose the type of good independently (first stage of the market game.) In that case, the firms only learned about the kind of good offered by the other firm after both had made their choices regarding the kind of good. As said in the theory section, the outcome of the extended market game underlying Proposition 5 could also be implemented using such one-stage coordination mechanism.

We recruited students of the same mandatory Economics course in the UvA's PPLE bachelor as in Experiment 1, albeit one year later. In total, 136 students participated: 72 in treatment COORDINATION and 64 in treatment NO COORDINATION, resulting in nine and eight matching groups per treatment respectively. Participants did not receive a show-up fee. They earned €7.90, on average, with a minimum of €0 and a maximum of €13.60.

5.2. Results Experiment 3

Again, we pay special attention to the results of Experiment 3 that diverge from our findings in Experiment 1. Before we present the results, we note that the distributions of third-party preferences, plotted in Figure 3, do not differ significantly between Experiments 1 and 3 (two-sample combined Kolmogorov-Smirnov test, p=0.808). Any differences between the two experiments are directly attributable therefore to the differences in the coordination mechanism used.

5.2.1. The Effect of CSR Coordination on Aggregate Market Outcomes

Table 12 presents the aggregate outcomes of Experiment 3. Figure 6 plots the share of fair goods traded and offers over time, and Table 13 presents random effect regressions of the type of goods traded, type of good offered, and market prices. As in Experiment 1, the introduction of coordination possibilities does not affect the share of fair goods traded. Similarly, there are no significant differences in the share of unfair goods traded nor in the likelihood that the transaction will occur. The share of fair goods traded is not significantly different across both coordination mechanisms. In relation to the type of offers made by firms, in consonance with Experiment 1, firms tend to coordinate more on symmetric than on asymmetric offers when introducing coordination possibilities.[31] Interestingly, the share of symmetric fair offers is not affected by CSR coordination but the share of symmetric unfair offer is. Even though it is only possible to coordinate on symmetric fair offers, the likelihood of a symmetric unfair offer significantly increases when introducing CSR coordination.

Table 12: Type of goods traded, market prices, and offer types in Experiment 3

Treatment	Fraction fair goods traded	Fraction unfair goods traded	No trade	Fraction Fair/Fair offers	Fraction Unfair/Unfair offers	Fraction Unfair/Fair offers	Price fair good	Price unfair good
NO COORDINATION	70.57%	25.52%	3.91%	45.31%	12.76%	41.93%	29.28	19.72
COORDINATION	64.81%	29.86%	5.32%	49.54%	20.14%**	30.32%***	29.56	16.73

Notes: *p<0.1, **p<0.05, ***p<0.01.

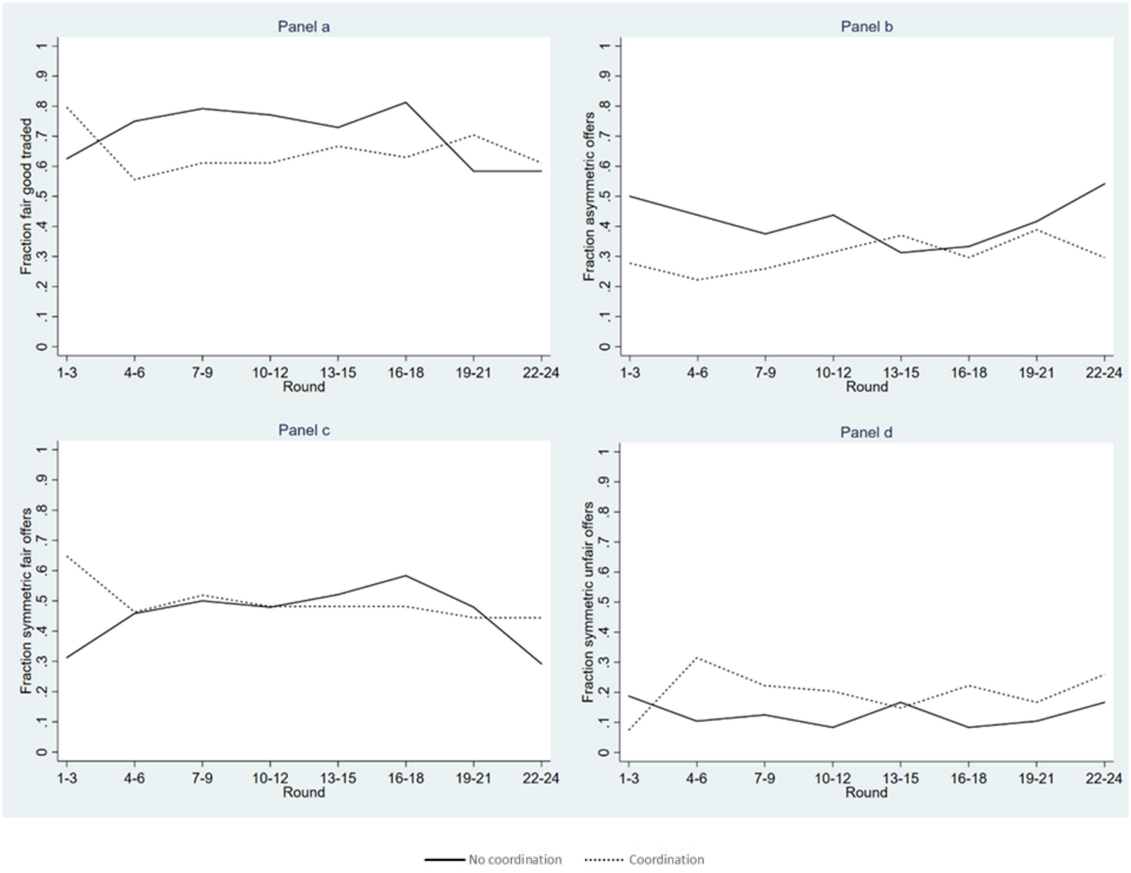
[31] 64% of the firms votes in favor of fair/fair; in 42% of the markets both firms did so.

