The Causal Effect of Income Growth on Market Social Responsibility

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We investigate whether income growth causes an increased concern for mitigating negative externalities from consumption. We conduct laboratory market experiments in which firms and consumers can exchange products that differ in the degree to which they diminish negative external impacts at the expense of higher production costs. Our treatments exogenously vary consumers' income. The data indicate that growth in consumer income causes an increase in the share of socially responsible consumption. Such a causal relationship is important from a policy perspective, as it implies that some negative external impacts of consumption activity can be mitigated as societies experience economic growth.

JEL Classification: C92, D31, D62, M14

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1 Introduction

Negative externalities resulting from market activity, such as environmental damage and pollution, often create serious social problems. Public authorities may fail to correct for market failures, for instance, due to lobbying, regulatory capture or other limitations inherent to political processes. As a result, concerns for social responsibility among market actors present a potentially valuable complementary approach (Bénabou and Tirole, 2010). However, voluntarily mitigating externalities is costly, as the production costs and prices of products that mitigate negative external impacts are typically higher than those of comparable conventional products. Thus, understanding the factors that influence socially and environmentally responsible market behavior—and that can, therefore, be employed to increase such behavior—is important for policy and welfare.[1]

One potentially important factor in this regard is whether economic growth—and, as a consequence, increased income—leads individuals to have greater willingness to pay to avoid negative externalities from their consumption. If this is the case, one potential consequence of economic growth might be more responsible societies in which market actors voluntarily internalize their market impacts to a greater extent. If responsible consumption rises with income, then increases in household wealth in countries such as China and India may yield consumers more concerned with responsible consumption, potentially offsetting negative social and environmental externalities produced by market activity.

Consistent with this possibility, several scholars argue for a positive relationship between income and behavior that produces more positive societal impacts. Shleifer (2004) hypothesizes that as "societies grow richer, their willingness to pay for ethical behavior […] increases as well" (p. 418). Similarly, Bénabou and Tirole (2010) argue that "social responsibility is likely to be a normal good" (p. 1). However, we know of no empirical evidence supporting these conjectures by cleanly establishing such a causal, positive relationship between income and socially responsible market behavior. In this paper, we therefore test the hypothesis that increased income has a positive impact on concerns for mitigating external impacts, against the null hypothesis of no relationship.

Methodologically, we employ the control afforded by laboratory experiments to investigate this causal relationship. Ideally, one would be able to answer our motivating question using non-

[1] Laboratory studies on the determinants of socially responsible market behavior include Rode et al. (2008), Bartling et al. (2015, 2022), Kirchler et al. (2015), Pigors and Rockenbach (2016), Irlenbusch and Saxler (2019), Sutter et al., (2020), Danz et al. (2022), and Engelmann et al. (2022); Hainmueller et al. (2015) report the results of a field experiment. Dufwenberg, et al. (2011) provide a theoretical treatment of the impact of social preferences in markets.

laboratory data. However, this is challenging for many reasons that we can address in a laboratory environment. For example, in our experiment we exogenously manipulate income in the form of money available to consumers, while outside the laboratory income is related to many social and individual factors—including time-varying tastes, improvements in education and changes in technology and regulations—that may influence the degree to which individuals or societies limit the negative external impacts of their market activity.[2] In addition, outside the laboratory it is difficult to identify goods that differ in the degree to which they yield negative external impacts while controlling for real or perceived quality, social status and other important factors potentially driving consumption behavior. Our laboratory environment allows us to compare the market shares of two products that are identical in every aspect, except for their negative external impacts and their production costs. Of course, laboratory results naturally raise concerns about external validity. But the challenges with alternative feasible approaches highlight the, at least complementary, value of producing clean experimental evidence from laboratory markets on the causal relationship between income and consumer social responsibility.

We report two laboratory studies that investigate the extent to which an increase in consumer income leads to an increase in the market share of products that mitigate negative external impacts. In our first study, subjects play one of three roles: consumers, sellers or third parties. Sellers set prices and select the degree of negative externalities produced by their products, with products that mitigate a larger degree of the negative externality costing more to produce. Products differ only in the externality they produce and in their prices, with more responsible products being more expensive but having identical material value for consumers. Consumers observe product offers and select one from the available options. Any resulting negative externality from a consumer's purchase decision affects the passive third parties. This reflects, for example, situations in which the types of products consumed by individuals in middle- to high-income countries result in pollution and environmental degradation mainly impacting lower-income countries, but where there exist costlier alternatives that mitigate such external impacts.[3] Our

[2] Indeed, such interactions may underlie the non-linear relationship between per-capita income and environmental impacts, referred to as the "Environmental Kuznets Curve" (Grossman and Krueger, 1995; Andreoni and Levinson 2001; Harbaugh et al. 2002; Israel and Levinson 2014), though the robustness of such a non-linear impact is itself not uncontroversial due to the challenges of empirically establishing such a relationship (Stern, 2004).

[3] Concrete examples include palm oil, whose production and widespread use threatens rainforests but where costlier synthetic alternatives exist (Saragosa, 2020), and environmental damage associated with low-cost disposal of limited-use products (Yeung, 2019).

design focuses primarily on consumers, providing them with greater market power and thereby reflecting their potential role as drivers of firms' willingness to offer more socially responsible products (as demonstrated by Aghion, et al., 2022, who study the effects of consumers' environmental concerns on firm' decisions to invest in "clean" technologies). Our primary measure of concern for external impacts is the degree to which consumers' product purchases mitigate the potential losses imposed on third parties. Using this design, we study the impact of exogenously increasing consumers' incomes on socially responsible market outcomes.

We find that increasing incomes lead to market outcomes reflecting higher levels of concern for social impact, demonstrated by a greater share of products purchased that are more costly but mitigate negative externalities. This effect is small for moderate income increases and only large in magnitude and statistically significant when the income increases are substantial—e.g., corresponding in relative size, roughly, to the increase in GDP per capita in China between 2006 and 2017.[4] Our main finding thus indicates that some negative external impacts of consumption activity can be mitigated as societies experience economic growth.

Moreover, our first study investigates two other aspects of income growth and its impact on concern for external impacts. First, we study how the distribution of income affects the relationship between income growth and responsible consumption. Economic growth often leads to income gains that are concentrated in small subsets of a country's population (see, e.g., Alvaredo et al. 2013). We explore this issue with two treatments that hold constant the aggregate total increase in income but vary whether this increase is equally distributed among all consumers in a market or concentrated on a small subset of consumers. Second, we investigate whether relative income comparisons matter, beyond absolute levels of income. Across treatments, we observe consumers who end up with the same levels of income but are either in markets where all other consumers experience similar income increases or in markets where some other consumers have income shocks that are either larger or smaller. We find that concern for external impact does not respond either to income inequality or to how much others' income changes—only absolute income changes appear to influence the willingness to pay to mitigate negative externalities.

[4] Depending on the treatment, we either double or quadruple income, which roughly corresponds, respectively, to the relative changes in GDP per capita in China between 2009 ($3,838, 2018 USD) and 2017 ($8,827) and 2006 ($2,099) and 2017. Data from the World Bank: https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?locations=CN.

Our second experimental study investigates the robustness of our main finding that income growth causes an increase in concerns for external impact. Study 2 replicates the design of our first study but changes two features. First, we vary the nature of the externality: it is no longer imposed on subjects in the role of a third party but instead on a charity fighting climate change, deforestation and poverty. Second, in an additional condition we increase not only the earnings of consumers but also the earnings of firms. These design features address the potential concern that our earlier results are driven by inequality aversion among laboratory subjects, which would question the external validity of the findings. Our second study replicates our main finding that increasing consumers' incomes increases the degree to which purchased products mitigate negative externalities, both for the case where only consumers' incomes are increased and for the case where all market actors' incomes are increased.

Existing correlational evidence supports the idea that pro-social or, more generally, moral behavior is higher among individuals with greater income. This is evident, for instance, in studies that investigate the relationship between income and charitable giving, which regularly observe that wealthier individuals donate more in absolute terms, though the question of whether they give more in relative terms remains inconclusive. For example, Andreoni (2006) finds that total charitable giving increased between 1962 and 2002 as incomes increased but giving as a share of income remained fairly stable (see also, Vesterlund 2006, Andreoni and Payne 2013). However, it is hard to rule out that other factors, such as differential tax treatment of large and small donations, may be at least partly responsible for these relationships. A recent study by Andreoni et al. (2021) identifies 180 high-SES and 180 low-SES households and sends them letters, containing either 5 Euros or 20 Euros, intended for another recipient. The results reveal that twice as many rich households (81 percent) return the envelopes as poor households (38 percent) and the result is generally robust to controlling for several household characteristics. This suggests that rich households are at least as concerned with returning money to which they are not entitled. However, a household's status as either high- or low-SES is not exogenous and other unobserved covarying factors may influence the differential concern in returning the envelopes between the two groups.

Other, also largely correlational, evidence suggesting a negative relationship between wealth and morality is provided by social psychologists. Specifically, in a series of studies, Piff et al. (2010, 2012) examine whether upper-class individuals are more likely to exhibit unethical behavior (e.g., breaking the law, lying to get ahead, cheating in games). Somewhat contrary to the

studies summarized above, their findings indicate that having more money makes people care less about others and feel more entitled to put their own interests first. However, their studies mainly rely on correlational analysis between self-reported social class and behavior, meaning that individuals with high and low social class may differ in other dimensions than income (such as level of education and occupational status). The two exceptions are studies that prime perceptions of relative social status, by asking people to engage in comparisons with others of high or low SES. In addition, many of the outcome measures involve hypothetical choices.

Relevant evidence also comes from laboratory experiments on the impact of income in dictator games. Several studies conduct dictator games with varying stake sizes (e.g., Forsythe, et al. 1994, Cherry et al. 2002, Carpenter et al. 2005). Engel (2011) provides a meta-analysis and finds that absolute amounts shared by dictators increase substantially when stake sizes increase—a 100-percent increase in a dictator's endowment produces an increase slightly below 100 percent in the amount transferred. Thus, pro-sociality, as measured by the absolute size of transfers, increases proportionally with income. However, dictator games possess a clear norm to share 50 percent of the endowment (e.g., Andreoni and Bernheim 2009, Krupka and Weber 2013), which limits generalization to contexts where a strong 50/50 norm is not applicable, including product purchases by consumers. In addition, prior evidence (e.g., Bartling et al. 2015) suggests that the degree of social concern can differ between dictator games and market contexts.

None of the above studies implements exogenous variation in income to study its impact on concern for social impact in a market context. Most closely related to our study is a working paper by Friedrichsen (2017), which experimentally investigates whether social responsibility is a normal good. The paper studies laboratory markets with one consumer, two firms and one worker. The firms set wages for the worker and the consumer decides how much to purchase from each firm. Consumers were randomized to have either a low or high income. Social responsibility is defined as a consumer buying a larger quantity from a firm that sets a strictly higher price but also pays a strictly higher wage than from a low-wage, low-price competitor. In total, 13.8 percent of consumer choices indicate a preference for the socially responsible product. Interestingly, the paper finds that richer consumers are *less* likely to favor the socially responsible product (10.2%) than are poor consumers (17.7%). A few design features, however, suggest the need for further investigation. First, the numbers of poor (18) and rich (19) consumers in the study are relatively low. Second, average payoffs for workers are higher than average payoffs for firms. Hence, a

socially responsible consumer concerned with equality may prefer to help firms at the expense of workers by buying more from the low-cost, low-wage firm.

The paper proceeds as follows. The next section provides a detailed description of the design of our experimental market environment and the corresponding manipulation of income by treatment, along with the results of both consumer and firm behavior. Section 3 describes Study 2, which provides a robustness check for our main finding. Section 4 concludes.

2 Study 1

2.1 Experimental Design

In our experimental market, participants in the roles of "firms" and "consumers" can exchange products that differ in their external impact, with products that impose a smaller negative externality also costing more to produce. The experiment comprises 30 periods, with the first 10 periods ("Part I") corresponding to a baseline design that is identical across all treatments. To study the effect of an exogenous increase in income on socially responsible market behavior, our treatments introduce varying positive shocks to consumers' incomes in periods 11-30 ("Part II").

2.1.1 Baseline Market Game

Each experimental market comprises 18 participants: six firms, six consumers and six passive third parties. The participants' roles in a market are fixed across all 30 periods of the experiment. In the initial 10 periods every firm, consumer and third party receives an income of 100 points. Firms and consumers can earn additional points by trading products, with products of varying types having different production costs and varying impacts on third parties.

At the beginning of a market period, every firm selects a product type and a price. A product's type corresponds to the total loss it imposes on third parties when purchased, which is between 0 and 60, and a corresponding production cost. The total loss is divided equally and imposed on each of the six third parties. Table 1 provides an overview of the 11 possible product types that a firm can offer, the associated combined and individual losses for third parties and the respective production costs. A natural feature of our design is that products that impose a smaller externality on third parties also cost more to produce. Specifically, a decrease in the combined loss to third parties of six—and, therefore, a decrease of one for the loss imposed on each third party—increases the production cost by one. Our experimental design thus captures situations where it

would be efficient to avoid the external harm as the marginal cost of producing more responsibly falls short of the marginal reduction of the external harm. This corresponds to situations, for example, in which a low-cost product available to consumers in high-income countries produces pollution that primarily impacts individuals in other parts of the world, and where a production technology that can mitigate the externality is socially efficient but privately costly, meaning that consumers and firms bear the marginal cost of more responsible production.