Table 13: Random effects regressions of type of goods traded, type of goods offered, and market prices in Experiment 3

	Fair good traded (1) Logit	Asymmetric offer (2) Logit	Fair/Fair offer (3) Logit	Unfair/Unfair offer (4) Logit	Price fair good (5)	Price unfair good (6)
Intercept	1.2398 (0.2197)	-0.4674 (0.1745)	-0.0170 (0.1870)	-2.1747*** (0.2748)	37.2650*** (1.3791)	25.1117*** (25347)
Coordination	-0.3693 (0.2350)	-0.5068*** (0.2007)	0.1615 (0.1948)	0.6224** (0.2564)	-0.1244 (1.4291)	-1.6989 (2.0689)
Period	-0.0161 (0.0121)	-0.0113 (0.0118)	-0.0134 (0.0115)	0.0020 (0.0160)	-0.6506*** (0.0796)	-0.4682** (0.0954)
N	816	816	816	816	551	227

*Notes: The dependent variable in (1) takes value 1 if the fair good is traded and 0 otherwise (unfair good traded or no transaction). Period takes values from 1 to 24. The dummy variable Coordination takes value 1 for the COORDINATION treatment. The models allow for individual level random effects. Robust standard errors in parentheses (clustered by subject). *p<0.1, **p<0.05, ***p<0.01.*

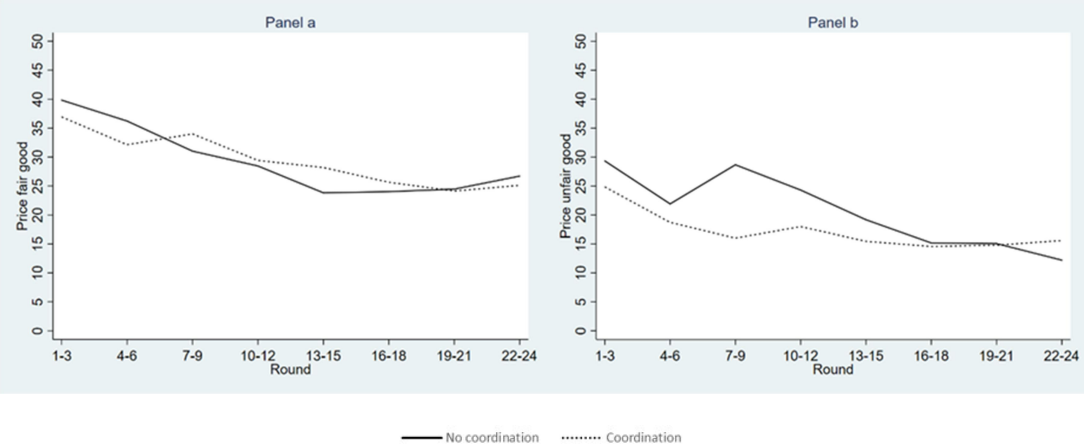
Figure 6: Evolution of the share of fair goods traded and offers in Experiment 3



Notes: Solid and dashed lines refer to the NO COORDINATION and COORDINATION treatments respectively.

While firms are less likely to reach an agreement in Experiment 3's coordination mechanisms than in Experiment 1's,[32] also in Experiment 3, the introduction of coordination possibilities does not affect prices for the fair or the unfair good. Again, we find that the firms' ability to coordinate has no significant impact on either consumer surplus or producer surplus.[33]

Figure 7: Evolution of the prices of the fair and the unfair goods in Experiment 3.



Notes: Solid and dashed lines refer to the NO COORDINATION and COORDINATION treatments respectively.

5.2.2. Firms' and Consumers' Individual Behavior

Table 14 includes regressions explaining firms' behavior in Experiment 3. Consistently with Experiment 1, the more participants care about the third party, the more likely they are to offer the fair good when acting as a firm. The absence of treatment effect on the type of good offered is also present in Experiment 3: The ability of firms to coordinate does not affect the likelihood of offering the fair good. Again, CSR coordination does not induce firms with strong third-party preferences to both offer the fair good.