Table 1: Product types, losses for third parties, and production costs

	Product types										
Combined loss	0	6	12	18	24	30	36	42	48	54	60
Individual loss	0	1	2	3	4	5	6	7	8	9	10
Production cost	30	29	28	27	26	25	24	23	22	21	20

At the same time as they select product types, firms also determine prices for their product offers.[5] Products are worth 70 to consumers, independently of the degree of externality they impose; the ability to hold constant the characteristics of a product, other than its social impact, is a valuable element of the control afforded by a laboratory environment. Firms are required to set prices between the production cost of the selected product type and the value of the product.

Firm's offers are conveyed to consumers in a posted-offer market. After firms make their decisions, consumers see the prices and types of the six products offered in that period. Offers are displayed in a random order. Each consumer can buy one product but can also decide not to buy any product. A decision not to buy a product yields no profits for either the consumer or any firm, but also means no losses for third parties. There is no capacity constraint on the supply side; that is, each firm can serve the entire market and sell up to six units of the offered product. Firms do not have to build up an inventory ex ante in order to meet the demand. The production process is thus akin to "production on demand" and firms' profits are given by the difference between the price and the production cost for each unit sold.[6] We implemented this production process to focus

[5] The interfaces for firms and consumers are provided in Appendix A.
[6] Since our design captures "production on demand," it cannot be distinguished whether it is the production that causes the externality or whether it is the consumption of the product.

on how consumers' preferences—and the response of such preferences to income—potentially drive the types of products available and purchased in the market (Aghion, et al., 2022).

The third parties are passive participants and do not make any decisions. However, their payoffs in a period are impacted by the types of products exchanged in the market. Specifically, each third party experiences a loss between 0 (whenever all consumers either only buy products that produce no loss or do not buy products at all) and 60 (whenever all consumers buy products that produce the maximum possible loss).[7]

Players' final payoffs, in points, in a given period are thus as follows:

$$\pi_{Consumer} = 100 + (70 - price) \cdot quantity\ purchased,$$

$$\pi_{Firm} = 100 + (price - cost) \cdot quantity\ sold,$$

$$\pi_{Third\ Party} = 100 - sum\ of\ losses\ from\ products\ exchanged,$$

where the quantity purchased by a consumer is either 0 or 1, the quantity sold for a firm can be any integer from 0 to 6 and the sum of losses for a third party ranges from 0 to 60. At the end of every period, players observe their own payoff. In addition, firms observe the offers made by all firms, how many products they sold, their payments and the impact of the products they sold on third parties. Consumers observe the effect of their purchasing decision on the payments of the six third parties.[8] Individual subjects are not identified to one another—i.e., there are no identification numbers associated with feedback—and therefore cannot track each other's actions across periods.

This baseline design is similar to the one in Bartling et al. (2015), but there are several important differences that are intended to mimic more natural consumer product market contexts. First, rather than a binary product type, our design allows for varying degrees of social impact, with the production costs proportional to the degree of externality mitigation. Second, rather than having a product externality that has a large impact on only one third party, each product has a smaller impact on a larger number of individuals (see Bartling et al., 2019, for a comparison of these two types of external impacts). Finally, we introduce much harsher competition on the supply side, by allowing each firm unlimited production capacity.

[7] Our design shares features with three-person ultimatum games, where a proposer makes a three-way offer that can be accepted by a responder but that also determines the payoff of a third, passive player (see, e.g., Güth and van Damme 1998, Bereby-Meyer and Niederle 2005).

[8] The screenshots of the feedback provided to participants are in Appendix B.

2.1.2 Treatments

Consumers' initial per-period income is 100 in the first 10 periods in all our treatments. To study the causal effect of increased consumer income on socially responsible market behavior, our design exogenously varies the size of consumers' initial per-period income in the remaining 20 periods. We implement this design—rather than one in which consumers have varying income levels from the outset—for two reasons. First, providing consumers across treatments with the same initial per-period income in Part I gives us a baseline measure of social responsibility. Second, increasing income in Part II relative to Part I implements differences in income *growth*, which more directly relates to our research question of whether we can expect an increase in concerns for external market impacts as societies become richer. Hence, much of our analysis will consist of difference-in-difference estimates of the responses of consumers in the treatment conditions who receive positive income shocks, relative to the comparable behavior in a *Baseline* control that retains the same per-period income of 100 in Part II, as in Part I.

Our three remaining treatments implement positive income shocks for consumers in all periods of Part II. At the end of Part I subjects receive new instructions that explain the change in initial income for consumers and that, otherwise, all procedures remain the same. For comparability, subjects also receive new instructions in the Baseline.

Table 2 provides an overview of our treatments. In a *Medium* condition, consumers each receive 200 in income at the start of a period throughout Part II, while in a *High* condition they each receive 400.[9] Finally, in an *Unequal* condition two consumers in each market receive 400, while the remaining four consumers continue to each receive 100. This implements an average increase of 200, as in *Medium*, but with gains concentrated on a small subset of consumers.

By comparing, in Part II, the types of products purchased in all three conditions receiving a positive income shock with the *Baseline*, we can test whether concern for external impact is a normal good. Furthermore, a comparison of *Unequal* and *Medium* allows us to study whether the distribution of income influences market behavior, when holding aggregate income fixed. Finally, we can also compare the behavior of consumers in *Unequal*, who receive income of either 100 or 400, to the behavior of consumers in the *Baseline* and *High* who have the same per-period income level. Note that consumers earning 100 and 400 in the *Unequal* condition receive the same absolute

[9] Recall from footnote 4 that these increases roughly correspond to the relative changes in GDP per capita in China between 2009 and 2017 (doubling) and 2006 and 2017 (quadrupling).

income as consumers in the *Baseline* and *High* conditions, respectively, but they differ in their income relative to other consumers in their market.

Table 2: Treatment overview

Treatment	Consumers' per-period income		Number of markets (participants)	Number of consumers in a market (total number of consumers) with a given initial income in Part II
	Part I (periods 1 to 10)	Part II (periods 11 to 30)		
Baseline	100	100	10 (180)	6 (60)
Medium	100	200	10 (180)	6 (60)
High	100	400	6 (108)	6 (36)
Unequal	100	100	16 (288)	4 (64)
	100	400		2 (32)

2.1.3 Procedural Details

As shown in Table 2, we conducted 10 markets in the *Baseline*, 10 markets in the *Medium* condition, 6 markets in the *High* condition and 16 markets in the *Unequal* condition. Our objective was to obtain 60 consumers in each treatment, but the substantial cost of the *High* condition limited the number of sessions we conducted.[10] We implemented a between-subjects design. In total, 756 subjects participated in Study 1, in 42 independent markets.

Before entering the lab, each subject randomly drew a card specifying at which computer terminal to sit and determining the subject's role. Subjects received written instructions, including comprehension questions that had to be answered correctly before the market began. An audio file with a summary of the instructions was played aloud to establish common information about actions, payoffs and procedures. Subjects initially learned only the details of Part I but were informed that Part II would follow and would consist of the same kind of market activity. Subjects received information about the details of Part II only after the conclusion of Part I. All our treatments are thus identical in Part I. The instructions used an explicit market context, describing the two different types of market participants as "firms" and "consumers" and referring to their

[10] To determine the power of our design to detect a significant difference at the 5% level, we used the effect size in Forsythe et al. (1994), who increase stakes from \$5 to \$10 in a dictator game. The power analysis indicates that the probability of detecting a two-sided effect between any two treatments in a Wilcoxon rank-sum test is about 90% if we use consumers as unit of observation and have a minimum of 32 observations per treatment.

actions as "trading" different "types of products" at offered "prices." The third parties were simply described as "Players C." We told the subjects in neutral language that a type of product "refers to the individual loss that a product imposes on each Participant C." At the conclusion of Part I, subjects received new instructions stating that the market procedures would be the same in Part II and specifying each type of participant's income, noting any relevant changes. The original English instructions for all treatments are in Appendix E.

At the end of the experiment, one period was selected at random to count for payment. Payoffs from the experiment, denominated in points, were converted to Swiss francs at the rate of 3 points per CHF 1 (Swiss francs and US Dollars were roughly at parity at the time of the study). On average, subjects earned about CHF 61, which includes a show-up fee of CHF 15.

We conducted the experiments using the software z-Tree (Fischbacher 2007) and recruited subjects using the software h-Root (Bock et al. 2014). Subjects were mainly students from the University of Zurich and the Swiss Federal Institute of Technology in Zurich. All sessions took place at the computer laboratory of the Department of Economics at the University of Zurich. Sessions lasted about two hours.

2.2 Results

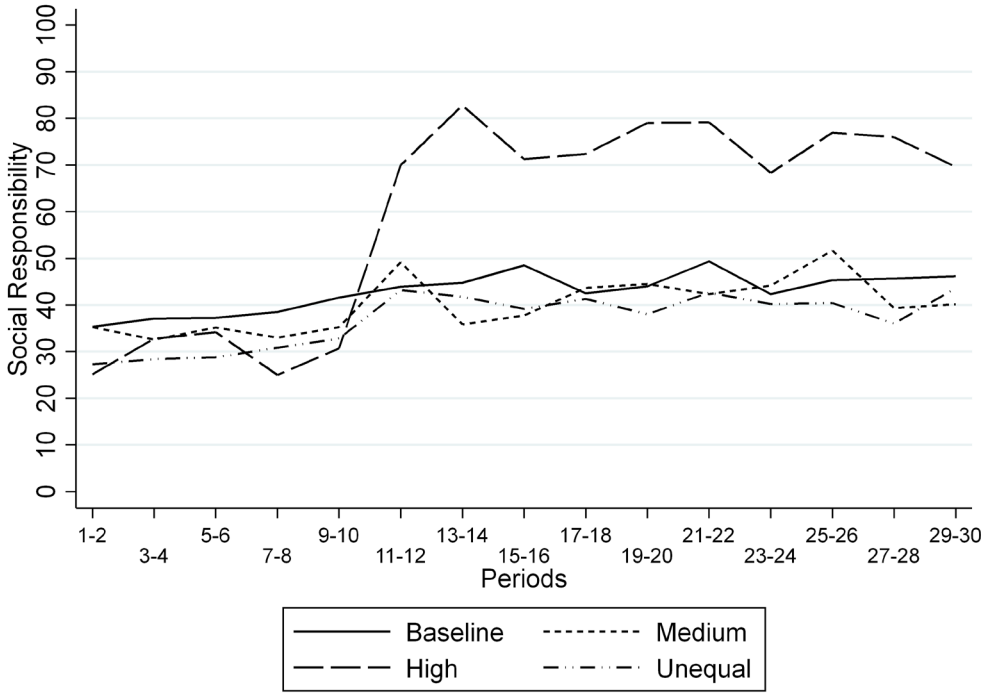
We define our measure of externality mitigation, or *social responsibility*, as the percentage of the total potential loss that is mitigated in the market. If all consumers buy the product type that produces the greatest negative externality—i.e., that imposes a loss of 60 on third parties—they are not mitigating any loss and this measure is 0. If, to the contrary, all consumers mitigate the entire externality—either by buying only the most responsible product type or by not buying any product at all—then the measure takes a value of 100.[11]

Figure 1 shows the time paths of this measure of social responsibility in all four treatments. To smooth variation, we pool the data into two-period blocks. A first observation is that, in Part I, our measure of social responsibility is very similar in all treatments, at a level of approximately 33 percent.[12]

[11] Cases in which consumers did not buy a product are very infrequent, ranging between 0.5 percent in *High* and 1.9 percent in *Baseline*. The market outcomes are thus almost entirely determined by consumers' purchases of different types of products and not by consumers refraining from buying at all.

[12] Table C.1 in Appendix C provides the average measure of social responsibility for each treatment and in each part. Table C.2 shows that none of the pairwise treatment comparisons for Part I is statistically significant in two-sided Wilcoxon rank-sum tests, neither at the consumer nor at the market level.

Figure 1: Average social responsibility across treatments



2.2.1 Income Growth and Externality Mitigation

Our primary focus is on the impact of increasing consumers' incomes in Part II on social responsibility. We first focus on comparisons between the *Baseline*, *Medium* and *High* conditions.

Figure 1 reveals that social responsibility increases slightly in the *Baseline* in Part II. Importantly, Figure 1 also reveals that social responsibility does not increase to a larger degree in Part II in *Medium*. Indeed, *Baseline* and *Medium* are not statistically significantly different in Part II (two-sided Wilcoxon rank-sum tests at the consumer (market) level, p=0.83 (0.65)). However, social responsibility increases substantially in Part II in *High*. The difference between *Baseline* and *High* is statistically significant in Part II (two-sided Wilcoxon rank-sum test, at the consumer (market) level, p=0.00 (0.04)), as is the difference between *Medium* and *High* (p=0.00 (0.01)).

Model (1) in Table 3 presents a linear regression complementing these observations, using a consumer's purchasing decision in a period as the unit of observation. The dependent variable is our measure of social responsibility (percent loss mitigated). Since these outcomes are determined jointly by the behavior of consumers and firms, one can interpret this as the degree to which a given market outcome produced by their combined choices reflects a concern for mitigating external impacts. We employ a standard differences-in-differences approach to examine treatment effects in Part II conditional on behavior in Part I. We include binary treatment variables, *Medium*,

High and *Unequal* (taking on value 1 in the respective treatments and 0 otherwise), a binary variable *Part II* (taking on value 1 for data from periods 11 to 30 and 0 otherwise), and interactions of the treatment variables with *Part II*. *Baseline* and *Part I* serve as omitted categories.

The positive coefficient for *Part II x Medium* indicates a slightly increased concern for external impact when consumers' income increases from 100 to 200, but the impact is small and not statistically significant. However, the coefficient for *Part II x High* is positive, much larger in magnitude and significant at the one percent level. This reveals a large impact on externality mitigation when income increases substantially.[13]

2.2.2 Relative Income and Externality Mitigation

We next study the *Unequal* condition, to investigate whether income inequality affects the relationship between income and social responsibility. Figure 1 shows that, on aggregate, the degree of socially responsible consumption in *Unequal* is very similar to that in the *Medium* condition, both of which have similarly small aggregate income increases. Indeed, the measures of social responsibility in *Unequal* and *Medium* are not significantly different in Part II (two-sided Wilcoxon rank-sum test, at the consumer (market) level, p=0.58 (0.71)). This is also reflected in the coefficient estimate for *Part II x Unequal* in model (1) in Table 3, which shows a small positive, but statistically insignificant, estimate similar in magnitude to that of the *Medium* condition.[14]

While the aggregate response to a positive income shock is small in the *Unequal* condition, we observe larger effects when we consider only those consumers whose income increased. Figure 2 shows that consumers whose initial per-period income increases from 100 in Part I to 400 in Part II in *Unequal* demonstrate considerably higher levels of social responsibility, while those consumers whose income remains at 100 demonstrate little change in their behavior. Using the difference in each market between the average social responsibility of products purchased by consumers whose income remains at 100 and consumers whose income increased, a sign test rejects the null hypothesis that both types of consumers demonstrate the same level of social responsibility in *Unequal* (two-sided test using a market as the unit of analysis, p = 0.02).

[13] We observe this increase in socially responsible consumption despite the fact that higher production costs of more responsible products translate into higher market prices. On average, the least responsible product, which costs 20 to produce, traded at a price of 22.5, while the most responsible product, costing 30 to produce, traded at a price of 37.6. We discuss the menu of product offers and prices in more detail in Section 2.2.4.

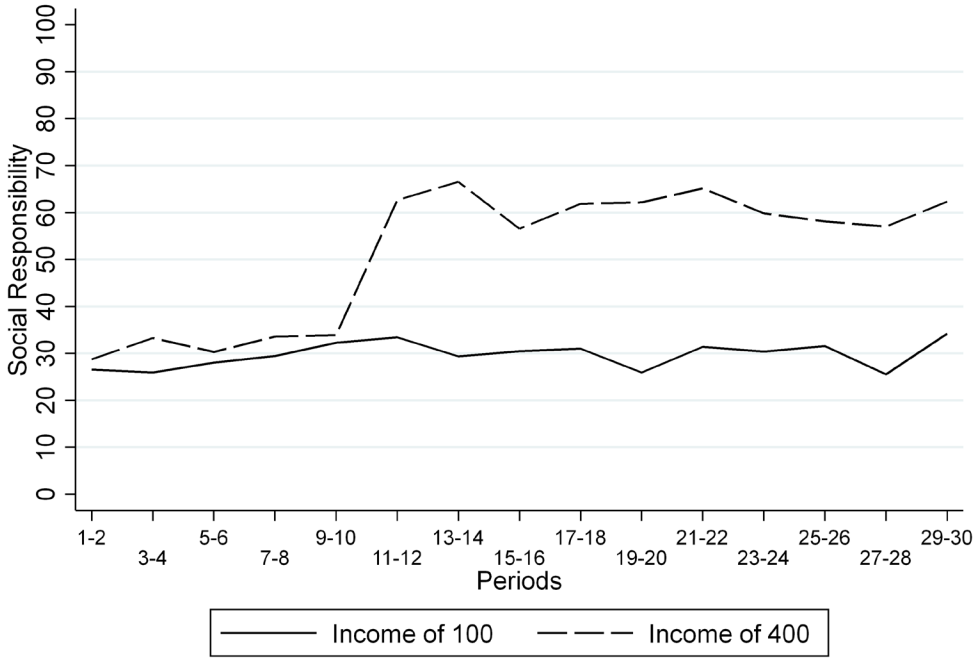
[14] A post-estimation test of equality of the coefficients for *Part II x Unequal* and *Part II x Medium* in model (1) fails to reject equality (p=0.69).

Table 3: Linear regressions of social responsibility measure

	(1) All subjects	(2) *Unequal*	(3) Income of 100 (*Unequal* and *Baseline)*	(4) Income of 400 (*Unequal* and *High)*
Medium	-3.700			
	(0.703)			
High	-8.394			
	(0.552)			
Unequal	-8.325		-9.497	2.413
	(0.380)		(0.309)	(0.865)
Part II	7.300	1.883	7.300	44.986**
	(0.110)	(0.380)	(0.107)	(0.017)
Part II x Medium	1.308			
	(0.849)			
Part II x High	37.686***			
	(0.000)			
Part II x Unequal	3.710		-5.417	-15.720
	(0.483)		(0.248)	(0.141)
Income of 400		3.516		
		(0.627)		
Part II x Income of 400		27.383***		
		(0.000)		
Constant	37.950***	28.453***	37.950***	29.556***
	(0.000)	(0.000)	(0.001)	(0.006)
Observations	7,560	2,880	3,720	2,040
Number of subjects	252	96	124	68

Notes: The dependent variable in all models is our measure of social responsibility (percent loss mitigated). Model (1) considers all treatments. Model (2) considers only observations from the *Unequal* condition. Model (3) considers only observations from consumers who receive an income of 100 in Part II (*Unequal* and *Baseline*). Model (4) considers only observations from consumers who receive an income of 400 in Part II (*Unequal* and *High*). *Medium*, *High* and *Unequal* are binary variables taking on value 1 in the respective treatments and 0 otherwise. *Part II* is a binary variable taking on value 1 for data from periods 11 to 30 and 0 otherwise. *Income of 400* is a binary variable taking on value 1 in case a consumer receives an income of 400 in Part II and 0 otherwise. P-values from standard errors clustered at the market level, estimated using the wild bootstrap (derived from running 10,000 replications in each case) are in parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%.

Figure 2: Average social responsibility in treatment *Unequal* by income



The regression analysis reported in model (2) in Table 3 addresses the same comparison. The regression includes only observations from the *Unequal* condition to study how social responsibility is affected by the income shock experienced by two out of the six consumers in each market. *Income of 400* is a binary variable taking on value 1 in case a consumer is to receive an initial per-period income of 400 in Part II and 0 otherwise. We find that the coefficient for *Part II x Income of 400* is positive and statistically significant, again indicating that consumers whose initial income increases from 100 to 400 exhibit a substantially higher level of socially responsible behavior than consumers whose initial income stays constant at 100. This finding supports our earlier analysis comparing the *Baseline* and *High* conditions, finding that a substantial income increase (from 100 to 400) fosters increased socially responsible market behavior. However, in the case where there are only two consumers with the large income increase, the effect of their increased social responsibility is not sufficient to produce a large impact on aggregate outcomes.

The *Unequal* condition also allows us to investigate how relative income comparisons influence socially responsible market behavior. First, recall that the behavior of consumers who receive 100 in Part II in the *Baseline*, where all consumers receive 100, changes little from their behavior in Part I (see Figure 1 and model (1) in Table 3). Our design allows us to compare the behavior of these consumers to the behavior of subjects who receive 100 in the *Unequal* condition,

where some other consumers receive 400. Even though both sets of consumers experience no income changes, the latter may react to the presence of income changes among others in their market. However, Figure 2 reveals that the behavior of these consumers changes very little from Part I to Part II. The difference between *Baseline* and *Unequal* in Part II for the consumers who receive 100 is only marginally statistically significant at the consumer level but not at the market level (two-sided Wilcoxon rank-sum test, at the consumer (market) level, p=0.051 (0.13)). A similar result obtains in model (3) of Table 3, which uses only observations from subjects who received incomes of 100 in Part II in the *Baseline* and *Unequal* conditions. The interaction term *Part II x Unequal* is small, negative and statistically insignificant.

Second, we can also compare socially responsible behavior in Part II by consumers who receive 400 in the *High* condition, where all consumers receive similar income shocks, to the behavior of the subset of consumers who receive 400 in the *Unequal* condition. The difference between *Unequal* and *High* in Part II for the consumers who receive 400 is not statistically significant (two-sided Wilcoxon rank-sum test, at the consumer (market) level, p=0.15 (0.13)). Model (4) in Table 3 considers only observations from these two classes of subjects. The interaction term *Part II x Unequal* is negative and sizable in magnitude, but it is not statistically significantly different from zero. Based on these results, we conclude that relative income comparisons do not appear to have large and robust effects on consumers' social responsibility.

2.2.3 Aggregate Income Effects

Returning to our main question of whether social responsibility is a normal good, we can also estimate the aggregate effects of income levels on socially responsible consumption. Table 4 presents results from regressions of our measure of social responsibility on a consumer's income in a period, using data from all treatments. The identification of income effects in this regression comes from the variation between subjects and across time in the size of the per-period income. All models use our measure of social responsibility as the dependent variable and the level of income as an explanatory variable, revealing a positive and statistically significant relationship whether or not we control for a time trend. The positive and statistically significant coefficients for *Income* are consistent with the interpretation that socially responsible consumption increases

with higher consumer income. The null hypothesis that income does not affect socially responsible market behavior is thus strongly rejected by our data.[15]

Table 4: OLS regression of social responsibility

	(1)	(2)	(3)
Income	0.109***	0.105***	0.130***
	(0.000)	(0.000)	(0.000)
Period		0.159	0.329
		(0.273)	(0.197)
Income x Period			-0.001
			(0.178)
Constant	23.732***	22.001***	18.931***
	(0.000)	(0.000)	(0.000)
Observations	7,560	7,560	7,560
Number of subjects	252	252	252

Notes. The dependent variable in models (1), (2) and (3) is our measure of social responsibility (percent loss mitigated). *Income* represents subjects' per-period income (100, 200 or 400). Model (2) includes the variable *Period*, taking on integer values between 1 and 30. Model (3) also includes the interaction of *Income* with *Period*. P-values from standard errors clustered at the market level, estimated using the wild bootstrap (derived from running 10,000 replications in each case) are in parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%.

2.2.4 Firm Behavior

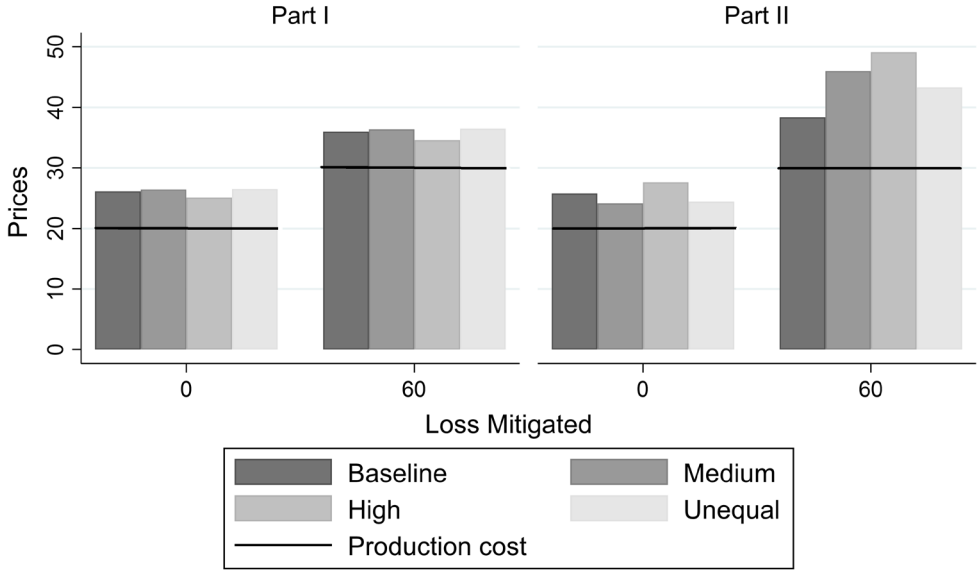
The above analysis revealed a causal impact of an exogenous increase in consumer income on the degree to which consumers purchase products that mitigate negative externalities. This suggests that socially responsible consumption is a normal good for consumers. While the focus of our design is on consumer preferences and how they drive changing market outcomes in response to income increases, consumers can only choose from the products offered by firms, meaning that it is also important to consider firms' behavior as a potential driver of the increase in socially responsible consumption. For example, it could be the case that firms, in response to the increase in consumer income, offered only products that impose a small negative externality. This would leave consumers with little choice, meaning that such firm responses to higher consumer income

[15] We refrain from making quantitative interpretations of the effect size and focus on the qualitative result for two reasons. First, the strength of laboratory experiments lies in the identification of qualitative effects, not on effect sizes (see, e.g., Kessler and Vesterlund 2015). Second, interpreting the size of the coefficient on *Income* depends on the linearity assumption in the simple regression model that we employ. Our results from Section 2.2.1, however, suggest that the effect of income on responsible market behavior in our study might not be linear.

might drive the increase in socially responsible market outcomes. It could also be the case that responsible products become relatively cheaper (e.g., due to increased competition among firms now all offering responsible products), and such a change in relative prices, rather than consumer preferences, could drive the observed change in market outcomes. To study these possibilities, we analyze relative prices and the menu of product offers.

We look at prices first. Figure 3 shows the average prices at which firms offered the most and the least responsible type of product in Parts I and II, separately for each treatment (as we show below in Figure 4, these two product types comprise the majority of firms' product offers).[16] The horizontal black lines indicate the production cost, which is 20 for the least responsible product type and 30 for the most responsible product type. The figure reveals that the mark-up on top of the cost of production is very similar in all treatments, between 5 and 10, except for the most responsible product type, where firms ask for higher markups in Part II of *Medium*, *Unequal*, and *High*. Importantly, the markup for the most responsible product type is highest in *High* in Part II, where we observe, nevertheless, the most responsible market outcome. This suggests that our earlier observation that consumers purchase more socially responsible products in Part II of *High* in Part II is not driven by firms making these products relatively less expensive.