Table 15 presents the results on consumer behavior in Experiment 3. Consistently with Experiment 1, the more participants cared about the third party, the more likely they were to avoid the externality when acting as consumers. Again, the ability of firms to coordinate does not affect the probability of the consumer avoiding the externality and third-party preferences do not affect the price paid for the fair good. The only difference between experiments is that consumers do not pay significantly more for the fair good when facing asymmetric offers.

[32] The likelihood is 80.56% and 42.13% in Experiments 1 and 3 respectively (p=0.000).
[33] Consumer surplus, based on the third-party preferences measured in part 1 of the experiment, equals 133.52 [133.49] in the NO COORDINATION [COORDINATION] treatment. Firm profits are equal to 77.56 [77.22] in the NO COORDINATION [COORDINATION] treatment. Producer surplus, based on third-party preferences, equals 101.23 [101.20] in the NO COORDINATION [COORDINATION] treatment.

Table 14: Firms' behavior in Experiment 3

	Fair good offered (1) Logit	Fair/Fair offer (3) Logit	Fair/Fair offer (4) Logit	Price offered for the fair good (5)
Intercept	-1.5847** (0.7075)	0.1213 (0.2104)	0.5862 (0.3213)	38.3899*** (2.4298)
Period	-0.0075 (0.0168)	-0.0128 (0.0124)	-0.0120 (0.0222)	-0.7134*** (0.0940)
3rdPartyPref	0.0889*** (0.0179)	-	-	0.0110 (0.0502)
Coordination	0.0940 (0.4831)	0.3139 (0.2427)	0.1532 (0.3314)	1.2662 (1.6410)
N	1528	1251	355	972

*Notes: The dependent variable in (1) and (2) takes value 1 if the fair good is offered. Period takes values from 1 to 24. Agreement in (2) takes value 1 if firms reach an agreement in the COORDINATION treatment. Coordination takes value 1 for the COORDINATION treatment. Specification (3) is restricted for observations where both firms in the same market are not unconditionally selfish i.e. 3rdPartyPref≠2.1875. Specification (4) is restricted for observations where both firms in the same market are unconditionally altruistic i.e. 3rdPartyPref=43.75. Observations where participants revealed inconsistent third-party preferences are excluded. The models allow for individual level random effects. Robust standard errors in parentheses (clustered by subject). *p<0.1, **p<0.05, ***p<0.01.*

Table 15: Consumer behavior in Experiment 3

	Avoiding the externality (1) Logit	Fair good purchased (2) Logit	Price paid for the fair good (3)	Price paid for the fair good (4)
Intercept	0.5765 (0.2933)	-1.1293 (1.7238)	35.2603*** (1.8250)	33.8159*** (2.4460)
Period	-0.0224 (0.0137)	-0.0581 (0.0458)	-0.6520*** (0.0853)	-0.6526*** (0.1161)
3rdPartyPref	0.0342*** (0.0080)	0.2604*** (0.0942)	0.0441 (0.0450)	0.0441 (0.0652)
Coordination	-0.3404 (0.2697)	-2.4546 (1.5902)	0.2013 (1.5087)	-
PricediffFU	-	-0.3318*** (0.0930)	-	-
Agreement	-	-	-	0.0691 (1.5036)
Asymmetric	-	-	1.3418 (1.0159)	-
N	752	261	510	267

Notes: The dependent variable in (1) takes value 1 if the fair or no good is bought. Specification (2) restricts the analysis to observations where the consumer receives offers for both types of good. The dependent variable in (2) takes value 1 if the fair good is bought and 0 otherwise. PricediffFU is the difference in prices between the fair and unfair good when the consumer faces an asymmetric offer. Period takes values from 1 to 24. Coordination takes value 1 for the COORDINATION treatment. Asymmetric takes value 1 if the consumer faces different type of goods in a certain round. Agreement in (4) takes value 1 if firms reach an agreement in the COORDINATION treatment. *Observations where participants revealed inconsistent third-party preferences are excluded. The models allow for individual level random effects. Robust standard errors in parentheses (clustered by subject). *p<0.1, **p<0.05, ***p<0.01.*

6. Conclusion

In an experiment designed to study the effectiveness of allowing firms to make CSR agreements in restraint of competition on the type of good they sell (fair or unfair) polarizes: product variety is reduced by coordination on offering more the same product type, either fair or unfair, roughly equally often. On balance, there is no significant effect on the fraction of fair goods traded, nor on average market prices, producer surplus, and consumer surplus. The reduction in product variety goes against the standard-model predictions under pure profit maximization, but is in line with our theory extension that a fraction of firms internalizes the negative externality unfair trade imposes on a third party. Third-party preferences are a powerful predictor for both consumer and firm behavior. However, we also find no support for CSR coordination facilitating fair production among firms that care about the negative externality.

We ran two additional experiments to test the robustness of these results. In Experiment 2, we vary the distribution of third-party preferences using a diffused negative externality. In Experiment 3, the firms are only allowed to coordinate on the fair good, to test whether the coordination mechanism matters crucially. In both experiments, the main results from the baseline experiment are corroborated. All in all, our experimental results suggest that both consumer and managerial values are a more important driver of CSR than opportunities for firms to coordinate their CSR activities.