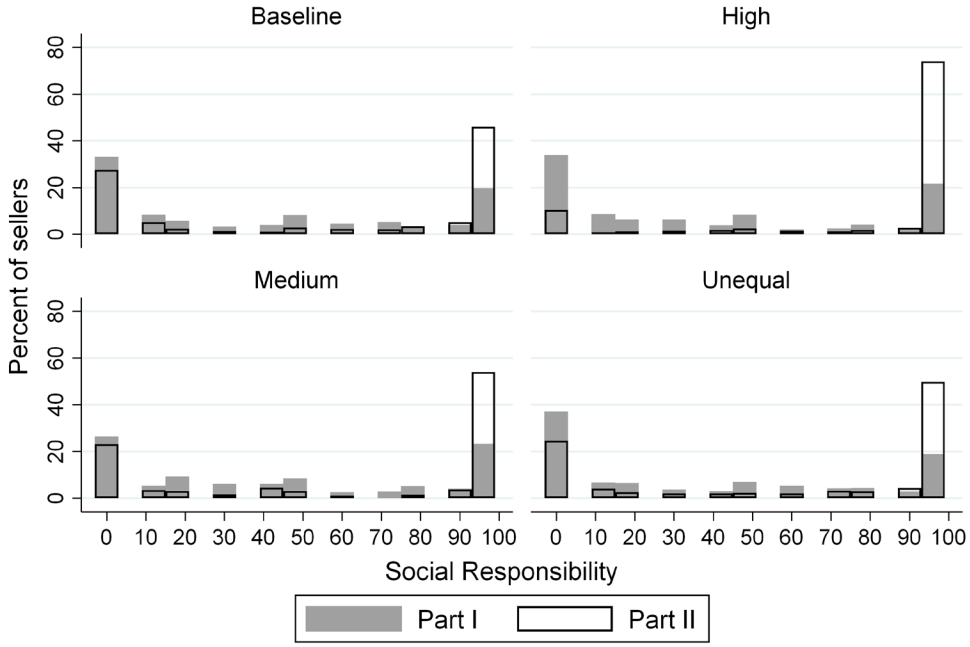
Figure 3: Average Prices of Most and Least Responsible Product Types by Treatment



[16] We provide additional graphs, complementary to Figure 3, including all types of products in Appendix Figure C.1.

Second, we consider the types of products available to consumers. Figure 4 shows the distribution of the types of products offered by firms in Parts I and II. We highlight two observations. First, the distribution of product types offered is highly bimodal, with the least responsible (leftmost bars) and most responsible products (rightmost bars) offered most frequently. These two product types make up over 50 percent of the product offers in every case, and no intermediate product type is offered more than 10 percent of the time.[17] Second, there is a pronounced shift between Part I and Part II from offering the least responsible product type to the most responsible product type. This shift is most pronounced in *High*, but it is also observed, to a lesser extent, in the other conditions, including in the *Baseline*, where consumers' incomes remain unchanged in Part II.

Figure 4: Distribution of Product Type Offers by Treatment



The observation that firms shift toward offering the most responsible product type in Part II—and that this shift is most pronounced in *High*, where we also observe the largest effect of the increase in consumer income on market outcomes—leaves open the possibility that the changing behavior of firms plays a driving role for our results. However, this shift could also just as likely

[17] Figure C.2 in Appendix C shows the frequencies of least responsible and most responsible products offered by firms across periods. The share of most responsible products, with a social responsibility of 100, increases across Part II in all conditions.

be a response to changing consumer preferences. We investigate these two potential mechanisms by studying, first, the extent to which "restrictive" menus of firms' product offers drive consumers' purchasing behavior and, second, by how past profitability affects firms' offer decisions.

First, if firms' product offers are driving consumers' purchasing behavior, we would expect that consumers have fewer less responsible product offers available in Part II—particularly in *High*, where we observe the largest change in market outcomes. To get at this, we study the number of cases in which consumers bought a product in a period when there was another option available that was both strictly less socially responsible and cheaper—that is, cases in which a consumer paid a higher price to purchase a more responsible product than an alternative available at a lower price. If the number of such cases is lower in *High*, then this would be consistent with firms' product offers restricting the consumers' purchasing decisions to a larger extent in *High* than in the other conditions. However, we find that the proportions of cases in which a consumer had a cheaper and less responsible alternative to the product they actually purchased are very similar in Part II of all treatments (0.43, 0.34, 0.44, and 0.44 in *Baseline*, *Medium*, *High*, and *Unequal*, respectively). None of the proportions in *Medium*, *High* or *Unequal* is significantly different from *Baseline* (two-sided Wilcoxon rank-sum test at the market level, $p \geq 0.257$ for all comparisons), suggesting that the menu of product offers was not differentially restrictive in Part II.

Second, we study how the past profitability of different types of products affects firms' current product type offers. Table C.3 in Appendix C reports linear regressions of firms' product type offers in Part II on (i) the difference between the average profit made from offering the most responsible product type and from offering the least responsible product type in the previous period and on (ii) the product type offered by a firm in the previous period. Table C.4 reports the same regressions but considers only the first 10 periods of Part II, where the dynamic adjustment following the implementation of the treatments is likely to be strongest. We find positive relationships between past profitability and current product type offers in all four conditions. The magnitudes and statistical significance of these relationships vary, though they are at least always marginally statistically significant for the first 10 periods of Part II. This analysis provides suggestive evidence that firms, on average, tend to be more likely to offer products that were previously more profitable, reflecting the impact of consumers' behavior on firms' offers.[18]

[18] This is also consistent with the observation that firms offering the most responsible product types tend to generate higher profits than those offering the least responsible product types in Part II of *Medium*, *Unequal* and *High* (see

The analyses provided in this section suggest that the increase in socially responsible products exchanged in Part II in *High* is not mainly driven by firms' preferences over different product types. Instead, it seems that firms' reactions to consumers' preferences play an important role.

3 Study 2

Study 1 provides causal evidence that increases in consumer income lead to a higher market share for products that mitigate negative external impacts. Study 2 aims to test the robustness of this finding, while also moving the impact of the externality closer to the kinds of social and environmental impacts that matter outside the laboratory.

It is important to consider whether particular features of laboratory experiments, not present outside the laboratory, might cause the positive relationship between income and concern for mitigating externalities. Specifically, the fact that external market impacts fall on other experimental subjects, who differ from consumers only in a random draw of roles and who also start each period with an initial income of 100, might make inequality particularly salient. Consumers with higher incomes might thus mitigate externalities in order to reduce inequalities among otherwise similar laboratory subjects. Study 2 further tests the null hypothesis that income does not affect consumer's concern for external impacts when we remove the direct contrast between higher consumer incomes and the incomes of third parties, as well as of firms, thereby moving our experimental environment closer to conditions outside the laboratory.

Study 2 replicates the design of Study 1, but changes two main features. First, we change the impact of the externality to affect a charity fighting climate change, deforestation and poverty in low-income countries. This brings our design closer to many non-laboratory markets involving externalities, where the impacts are often imposed on the environment or on poor individuals in distant countries. It also makes payoff comparisons between consumers and those affected by the externality less clear than when these comparisons involve participants randomly assigned to different roles in the same laboratory session. Second, in one of the treatments, we additionally keep the relative income of all laboratory subjects—consumers and firms—equal, by giving all of them the same income shock.

Appendix Figure C.3), further suggesting that an increased willingness to pay by consumers for purchasing socially responsible products drives market outcomes.

3.1 Experimental Design

In Study 2, each experimental market comprises 12 participants: six firms and six consumers. For each 12-person market, we allocate an initial donation of 360 points (corresponding to CHF 120) to the charitable organization, *Carbon Offsets To Alleviate Poverty* (see https://cotap.org/). This organization funds programs that fight deforestation, climate change and poverty. However, the size of the actual resulting donation could change depending on the external impacts produced by type of products exchanged in the market. As in Study 1, each possible product type corresponds to a particular external impact—in this case, a reduction in the size of the donation, and its corresponding cost, as shown in Table 5.[19]

Table 5: Product types, reduction to the donation, and production costs

	Product types										
Reduction to the donation	0	6	12	18	24	30	36	42	48	54	60
Production cost	40	38	36	34	32	30	28	26	24	22	20

As in Study 1, market participants' initial per-period income is 100 in the first 10 periods (Part I) in all our treatments. We then exogenously vary the size of participants' per-period income in the remaining 20 periods (Part II). Our first condition is a *Baseline* control that implements the same per-period income of 100 in Part II. In a *High (consumers)* condition, consumers each receive 400 in income at the start of a period throughout Part II, while firms continue to each receive 100. In a *High (consumers & firms)* condition, both consumers and firms each receive 400.[20] Table 6 provides an overview of the treatments.

All procedures are as in Study 1. We conducted six markets in each treatment, using a total of 216 subjects, mainly from the University of Zurich and the Swiss Federal Institute of Technology in Zurich.

[19] The marginal production cost of socially responsible products is higher in Study 2 than in Study 1. This reflects our prior that, even in the *Baseline* condition, donating to fight poverty and mitigate climate change would provide stronger motives to exchange socially responsible products than the external impacts in Study 1.
[20] The instructions for all treatments of Study 2 are in Appendix F.

Table 6: Treatment overview

Treatment	Part I (periods 1 to 10)	Part II (periods 11 to 30)		Number of markets (participants)
	All participants' income	Consumers' income	Sellers' income	
Baseline	100	100	100	6 (72)
High (consumers)	100	400	100	6 (72)
High (consumers & firms)	100	400	400	6 (72)

3.2 Market Outcomes

Figure 5 shows the time paths of our measure of social responsibility in all three treatments, equivalently to Figure 1 for Study 1.[21] The figure shows that concern for mitigating externalities increases in Part II both in *High (consumers)* and *High (consumers & firms)*. The figure also reveals some differences in the degree of responsible behavior across treatments in Part I. Even though subjects are randomized into treatments, which are identical in Part I, externality mitigation in Part I appears to be higher in *High (consumers & firms)* and somewhat lower in *High (consumers)* relative to the *Baseline* condition.[22]

Model (1) in Table 7 reports a linear regression using a differences-in-differences panel structure, comparable to model (1) in Table 3 for Study 1.[23] The model regresses our measure of social responsibility, defined as the percentage of the total possible externality mitigation realized, on binary treatment variables, *High (consumers)* and *High (consumers & firms)* (taking on value 1 in the respective treatments and 0 otherwise), a binary variable for *Part II*, and interactions of the treatment variables with *Part II*. *Baseline* and *Part I* serve as omitted categories. Part I differences do not reach conventional levels of statistical significance. More importantly, the coefficients for *Part II x High (consumers)* and *Part II x High (consumers & firms)*, which measure

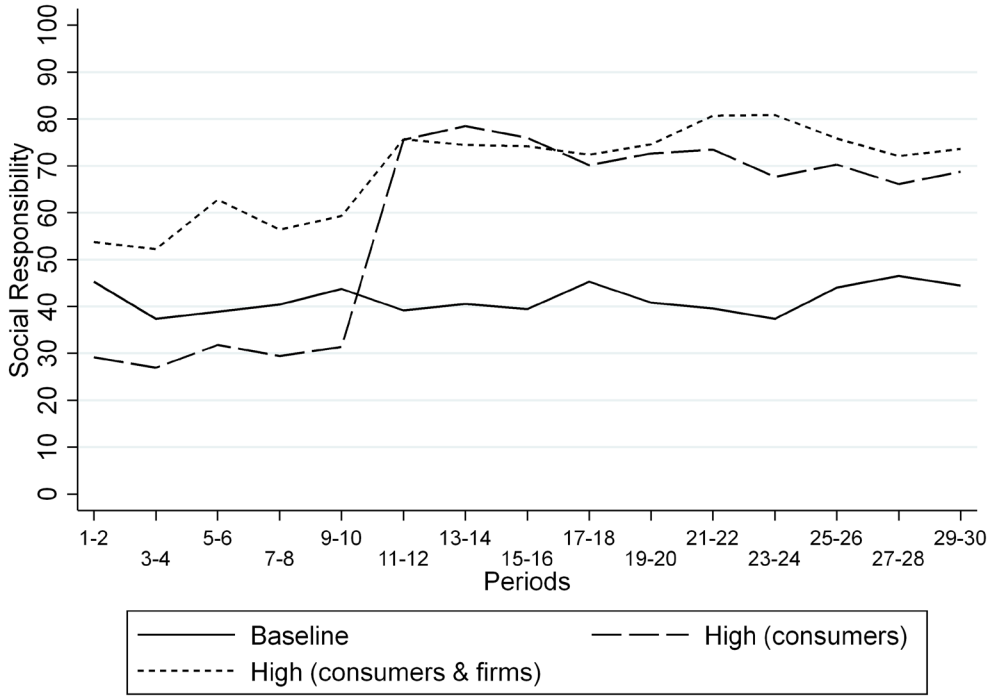
[21] As in Study 1, cases in which consumers do not buy a product at all are very infrequent, ranging between 1.0 percent in *High (consumers & firms)* and 2.6 percent in *Baseline*. Recall that these cases enter the measure of responsibility with a value of 100 because no loss is imposed in cases where a consumer does not buy a product.

[22] The average measure of social responsibility in each treatment and in each part can be found in Table D.1 in Appendix D. Table D.2 shows that the differences between *Baseline* and *High (consumer & firms)* and between *Baseline* and *High (consumers)* in Part I are not statistically significant at the five percent level using two-sided Wilcoxon rank-sum tests; the difference between *High (consumers)* and *High (consumers & firms)* is significant.

[23] In contrast to Study 1, we do not report Wilcoxon rank-sum tests on differences in Part II in Study 2, because these tests do not account for the initial differences that we observe between treatments in Part I.

the treatment effects of increasing income relative to the *Baseline*, are both positive, large in magnitude and significant at the one percent level.[24] Both conditions thus reproduce the key finding from Study 1 that a substantial increase in income causes an increase in concern for mitigating negative externalities. Note that this holds even in the *High (consumers & firms)* condition that eliminates relative income differences among all laboratory subjects and even though concern for external impact in Part I is already at a relatively high level, thereby reducing the scope for a further increase.

Figure 5: Average social responsibility across treatments



In models (2) through (4) in Table 7, we estimate the aggregate effects of income on responsible consumption, similarly to Table 4 for Study 1, by using data from all three treatments in Study 2. Both models use the level of externality mitigation as the dependent variable and the level of income as an explanatory variable, revealing a positive and statistically significant relationship whether or not we control for time trends. The positive and statistically significant coefficients for *Income* are similar in magnitude to those in Study 1, again indicating that

[24] A post-estimation test for model (1) indicates that the coefficients for *High (consumers)* and *High (consumers & firms)* and the coefficients for *Part II x High (consumers)* and *Part II x High (consumers & firms)* are statistically significantly different from each other (p=0.004 and p=0.009, respectively).

responsible consumption rises with income. The null hypothesis that income does not affect responsible market behavior is thus again rejected in Study 2.

Table 7: Linear regression of the percent loss mitigated

	(1)	(2)	(3)	(4)
High (consumers)	-11.389			
	(0.301)			
High (consumers & firms)	15.750			
	(0.236)			
Part II	0.583			
	(0.984)			
Part II x High (consumers)	41.569***			
	(0.000)			
Part II x High (consumers & firms)	17.958**			
	(0.022)			
Income		0.105***	0.106***	0.124***
		(0.000)	(0.004)	(0.000)
Period			-0.049	0.132
			(0.861)	(0.808)
Income x Period				-0.001
				(0.511)
Constant	41.139**	31.770***	32.186***	29.445***
	(0.025)	(0.000)	(0.000)	(0.000)
Observations	3,240	3,240	3,240	3,240

Notes. The dependent variable in all models is the percent loss mitigated. *High (consumers)* and *High (consumers & firms)* are binary variables taking on the value 1 in the respective treatment, and 0 otherwise. *Baseline* serves as omitted category in model (1). *Part II* is a binary variable taking on value 1 for data generated from period 11 to 30 and 0 from period 1 to 10. The variable *Income* represents subjects' per-period income (100 or 400). Model (3) includes the variable *Period* taking on integer values between 1 and 30. Model (4) also includes the interaction of *Income* with *Period*. P-values from standard errors clustered at the market level, estimated using the wild bootstrap (derived from running 10,000 replications in each case) are in parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%.

3.3 Firm Behavior

Analogously to Study 1, we also analyze firm behavior. Figure 6 shows the prices at which the firms offered the most and least responsible type of product in Part II, separately for each treatment. The mark-up on the cost of production, shown as a horizontal black line, is again similar in all treatments. As in Study 1, we do not observe that the most responsible product is less expensive in Part II of the treatments with increased consumer income compared to Part I. For *High (consumers)* we observe that the least responsible product is relatively more expensive in Part II, but this pattern is not present in *High (consumers & firms)*. Overall, this suggests, again, that the

more responsible market outcomes in conditions with increased consumer income are not driven by more responsible products becoming relatively less expensive due to differential markup strategies by firms.

Figure 6: Prices of Product Offers in Part II

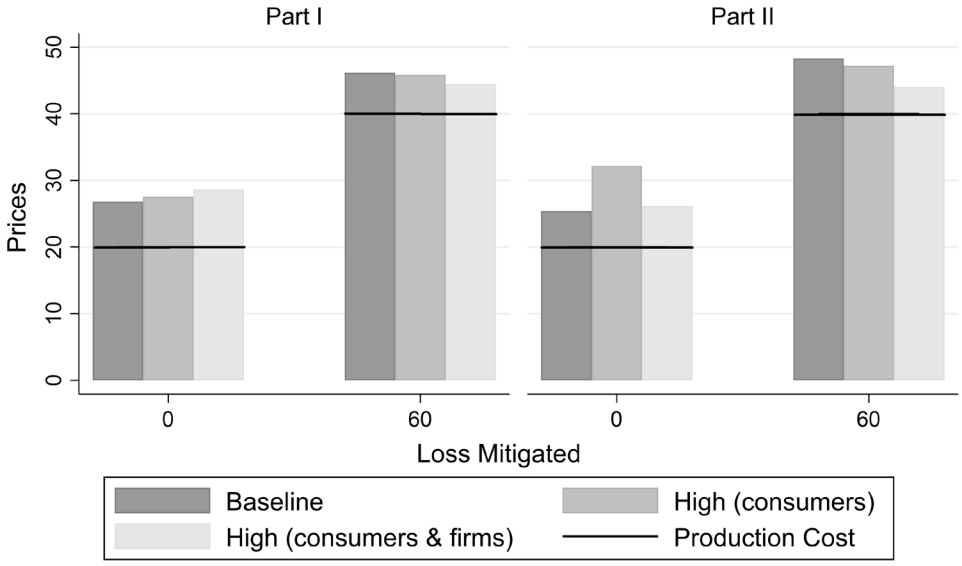


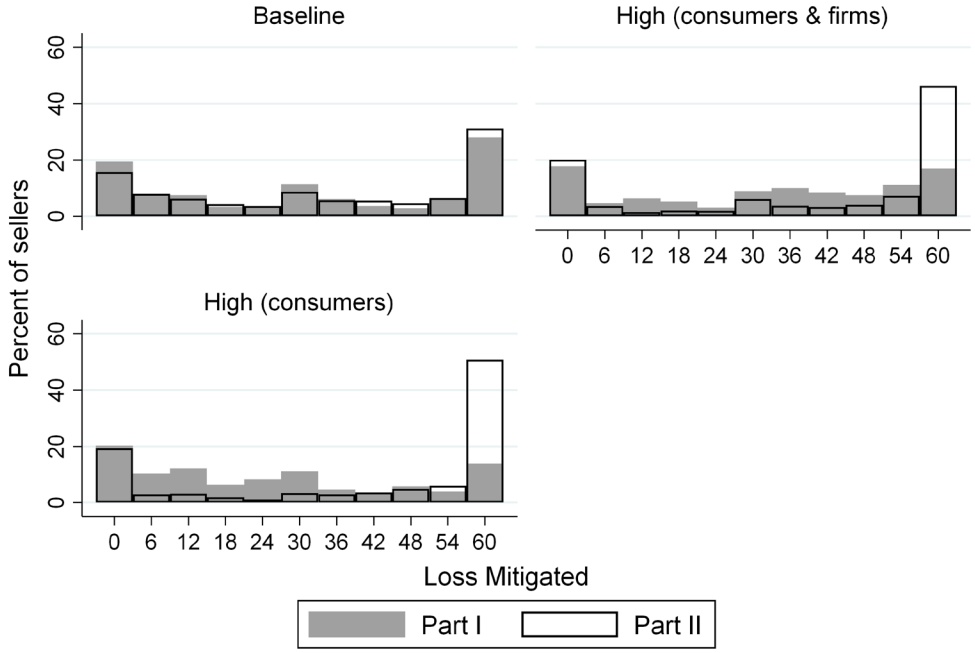
Figure 7 shows the distribution of types of products offered by firms in Parts I and II, separately for each treatment.[25] As in Study 1, the least and the most responsible product are the modal product types offered. Moreover, there is again a pronounced shift toward the most responsible product type in Part II in *High (consumers)* and *High (consumers & firms)*, though not in the *Baseline*. This observation is again consistent with firms' changing product offers either driving or responding to consumer purchasing behavior.

As in Study 1, we measure the restrictiveness of the product menus offered by firms by studying the number of cases in which consumers had a less responsible and less expensive alternative to the product that they actually bought. We find that the number of such cases is comparable in Part II of all three treatments and amounts to 0.57, 0.67, and 0.72 in *Baseline*, *High (consumers)* and *High (consumers & firms)*, though it is somewhat higher in the treatments with increased consumer income and marginally statistically significantly higher in treatment *High (consumers & firms)* compared to *Baseline* (two-sided Wilcoxon rank-sum test at the market level, p=0.093). Thus, if anything, consumers are acting more responsibly given the choice menus that

[25] Similarly to Study 1, we provide additional graphs including all types of products in Appendix Figure D.1.

they face in the two *High* conditions, by forgoing options that were cheaper and less responsible. This suggests, as in Study 1, that it is not firms' menu offers that are driving consumers to purchase more responsible products in conditions with higher income, but instead consumers' willingness to sacrifice personal benefit for social responsibility.

Figure 7: Distribution of Product Type Offers



In Tables D.3 and D.4 in Appendix D we report linear regressions of firms' product type offers on the past profitability of different product types, controlling for the product type offered by that firm in the previous period, equivalent to the analysis provided for Study 1. We again find a positive relationship between the past relative profitability of more responsible products and firms' subsequent product type offers, which is at least marginally statistically significant in every comparison. This provides evidence that firms react to the profitability of the different product types, rather than acting entirely on their own preferences over products.[26]

We again conclude that market outcomes appear to be at least partly driven by firms responding to changes in consumers' preferences rather than firms forcing consumers to buy more responsible products.

[26] Unlike in Study 1, we do not find that firms offering the most responsible product type earn higher profits, on average, than those offering the least responsible product types (see Figure D.3 in Appendix D). This is consistent with the lack of a price premium for the most responsible products, unlike in Study 1 (see Figures 4 and 7).

4 Conclusion

Despite prominent claims that socially responsible consumption increases with income (Shleifer 2004, Bénabou and Tirole 2010), there is little empirical evidence of this relationship. We aim to provide causal evidence on how individuals' willingness to impose externalities on others through their market actions is affected by increases in income. This question is important for understanding at least one potential influence on the degree to which production and exchange through markets yields externalities such as pollution and environmental degradation. However, addressing this question using observational data is challenging due to limitations of data availability and an inability to establish causality.

To obtain causal evidence of the relationship between income and concern for external impacts, we conduct two laboratory experiments that create stylized product markets with varying product types that differ in the degree to which they generate externalities borne by others outside of the market. More responsible products cost more to produce, meaning that consumers have to be willing to pay for such products in order for them to be sufficiently profitable for firms to provide them. Using this design, we introduce exogenous positive income shocks to identify the resulting effect of such income growth on responsible consumption.

Our results reveal a positive relationship between income and the willingness to mitigate negative external impacts. We find evidence across two studies that vary important characteristics of the traded products and the distributions of income. However, we also find that consumers' incomes have to increase substantially before this relationship is economically and statistically significant. Nevertheless, our experiments clearly reject the null hypothesis that income has no impact on responsible market behavior.

Our laboratory approach, while allowing clean causal tests, naturally raises questions about generalizability. While other laboratory designs have previously demonstrated concordance between responsible laboratory market behavior and purchasing decisions involving real consumer products (Engelmann et al. 2022), there are undoubtedly features of our experimental design that are unlikely to obtain outside the laboratory. For example, in our study income increases suddenly, all at once, rather than through the more gradual process characterizing most income trajectories outside the laboratory. It is certainly reasonable that more gradual income changes may produce smaller effects. In addition, outside the laboratory, individuals have a greater variety of product choices available to them—rather than a unique product category that varies only along the

dimension of external impact as in our study. Therefore, consumers with rising incomes may often start to consume new categories of products—such as beef, personal automobiles and air travel—that may have more detrimental environmental and social impacts than the products purchased at lower income levels. Finally, rising incomes themselves may be partly due to certain kinds of economic activities, such as industrialized production with high pollution levels, that themselves produce more negative external impacts. Hence, the question of whether rising incomes will necessarily reduce the degree to which a society creates negative environmental and social impacts is far more complicated than what our experiment can answer and presents valuable opportunities for investigation with richer designs.

An appropriate way to view our findings in this context is that income growth may produce an increase in individuals' concerns for external impacts, which our laboratory approach is able to demonstrate in a much more controlled manner than is possible using observational data. However, the extent to which such a preference actually results in lower social and environmental impacts requires consideration of many additional important channels.