The motivating policies to advance CSR by restricting competition are not supported by our findings. Even though *CECED* may be an example of collusion on symmetric 'fair' products, on average, allowing firms a CSR cartel exemption has no impact on fair production, even among firms that internalize the negative externality. Instead our experimental results suggest that CSR coordination may induce firms to collude on less CSR than they otherwise would. This is consistent with Schinkel & Spiegel (2017), who establish that the coordination of product standards reduces incentives to invest in greener products, despite consumers' willingness to pay for them. An illustrative case in point is the 1920s international Phoebus cartel of lightbulb producers, including General Electric, Osram, and Philips, that agreed to reduce the lifespan of lightbulbs.[34] Instead of differentiating their products, the lightbulb conspiracy coordinated on 'unfair' goods. A more recent example may be the suspicion against German auto manufacturers for collusion to slow down the roll-out of technology to clean their cars' emissions.[35]

In addition, CSR coordination carries the risk of putting firms in the position to collude on other dimensions of competition as well, including on higher prices, lower quality, less production capacity, or less R&D. This has been found in industries in which R&D joint ventures were allowed.[36] In our experiment we did not allow subjects to collude beyond product quality. There are nevertheless hints of the joint CSR standard setting also affecting pricing decisions. In particular may it be indicative of tacit collusion that, while product variety decreases up under collusion, so that the subsequent price competition should be stronger, we find instead that

[34] Krajewski, M., "The Great Lightbulb Conspiracy: The Phoebus cartel engineered a shorter-lived lightbulb and gave birth to planned obsolescence," IEEE, 24 Sep 2014.
[35] European Commission, "Antitrust: Commission opens formal investigation into possible collusion between BMW, Daimler and the VW group on clean emission technology," September 18, 2018.
[36] See Duso et al. (2014) and Sovinsky & Helland (2019).

prices stay roughly the same.[37] Future research, for example on experiments in which subjects can communicate more broadly in the context of being allowed to coordinate CSR activities, is needed to reveal under what circumstances public interests can possibly be promoted by private collusion.

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[37] In Experiment 1, in the COORDINATION treatment, when consumers face symmetric fair offers, the price offered by firms for the fair good is 31.34 when an agreement is reached and 23.95 when not. The difference is statistically significant at the 5% level.

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Appendix A: Proofs of Propositions

Proof of Proposition 1. We solve the game using backward induction. Assume for the moment that both the fair and the unfair goods are offered at 'moderate' prices so that consumers always buy a good and that some buy the fair good and some buy the unfair good (it is readily verified that the equilibrium prices satisfy those assumptions). In the case that both firms offer the same good, the Bertrand logic applies, resulting in (close to) marginal-cost pricing in equilibrium. If the firms offer a different good, the one selling the unfair good solves

$$p^u \in argmax_p\{P\{\gamma < p^f - p\}(p - c^u) + P\{\gamma \geq p^f - p\}\varphi_i\} = \left\{\frac{p^f + c^u + \varphi_i}{2}\right\} \qquad (4)$$

when best-responding to the other firm choosing a price $p^f \in (c^u + \varphi_i, 2\overline{\gamma} + c^u + \varphi_i)$. The firm selling the fair good solves

$$p^f \in argmax_p\{P\{\gamma \geq p - p^u\}(p - c^f + \varphi_i)\} = \left\{\frac{\overline{\gamma} + p^u + c^f - \varphi_i}{2}\right\} \qquad (5)$$

for $p^u \in (c^f - \varphi_i - \overline{\gamma}, c^f - \varphi_i + \overline{\gamma})$. Solving the two equations for p^u and p^f yields the equilibrium prices (1) and (2). The firms' resulting profits are

$$\pi_i = \pi^f \equiv \frac{(c^u - c^f + 2\overline{\gamma})^2}{9\overline{\gamma}};\ \pi_j = \pi^u \equiv \frac{(c^f - c^u + \overline{\gamma})^2}{9\overline{\gamma}}$$

respectively. The first stage then reduces to the following 2 × 2 game

		Firm 1	
		Fair	Unfair
Firm 2	Fair	0,0	π^f, π^u
	Unfair	π^u, π^f	0,0

This game has a unique symmetric mixed-strategy equilibrium in which a firm chooses the fair good with probability $\frac{\pi^f}{\pi^f + \pi^u} = \frac{(c^u - c^f + 2\overline{\gamma})^2}{(c^u - c^f + 2\overline{\gamma})^2 + (c^f - c^u + \overline{\gamma})^2} \equiv q^f$.■

Proof of Proposition 2. Using backward induction, and the equilibrium prices derived in the proof of Proposition 1, it is readily verified that the strategies displayed constitute a subgame perfect equilibrium.