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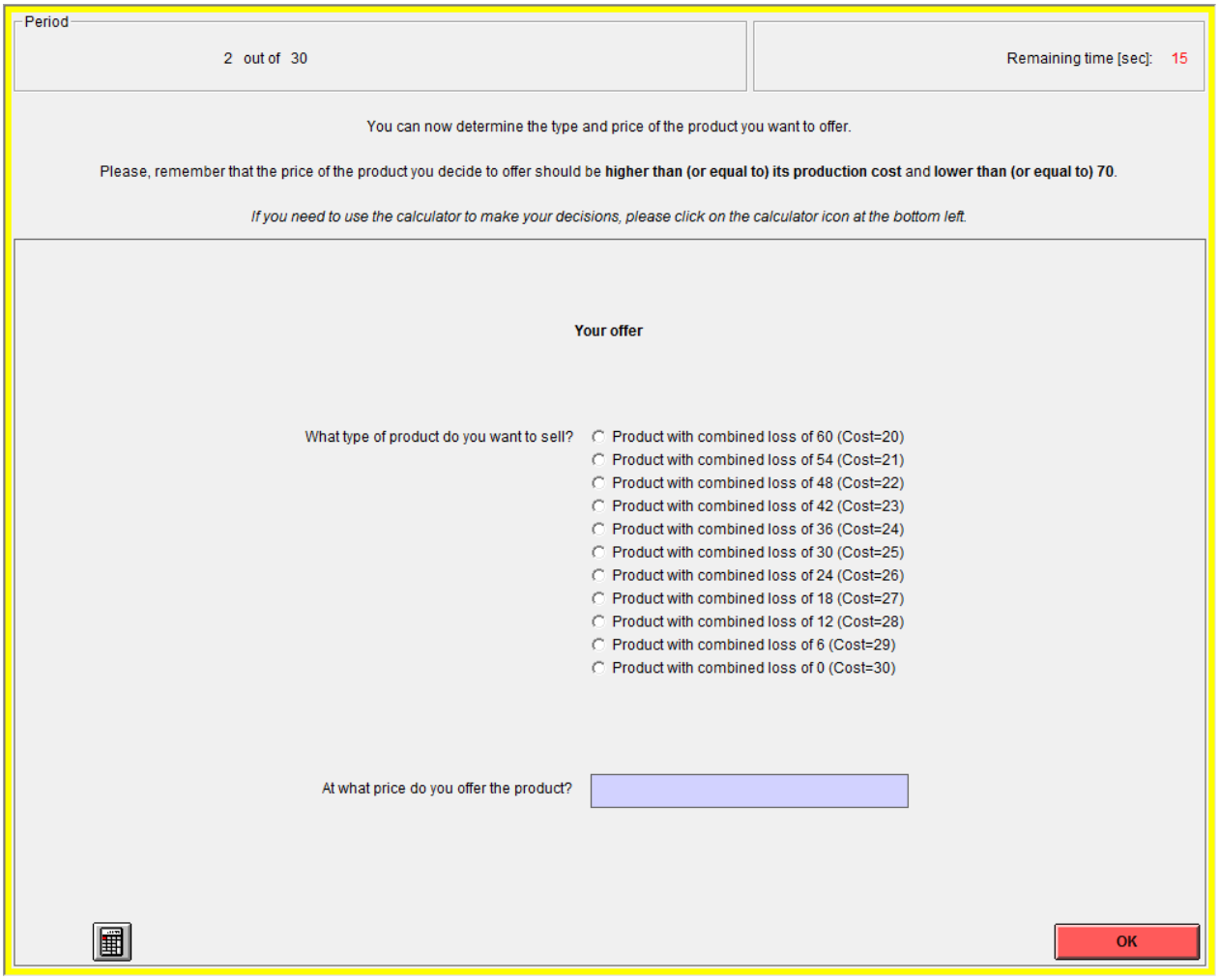
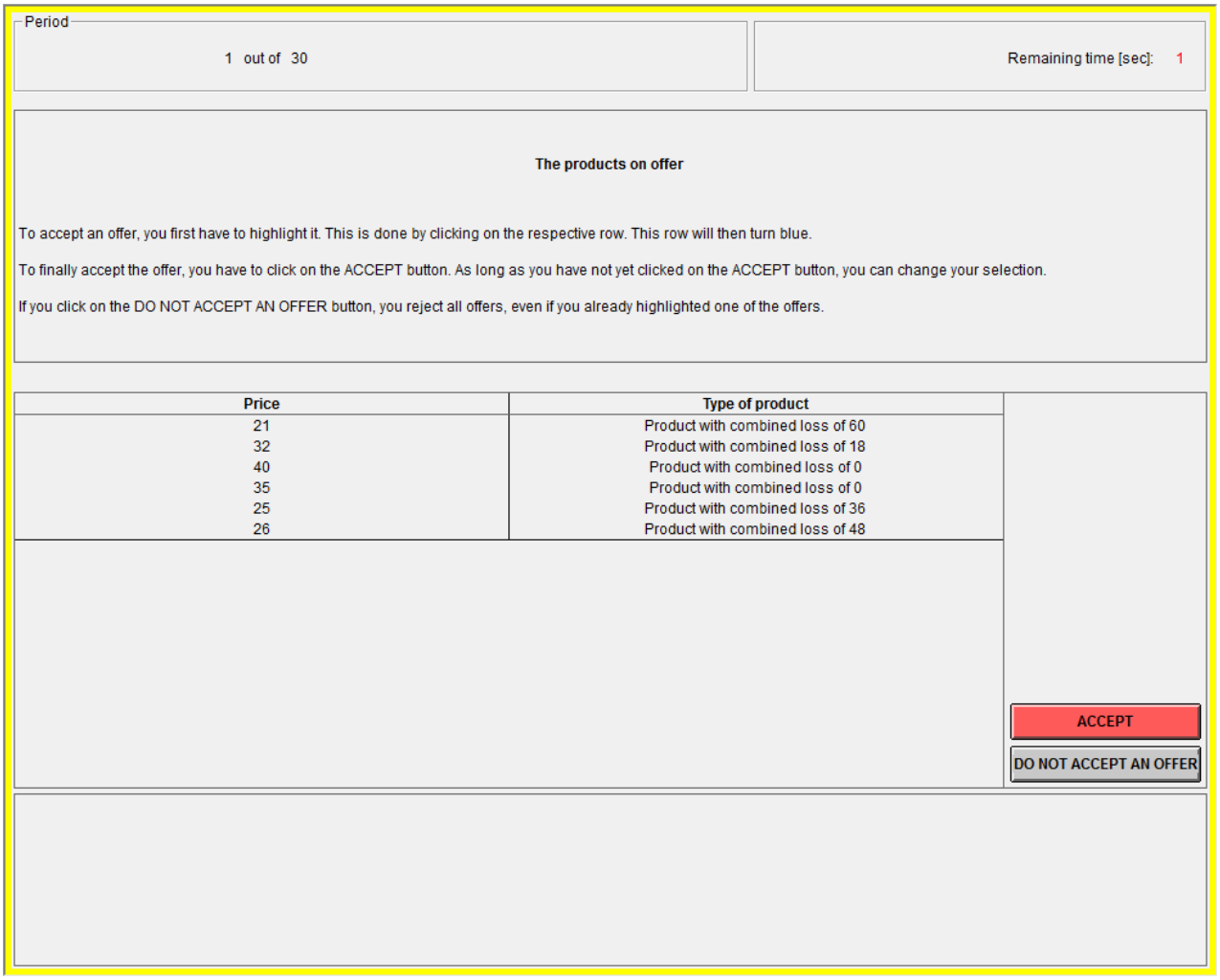
Appendix (for online publication)

A. Interfaces for Firms' and Consumers' Decisions

For Firms: They can select the product type they want to sell and determine a price for their product offer.

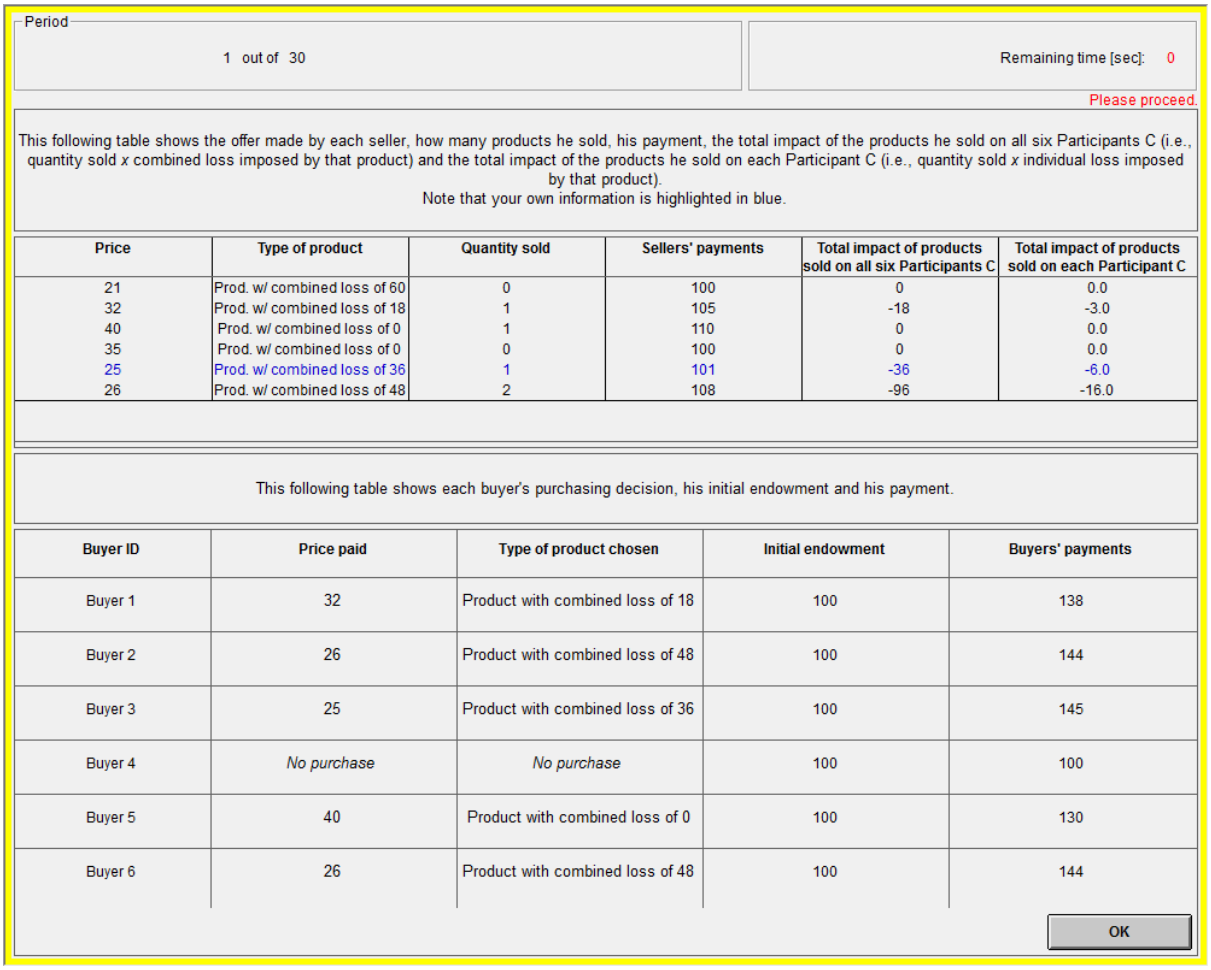


For Consumers: They decide which product they want to buy if any.



B. Feedback Received by Participants at the End of Each Period

For Firms: They observe the offers made by all firms and their respective payments.



Period

1 out of 30

Remaining time [sec]: 0

Please proceed.

This following table shows the offer made by each seller, how many products he sold, his payment, the total impact of the products he sold on all six Participants C (i.e., quantity sold *x* combined loss imposed by that product) and the total impact of the products he sold on each Participant C (i.e., quantity sold *x* individual loss imposed by that product).
Note that your own information is highlighted in blue.

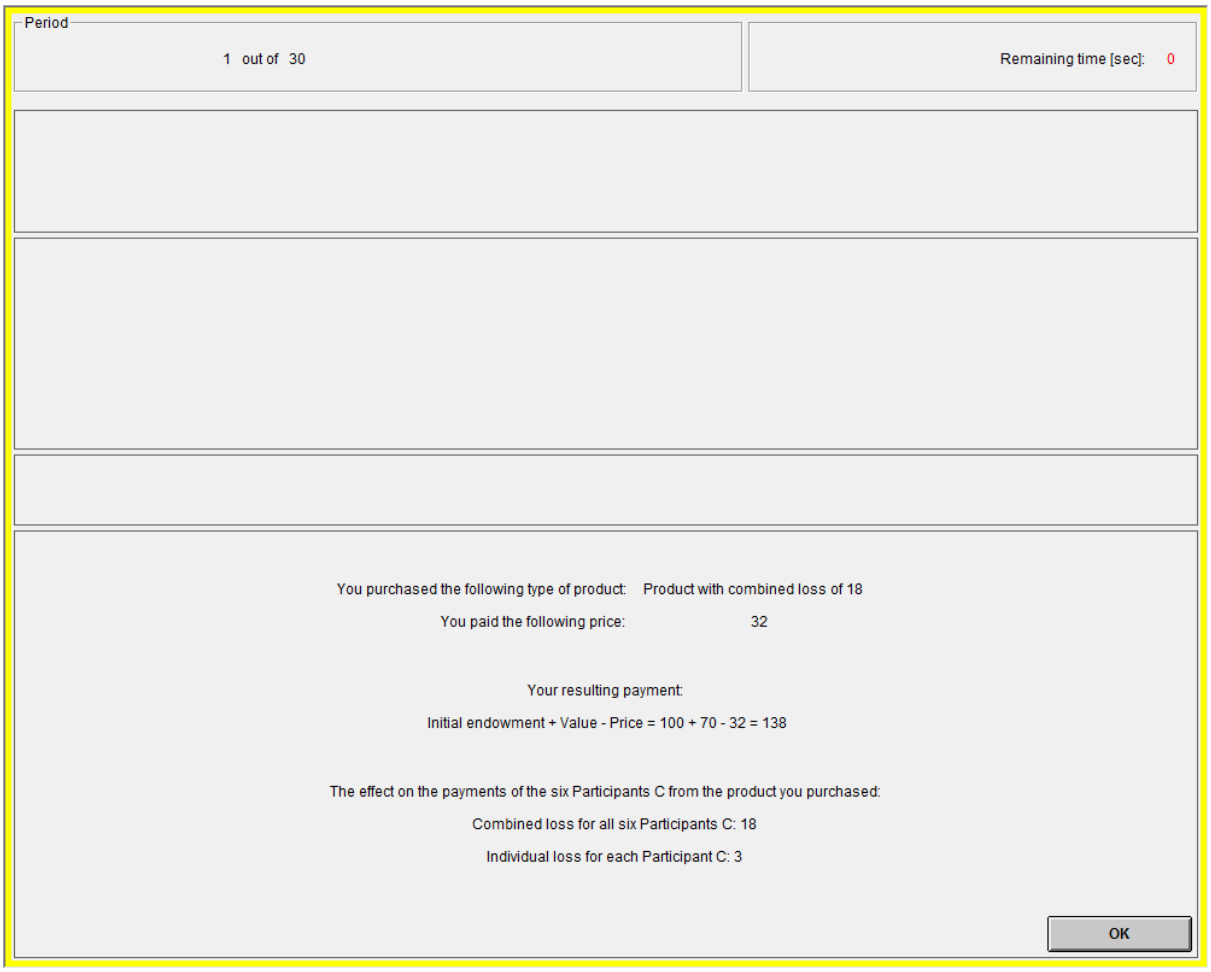
Price	Type of product	Quantity sold	Sellers' payments	Total impact of products sold on all six Participants C	Total impact of products sold on each Participant C
21	Prod. w/ combined loss of 60	0	100	0	0.0
32	Prod. w/ combined loss of 18	1	105	-18	-3.0
40	Prod. w/ combined loss of 0	1	110	0	0.0
35	Prod. w/ combined loss of 0	0	100	0	0.0
25	Prod. w/ combined loss of 36	1	101	-36	-6.0
26	Prod. w/ combined loss of 48	2	108	-96	-16.0

This following table shows each buyer's purchasing decision, his initial endowment and his payment.

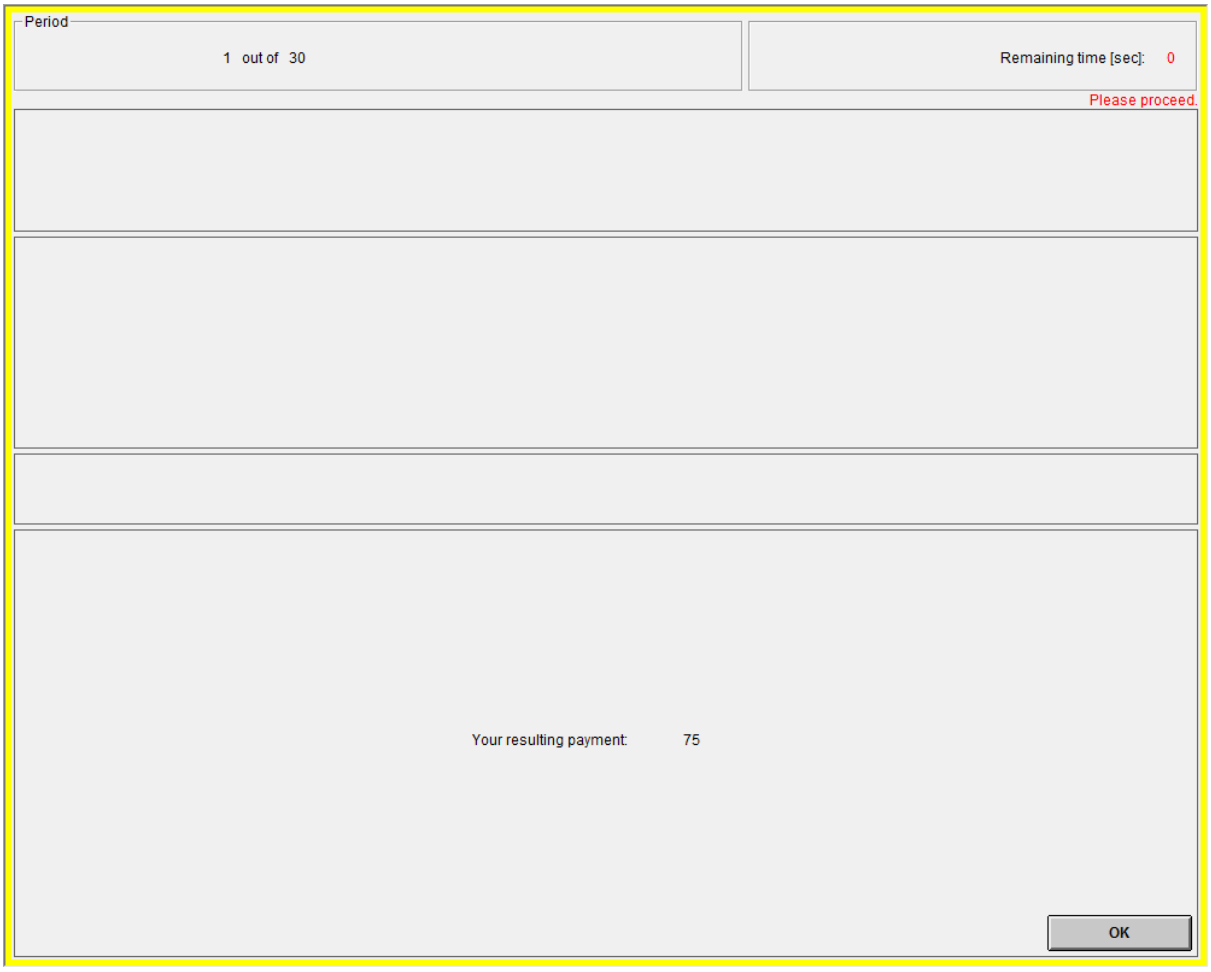
Buyer ID	Price paid	Type of product chosen	Initial endowment	Buyers' payments
Buyer 1	32	Product with combined loss of 18	100	138
Buyer 2	26	Product with combined loss of 48	100	144
Buyer 3	25	Product with combined loss of 36	100	145
Buyer 4	*No purchase*	*No purchase*	100	100
Buyer 5	40	Product with combined loss of 0	100	130
Buyer 6	26	Product with combined loss of 48	100	144

OK

For Consumers: They observe the effect of their purchasing decision on the payments of the third parties.



For Third Parties: They can only observe their payment.



C. Additional Analysis for Study 1

Table C.1: Percentage of the total potential loss mitigated by purchased products

	Part I	Part II
Baseline	37.95 %	45.25 %
Medium	34.25 %	42.86 %
High	29.56 %	74.54 %
Unequal	29.63 %	40.64 %

Table C.2: Wilcoxon rank-sum tests of social responsibility measure at the consumer (market) level, two-sided

p-values	*Baseline*	*Medium*	*High*	*Unequal*
Baseline	-	0.8131 (0.9397)	0.3117 (0.4477)	0.3349 (0.5980)
Medium	0.8335 (0.6501)	-	0.2638 (0.3290)	0.3126 (0.4292)
High	0.0002 (0.0393)	0.0000 (0.0092)	-	0.6399 (0.4610)
Unequal	0.4835 (0.6732)	0.5804 (0.7121)	0.0000 (0.0007)	-

Notes. Test of differences in the measure of socially responsible behavior across treatments. The p-values in the shaded area correspond to Part I and the rest to Part II.

Table C.3: Linear Regressions of Firm Product Type Offers in Part II (All Periods)

	(1) *Baseline*	(2) *Medium*	(3) *High*	(4) *Unequal*
Lag Profit Difference	1.056**	0.628*	0.376	0.575**
	(0.022)	(0.051)	(0.160)	(0.047)
Lag Loss Mitigated	0.482***	0.586***	0.311**	0.463***
	(0.000)	(0.000)	(0.031)	(0.000)
Constant	18.025***	15.275***	32.996***	19.538***
	(0.000)	(0.000)	(0.000)	(0.000)
Observations	1,140	1,140	684	1,824
Number of subjects	60	60	36	96

Notes. The dependent variable in all models is the percent loss mitigated. *Lag Profit Difference* is the difference in the average profit obtained in the prior period between firms offering the most responsible product type and firms offering the least responsible product type. *Lag Loss Mitigated* is a firm's type of product offered in the previous period. P-values from standard errors clustered at the market level, estimated using the wild bootstrap (derived from running 10,000 replications in each case) are in parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table C.4: Linear Regressions of Firm Product Type Offers in Part II (Periods 11-20)

	(1) *Baseline*	(2) *Medium*	(3) *High*	(4) *Unequal*
Lag Profit Difference	1.171**	0.510*	0.933**	0.692*
	(0.041)	(0.100)	(0.031)	(0.064)
Lag Loss Mitigated	0.478***	0.523***	0.305***	0.449***
	(0.000)	(0.000)	(0.000)	(0.000)
Constant	17.853***	17.401***	31.357***	20.124***
	(0.000)	(0.000)	(0.000)	(0.000)
Observations	540	540	324	864
Number of subjects	60	60	36	96

Notes. The dependent variable in all models is the percent loss mitigated. *Lag Profit Difference* is the difference in the average profit obtained in the prior period between firms offering the most responsible product type and firms offering the least responsible product type. *Lag Loss Mitigated* is a firm's type of product offered in the previous period. P-values from standard errors clustered at the market level, estimated using the wild bootstrap (derived from running 10,000 replications in each case) are in parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%.

Figure C.1: Average Prices of Offered Product Types

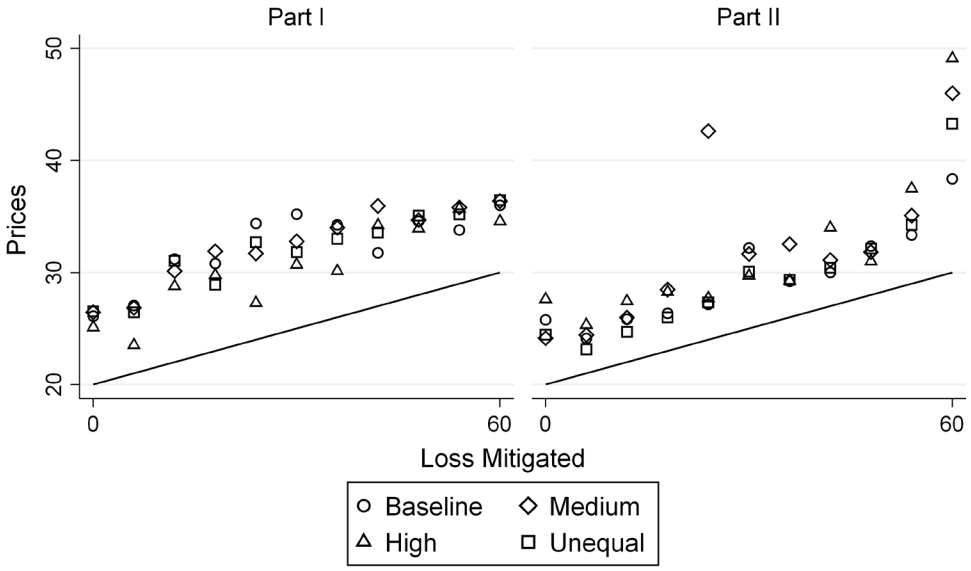


Figure C.2: Shares of Most and Least Responsible Product Types Offered by Firms

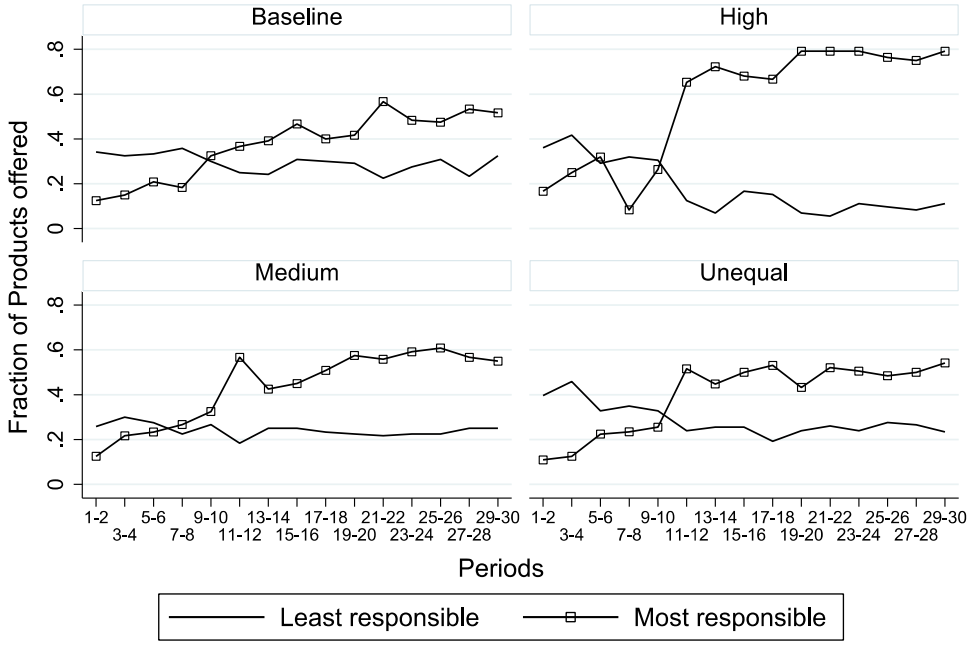
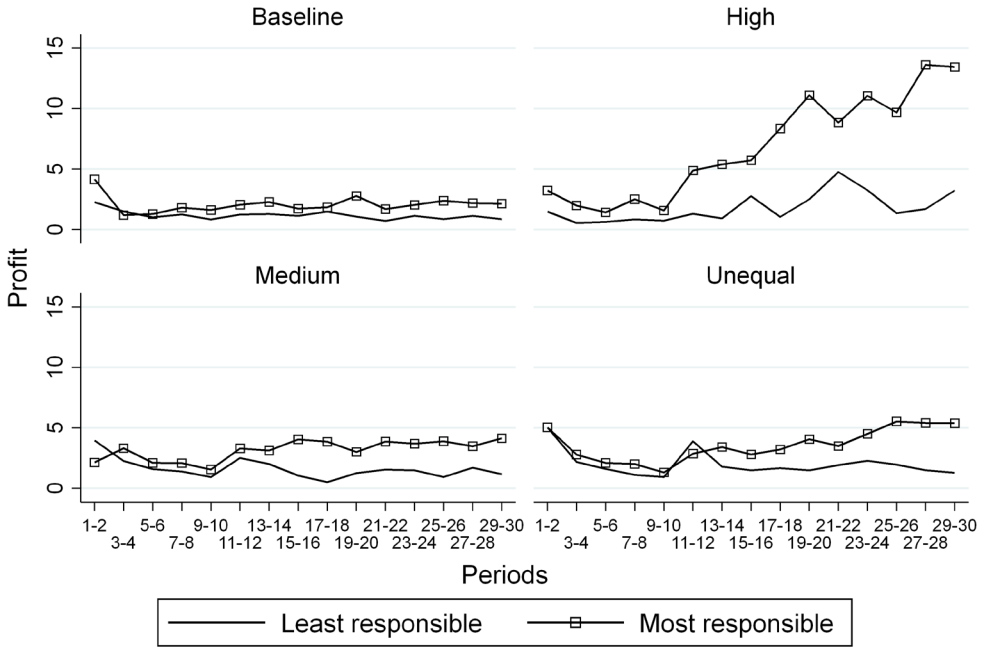