Proof of Proposition 3. The difference in consumer surplus between the asymmetric equilibrium and the symmetric equilibrium is given by

$$\Delta CS = \int_{\underline{\gamma}}^{\overline{\gamma}} \left((q^f)^2 (c^f - p^f) + (1 - q^f)^2 (\gamma - p^f + c^u) \right) d\gamma + \int_0^{\underline{\gamma}} \left((q^f)^2 (c^f - \gamma - p^u) + (1 - q^f)^2 (c^u - p^u) \right) d\gamma$$

$$\leq \int_{\underline{\gamma}}^{\overline{\gamma}} (1 - q^f)^2 (\gamma - p^f + c^u) d\gamma + \int_0^{\underline{\gamma}} (q^f)^2 (c^f - \gamma - p^u) d\gamma$$

$$= \left(1-q^f\right)^2\left(\overline{\gamma}-\underline{\gamma}\right)\left(\frac{\overline{\gamma}}{2}+\frac{\underline{\gamma}}{2}-p^f+c^u\right)+\left(q^f\right)^2\underline{\gamma}\left(c^f-\frac{\underline{\gamma}}{2}-p^u\right)<0,$$

where $\underline{\gamma}=p^f-p^u$ is the consumer type that is indifferent between buying the fair good and the unfair good when both are offered at the equilibrium prices. The first [second] term on the RHS of the first equality refers to consumer types γ who buy the [un]fair good at the equilibrium prices if both goods are offered to the market. The first inequality follows because $c^f<p^f$ and $c^u<p^u$. The second inequality follows from $\underline{\gamma}=p^f-p^u$ and $p^f+p^u=c^f+c^u+\overline{\gamma}$.■

Proof of Proposition 4. We start by solving the market game. Assume for the moment that both the fair and the unfair goods are offered at 'moderate' prices so that consumers always buy a good and that some buy the fair good and some buy the unfair good (it is readily verified that the equilibrium prices satisfy those assumptions). In the second stage, if both firms have chosen the same kind of good in stage 1, (close to) marginal cost pricing an equilibrium outcome according to Bertrand logic. The best response of the firm producing the [un]fair good is given by Eq. (4) [Eq. (5)]. Solving for the equilibrium prices yields

$$p^f=\frac{2c^f+c^u-2\varphi+2\overline{\gamma}}{3} \tag{6}$$

$$p^u=\frac{c^f+2c^u-\varphi+\overline{\gamma}}{3}. \tag{7}$$

The conditions $c^u\leq c^f$ and $c^f-c^u<2\overline{\gamma}-\varphi$ ensure that both firms sell a strictly positive quantity at the proposed equilibrium prices, which, in turn, implies that both firms indeed maximize profits.

The expected profits for type $\varphi_j=0$ are

$$\pi_j=\alpha(p^u-c^u)P\{\gamma<p^f-p^u\}=\alpha\frac{\left(c^f-c^u-\varphi+\overline{\gamma}\right)^2}{9\overline{\gamma}}.$$

If it deviates by producing the fair good, its optimal price when the other firm has type $\varphi_i=0$ is equal to $\tilde{p}^f=\frac{4c^f+2c^u-\varphi+4\overline{\gamma}}{6}$. The resulting expected profits are

$$\tilde{\pi}_f=(1-\alpha)\frac{\left(2c^u-2c^f-\varphi+4\overline{\gamma}\right)^2}{36\overline{\gamma}}.$$

So, firm j has no reason to deviate if and only if

$$\alpha\geq\frac{\left(2c^u-2c^f-\varphi+4\overline{\gamma}\right)^2}{(2c^u-2c^f-\varphi+4\overline{\gamma})^2+4(c^f-c^u-\varphi+\overline{\gamma})^2}=\underline{\alpha}.$$

Type $\varphi_i=\varphi$ has no reason to deviate to producing the unfair good because it can only get a strictly positive market share at a price

$$\tilde{p}^u<p^f=\frac{2c^f+c^u-2\varphi+2\overline{\gamma}}{3}\leq c^u+\varphi.$$

where the latter equation follows from the assumption that $\varphi \geq \frac{2}{5}(\overline{\gamma} + c^f - c^u)$. However, when the firms sells at a price $\tilde{p}^u$, it incurs costs c^u and forgoes the positive externality φ so that it is strictly better off letting the other firm sell the fair good.

Now, we turn to the extended market game. The following strategies constitute a perfect Bayesian equilibrium. In the coordination mechanism, a type-0 firm proposes offering the unfair [fair] good itself and the other firm offering the fair [unfair] good if $\pi^u \geq \pi^f$ [$\pi^u < \pi^f$]. A type-φ firm proposes both firms offering the fair good. A type-φ firm accepts proposals according to which it offers the fair good. Type-0 firms accept asymmetric proposals and reject symmetric proposals. If a proposal is accepted, firms choose prices according to Proposition 1. If all proposals are rejected, a firm offers an [un]fair good in the first stage of the market game if its type is φ [0]. In the extended market game type-0 firms differentiate their goods, while they both offer the unfair good when both are present. Any other realization of types ($0, \varphi$ or φ, φ) results in the same outcome in the two games. As a consequence, the fair good is traded more often in the extended market game than in the market game.

Proof or Proposition 5. It is readily verified that the market game has a perfect Bayesian equilibrium in which both firms offer the unfair good charging a price equal to $c^u + \varepsilon$. The following strategies constitute a perfect Bayesian equilibrium of the extended market game. In the coordination mechanism, a type-0 firm proposes offering the unfair good itself and the other firm offering the fair good. A type-φ proposes both firms offering the fair good. A type-φ firm only accepts proposals according to which both firms offer the fair good. Type-0 firms only accept proposals according to which they offer the unfair good. In case both proposals are rejected, a firm offers the unfair good in the first stage of the market game. In equilibrium, both firms offer equilibrium price are $c^u + \varepsilon$ [$c^f + \varepsilon$] for the unfair [fair] good. As a result, the fair good is produced in the extended market game if both firms are of type φ while it is never produced in the market game.

Appendix B: Instructions

Instructions Experiment 1 and 3

Welcome to the experiment!

The instructions are simple, and if you follow them carefully, you might be able to earn money for yourself and another participant in the lab. **Both what you and the other participant earn depends on the decisions you make and on the decisions of the others**. You will be **privately** paid at the end of the experiment.

Earnings in the experiment will be denoted by francs. For every 10 francs you earn for yourself in this experiment, you will receive 1 euro.

We ask that you do not communicate with other people during the experiment. Please refrain from verbally reacting to events that occur during the experiment. This is very important.

Raise your hand when you have a question and one of the experimenters will come to your desk.

Structure of the experiment

The experiment consists of two parts. **Part 2 will be explained after we have finished part 1**.

In part 1, you will be asked to make 10 decisions. In part 2, you will be asked to make decisions in 24 rounds. **Only one** of the 10 decisions in part 1 or **one** of the 24 rounds of part 2 will be randomly selected for payment at the completion of the experiment. Payment will be made to you in private.

Instructions Part 1

	Option A		Option B	
1	The other participant 80	You 125	The other participant 0	You 130
2	The other participant 80	You 120	The other participant 0	You 130
3	The other participant 80	You 115	The other participant 0	You 130
4	The other participant 80	You 110	The other participant 0	You 130
5	The other participant 80	You 105	The other participant 0	You 130
6	The other participant 80	You 100	The other participant 0	You 130
7	The other participant 80	You 95	The other participant 0	You 130
8	The other participant 80	You 90	The other participant 0	You 130
9	The other participant 80	You 85	The other participant 0	You 130
10	The other participant 80	You 80	The other participant 0	You 130

The options refer to payments to you and one of the other participants in this experiment. For each option, two amounts will be displayed: one amount that you will receive yourself, and one amount that another participant will receive. This other participant is one that we will randomly choose. This other participant will remain anonymous to you.

Recall that only one of the 10 decisions in this part or one of the 24 rounds of part 2 will be randomly selected for payment at the completion of the experiment. If one of the decisions in this part is selected, all participants will be randomly matched into pairs. In each pair, one participant will be randomly chosen, with a probability of 50%, to be the Proposer, and the other will be the Receiver.

If you are chosen to be the Proposer, you will receive the amount you decided to receive in that chosen decision and your paired Receiver will receive the amount you decide to give to "the other participant". Your paired Receiver's decisions in part 1 will have no influence at all.

Questions

To ensure that these instructions have been understood, we would like you to fill in the blanks into the following statements by indicating how many francs both yourself and the other would obtain if the following choices were made in the randomly selected rows:

1) If you choose option A in row 1:

You: The Other:

2) If you choose option B in row 4:

You: The Other:

Instructions Part 2

This part consists of 24 rounds. In every round, you will be asked to make decisions about the sale and purchase of goods in markets. Recall that only one of the 24 rounds of this part or one of the 10 decisions in the previous part will be selected randomly at the completion of the experiment for payment.

Markets

In every round, you will be a member of a group. This group consists of you and three other people. Two of you will play the role of sellers. A third group member is a buyer. The remaining group member is passive: He or she can neither sell nor buy. However, he/she can incur losses when the sellers and the buyer in his/her group trade.

The four group members will be randomly assigned to one of these roles at the beginning of the experiment. The group composition is unknown to you and to other participants. You will not know who is in your group. Others will not know whether you are in their group. In addition, we will make new groups in every round. Thus, the members of your group will change from round to round.

There are two possible goods that a seller can produce: a fair and an unfair good. When the buyer buys a fair product, the passive group member will obtain 70 francs. In contrast, the

passive group member will lose all of its 70 francs when the buyer buys an unfair product. If no good is traded, the passive group member obtains 70 francs.

From one round to the next, buyers and sellers sometimes switch roles. So, when in one round you are a seller, in the next, you may be a buyer. The role of the passive group member is fixed throughout the experiment. In other words, once you are assigned the role of passive group member in the first round of the experiment, you keep this role in all following rounds.

Sellers

In each round the two sellers have to make two choices. First they decide what kind of good they would like to sell: a fair or an unfair good. Then they choose a price at which they would like to sell their good to the buyer.

(Here text for Coordination treatment; see below)

Once both sellers have decided which good they would like to sell, they will be informed of the decision of the other seller in the market. Only then will the sellers choose the price at which they would like to sell their good. The price must be between 0 and 100 francs. At the end of each round the sellers will be able to observe the price chosen by the other seller and whether a transaction took place.

If a seller sells a good, he or she obtains the price he or she posted. If a seller sells the fair good to the buyer, the seller must pay a production cost of 15 francs. A seller has zero production costs when selling the unfair good, or when not selling anything.

In addition to payoffs achieved through transactions, the sellers will receive 70 francs in each round regardless of whether they make a transaction or not.

Buyers

The buyer may choose to buy only one good from one of the two sellers. The buyer may also decide not to purchase at all. Before making a choice, the buyer will be informed of the price of the two goods and whether the goods are fair or unfair. If a buyer purchases either good, he or she will receive a payoff of 80 francs minus the price he or she pays to the seller offering the good. A buyer will also receive an additional 70 francs regardless of whether they purchase a good or not.

Recall that when the buyer buys a fair product, the passive group member will obtain 70 francs. In contrast, the passive group member will lose all of his/her 70 francs when the buyer buys an unfair product. If no good is traded, the passive group member obtains 70 francs.

Questions

To ensure that these instructions have been understood we would like you to fill in the blanks into the following statements by indicating how many francs both yourself and the passive group member would obtain if the following choices were made in the randomly selected round.

1) Suppose you are a seller. You offer a fair good at the price 45 francs that is purchased by the buyer. The payoffs are:

You: The passive group member: Other Seller: Buyer:

2) Suppose you are a buyer. You buy an unfair good at the price of 5 francs. The payoffs are:

You: The passive group member: Seller you chose: Other seller:

Formulas that may help you to answer the questions:

Profits buyer when not buying the product: 70

Profits buyer when buying a product: 70 + (80 - price)

Seller when not selling the product: 70

Seller when selling the FAIR product: 70 + price - 15

Seller when selling the UNFAIR product: 70 + price

Money for the passive group member when a FAIR product is bought or no transaction: 70

Instructions Experiment 2

Welcome to the experiment!

The instructions are simple, and if you follow them carefully, you might be able to earn money for the purpose of environmental protection, as well as earn an amount of money for yourself. **Both what you earn and what you decide to leave as a donation to environmental protection depends on the decisions you make and on the decisions of the others.** You will be **privately** paid at the end of the experiment.

Earnings in the experiment will be denoted by francs. For every 10 francs you earned for yourself in this experiment, you will receive 1 euro. At the end of the experiment, we will donate the francs that were designated for environmental protection to CarbonFund.org. CarbonFund.org is an organization that allows individuals to offset their carbon footprint, which includes the emissions from their homes, cars, and air travel. In particular, for every 10 francs retained for CarbonFund.org, we will donate 1 euro to CarbonFund.org, which allows offsetting about 110 kg of CO2. In addition to this, all participants will receive a 7.50 euro show up fee for attending the experiment.

We ask that you do not communicate with other people during the experiment. Please refrain from verbally reacting to events that occur during the experiment. This is very important.

Raise your hand when you have a question and one of the experimenters will come to your desk.

Structure of the experiment

The experiment consists of two parts. **Part 2 will be explained after we have finished part 1**.

In part 1, you will be asked to make 10 decisions. In part 2, you will be asked to make decisions in 24 rounds. **Only one** of the 10 decisions in part 1 or **one** of the 24 rounds of part 2 will be randomly selected for payment at the completion of the experiment. Payment will be made to you in private. Contributions to CarbonFund.org will remain anonymous. At the end of the experiment, we will publicly donate the total amount raised in this experiment to CarbonFund.org. Other participants will not know what your personal donations were.

Instructions Part 1

Option A				Option B			
1	○	CarbonFund.org 80	You 125	1	○	CarbonFund.org 0	You 130
2	○	CarbonFund.org 80	You 120	2	○	CarbonFund.org 0	You 130
3	○	CarbonFund.org 80	You 115	3	○	CarbonFund.org 0	You 130
4	○	CarbonFund.org 80	You 110	4	○	CarbonFund.org 0	You 130
5	○	CarbonFund.org 80	You 105	5	○	CarbonFund.org 0	You 130
6	○	CarbonFund.org 80	You 100	6	○	CarbonFund.org 0	You 130
7	○	CarbonFund.org 80	You 95	7	○	CarbonFund.org 0	You 130
8	○	CarbonFund.org 80	You 90	8	○	CarbonFund.org 0	You 130
9	○	CarbonFund.org 80	You 85	9	○	CarbonFund.org 0	You 130
10	○	CarbonFund.org 80	You 80	10	○	CarbonFund.org 0	You 130

In this stage of the experiment you will be asked to make 10 choices from the table on your screen. You must choose between Option A and Option B in each of the 10 choices. These choices differ in the amount of francs that you apportion to yourself and the amount that you leave for CarbonFund.org. If one of the choices in this part is selected for payment at the end of the experiment, your show-up fee (7.5 euros) is added to the amount presented in the table.

Questions

To ensure that these instructions have been understood, we would like you to fill in the blanks into the following statements by indicating how many francs both both yourself and CarbonFund.org would obtain:

1) If you choose option A in row 1:

You: CarbonFund.org:

2) If you choose option B in row 4:

You: CarbonFund.org:

Instructions Part 2

This part consists of 24 rounds. In every round, you will be asked to make decisions about the sale and purchase of goods in markets. Recall that only one of the 24 rounds of this part or one of the 10 decisions in the previous part will be selected randomly at the completion of the experiment for payment.

Markets

In every round, you will be a member of a group. This group consists of you and two other people. Two of you will play the role of sellers. The remaining member is a buyer. The three group members will be randomly assigned to one of these roles at the beginning of each round. The group composition is unknown to you and to other participants. You will not know who is in your group. Others will not know whether you are in their group. In addition, we will make new groups in every round. Thus, the members of your group will change from round to round.

There are two possible goods that a seller can produce: a fair and an unfair good. When the buyer buys a fair product, CarbonFund.org will obtain 70 francs for carbon offset. In contrast, CarbonFund.org will lose all of its 70 francs when the buyer buys an unfair product. If no good is traded, CarbonFund.org obtains 70 francs.

Sellers

In each round the two sellers have to make two choices. First they decide what kind of good they would like to sell: a fair or an unfair good. Then they choose a price at which they would like to sell their good to the buyer.

(Here text for Coordination treatment; see below)

Once both sellers have decided which good they would like to sell, they will be informed of the decision of the other seller in the market. Only then will the sellers choose the price at which they would like to sell their good. The price must be between 0 and 100 francs. At the end of each round the sellers will be able to observe the price chosen by the other seller and whether a transaction took place.

If a seller sells a good, he or she obtains the price he or she posted. If a seller sells the fair good to the buyer, the seller must pay a production cost of 15 francs. A seller has zero production costs when selling the unfair good, or when not selling anything.

In addition to payoffs achieved through transactions, the sellers will receive 70 francs in each round regardless of whether they make a transaction or not.

Buyers

The buyer may choose to buy only one good from one of the two sellers. The buyer may also decide not to purchase at all. Before making a choice, the buyer will be informed of the price of the two goods and whether the goods are fair or unfair. If a buyer purchases either good, he or she will receive a payoff of 80 francs minus the price he or she pays to the seller offering the good. A buyer will also receive an additional 70 francs regardless of whether they purchase a good or not.

Recall that when the buyer buys a fair product, CarbonFund.org will obtain 70 francs for carbon offset. In contrast, CarbonFund.org will lose all of its 70 francs when the buyer buys an unfair product. If no good is traded, CarbonFund.org obtains 70 francs.

Questions

To ensure that these instructions have been understood we would like you to fill in the blanks into the following statements by indicating how many francs both yourself and the passive group member would obtain if the following choices were made in the randomly selected round.

1) Suppose you are a seller. You offer a fair good at the price 45 francs that is purchased by the buyer. The payoffs are:

You: CarbonFund.org: Other Seller: Buyer:

2) Suppose you are a buyer. You buy an unfair good at the price of 5 francs. The payoffs are:

You: CarbonFund.org: Seller you chose: Other seller:

Formulas that may help you to answer the questions:

Profits buyer when not buying the product: 70

Profits buyer when buying a product: 70 + (80 - price)

Seller when not selling the product: 70

Seller when selling the FAIR product: 70 + price - 15

Seller when selling the UNFAIR product: 70 + price

Money for CarbonFund.org when a FAIR product is bought or no transaction: 70

Additional text in Coordination treatment in Experiments 1 and 2:

The two sellers are allowed to make an agreement on which good they would like to produce. For this purpose, both sellers can make a proposal to the other seller. The table below presents the possible proposals that a seller can make:

		The other seller's product	
		Fair Good	**Unfair Good**
My product	**Fair Good**	Both produce fair goods	I produce the fair good, the other seller produces the unfair good
	Unfair Good	I produce the unfair good, the other seller produces the fair good	Both produce unfair goods

The computer randomly chooses one seller to make the first proposal. If the other seller rejects this proposal, the other seller can make a new proposal. Once a seller accepts the other seller's proposal, each offers the agreed upon product to the buyer.

If both sellers' proposals are rejected, both sellers will have to choose the product type and the price independently. If this is the case, they will only find out which good the other seller has chosen to sell after both sellers have made their choices regarding the product type. After both the sellers have made their choice of good the sellers have to choose a price at which to sell their good.

Additional text in Coordination treatment in Experiment 3:

The two sellers are allowed to make an agreement on both offering the fair good. For this purpose, **both sellers are asked whether they agree that both offer the fair good.** Both sellers must answer "yes" or "no". If both choose "yes", each offers the fair product to the buyer. If one or two sellers chooses "no", both sellers will choose the product type independently. In this case, they will only find out which good the other seller has chosen to sell after both sellers have made their choices regarding the product type.

After both the sellers have made their choice of good (with or without agreement), the sellers have to choose a price at which to sell their good.