Figure C.3: Firms' Profits for Different Products Types



D. Additional Analysis for Study 2

Table D.1: Percentage of the total potential loss mitigated by purchased products

	Part I	Part II
Baseline	41.14 %	41.72 %
High (consumers)	29.75 %	71.90 %
High (consumers & firms)	56.89 %	75.43 %

Table D.2: Wilcoxon rank-sum tests of social responsibility measure at the consumer (market) level, two-sided

p-values	*Baseline*	*High (consumers)*	*High (consumers & firms)*
Baseline	-	0.2768 (0.4233)	0.0546 (0.2002)
High (consumers)	0.0008 (0.0374)	-	0.0003 (0.0104)
High (consumers & firms)	0.0004 (0.0250)	0.3385 (0.5218)	-

Notes. Test of differences in the measure of socially responsible behavior across treatments. The p-values in the shaded area correspond to Part I and the rest to Part II.

Table D.3: Linear Regressions of Firm Product Type Offers in Part II (All Periods)

	(1) *Baseline*	(2) *High (consumers)*	(3) *High (consumers & firms)*
Lag Profit Difference	0.631***	0.336*	1.572***
	(0.000)	(0.063)	(0.000)
Lag Loss Mitigated	0.493***	0.406***	0.426***
	(0.000)	(0.000)	(0.000)
Constant	18.419***	24.433***	23.608***
	(0.000)	(0.000)	(0.000)
Observations	684	684	684
Number of subjects	36	36	36

Notes. The dependent variable in all models is the percent loss mitigated. *Lag Profit Difference* is the difference in the average profit obtained in the prior period between firms offering the most responsible product type and firms offering the least responsible product type. *Lag Loss Mitigated* is a firm's type of product offered in the previous period. P-values from standard errors clustered at the market level, estimated using the wild bootstrap (derived from running 10,000 replications in each case) are in parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%.

Table D.4: Linear Regressions of Firm Product Type Offers in Part II (Periods 11-20)

	(1) *Baseline*	(2) *High (consumers)*	(3) *High (consumers & firms)*
Lag Profit Difference	0.745***	0.420*	1.514***
	(0.000)	(0.063)	(0.000)
Lag Loss Mitigated	0.454***	0.390***	0.404***
	(0.000)	(0.000)	(0.000)
Constant	18.488***	25.690***	24.034***
	(0.000)	(0.000)	(0.000)
Observations	324	324	324
Number of subjects	36	36	36

Notes. The dependent variable in all models is the percent loss mitigated. *Lag Profit Difference* is the difference in the average profit obtained in the prior period between firms offering the most responsible product type and firms offering the least responsible product type. *Lag Loss Mitigated* is a firm's type of product offered in the previous period. P-values from standard errors clustered at the market level, estimated using the wild bootstrap (derived from running 10,000 replications in each case) are in parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%.

Figure D.1: Average Prices of Offered Product Types

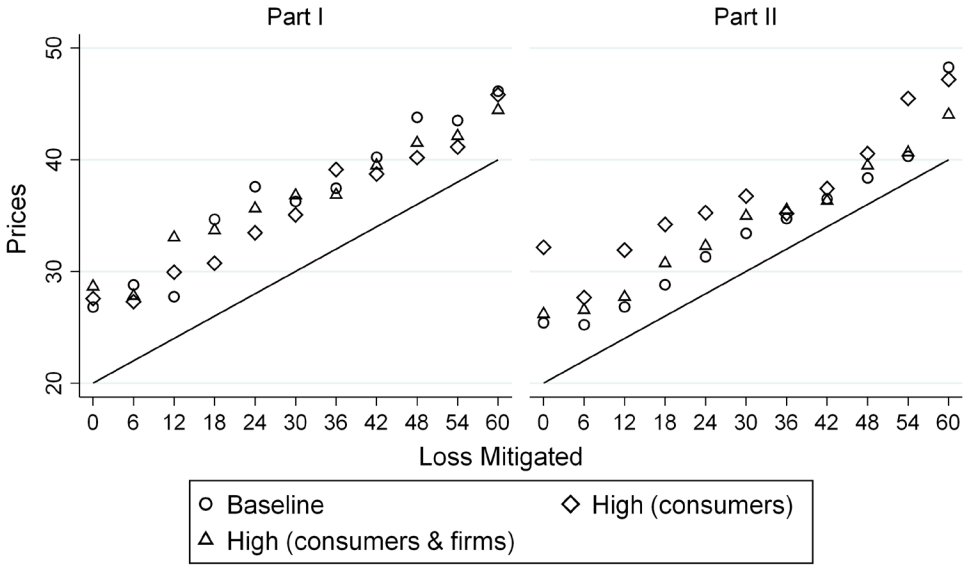


Figure D.2: Shares of Most and Least Responsible Product Types Offered by Firms

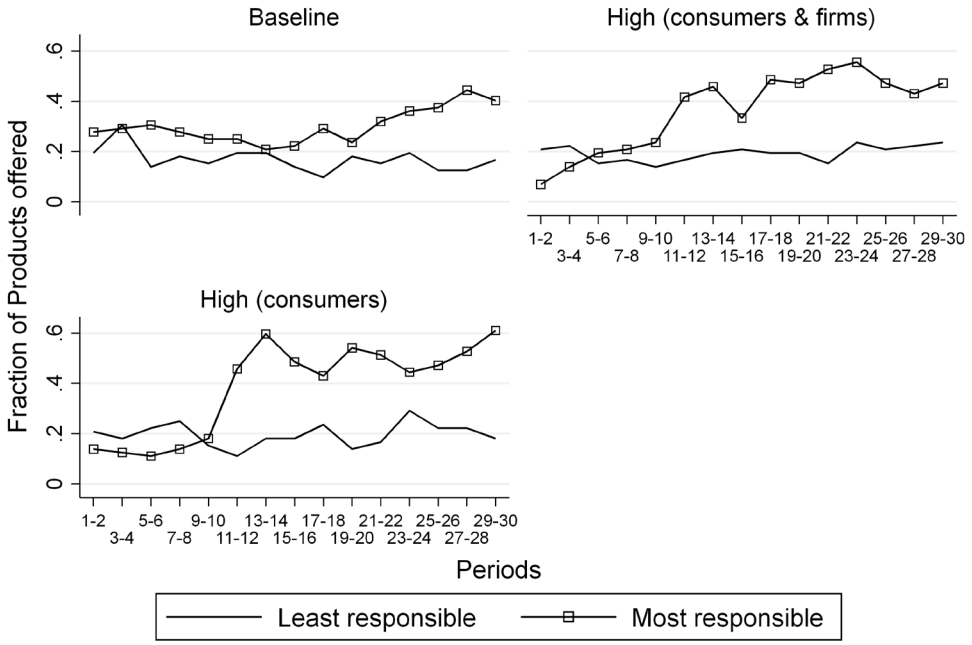
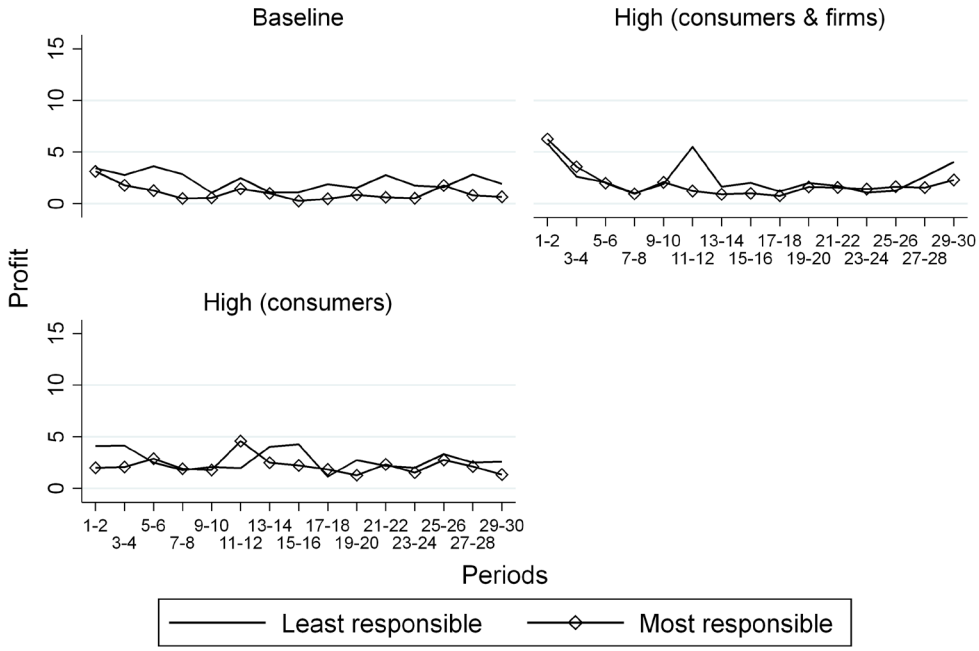


Figure D.3: Firms' Profits for Different Products Types


Baseline
High (consumers & firms)
High (consumers)
Profit
0
5
10
15
1-2
3-4
5-6
7-8
9-10
11-12
13-14
15-16
17-18
19-20
21-22
23-24
25-26
27-28
29-30
Periods
Least responsible
Most responsible

E. Experimental Instructions for Study 1

In the following, we provide the instructions for Part I, and the instructions for Part II for the treatments *Baseline*, *Medium*, *High* and *Unequal*.

General instructions

We are pleased to welcome you to this economic study.

Please read the following instructions carefully. You can—depending on your decisions and/or those of the other participants—earn money in addition to the **15 Swiss francs** that you receive as an initial participation payment. It is thus very important that you read the instructions carefully.

This study will have **two parts**. Part I lasts 10 periods and Part II lasts 20 periods. The entire study will thus last for **30 periods**.

In addition to the initial participation payment of 15 Swiss francs, you will be paid your earnings from **one randomly selected period**. That is, the computer will randomly select one period out of 30 at the end of the study to count for payment. Since you do not know which period the computer will randomly select, you must consider your decisions in each of the 30 periods very carefully.

During the study, we will not speak of Swiss francs, but of points. The points you earn during the study will be converted to Swiss francs at the end of the study. The following conversion rate applies:

6 points = 2 Swiss francs

At the end of today's study, you will receive your payment **in cash**.

We will explain **the exact procedures for Part I on the next pages**. You will receive instructions about all changes, if any, to the procedures prior to the start of Part II. *Note that the decisions taken in Part I of the study do **not** influence the procedures for Part II.*

Communication with the other participants is strictly forbidden during the study. Violation of this rule will lead to exclusion from the study and loss of all payments.

For the sake of simplicity, we will always use male forms of pronouns for participants; the instructions obviously also refer to female participants.

A. THE MARKET ACTIVITY

In all periods in Parts I and II, you will participate in the same market activity, described below.

► Market participants

There are three types of participants in this study: Participants A, B, and C. **Participants A are sellers and Participants B are buyers. Participants C can neither sell nor buy, but they can incur losses due to the transactions between Participants A and B.**

The participants are divided into groups of 18 people. There are **six** Participants A (sellers), **six** Participants B (buyers), and **six** Participants C in each group.

You will see whether you are Participant A, B, or C on your screen at the beginning of the study. **Your role as Participant A, B, or C will remain the same during the entire study**.

► Market products

In the market activity, different types of product can be exchanged, i.e. sold and bought. The **type of product** refers to the **loss** that exchanging a product imposes on Participants C. A product only creates a loss when it is sold by a Participant A (seller) to a Participant B (buyer).

Each possible type of product produces a particular loss for the six Participants C, as shown in **Table 1**. The *individual loss* is the loss that the product imposes on each Participant C. This can be any value from 0 to 10. Because there are six Participants C who all incur the same loss from a product, the total *combined loss* produced by a product corresponds to the individual loss multiplied by six, and is between 0 and 60. For example, if the individual loss from a product is 5 points for each of the six Participants C then the combined loss produced by this product is 6 $\boldsymbol{x}$ 5 = 30 points.

Each type of product entails a production cost for Participant A when the product is sold. The production cost is **between 20 and 30 points** and **depends on the type of product**. Lower production costs imply higher losses for Participants C. Specifically, each decrease in the production cost of 1 point induces a 1-point increase in the individual loss for each Participant C (and, hence, a 6-point increase in the combined loss for all Participants C). **Table 1** shows the exact production cost for each type of product.

All products are **worth 70 points** to Participants B (buyers) when they are bought, regardless of what type of product it is.

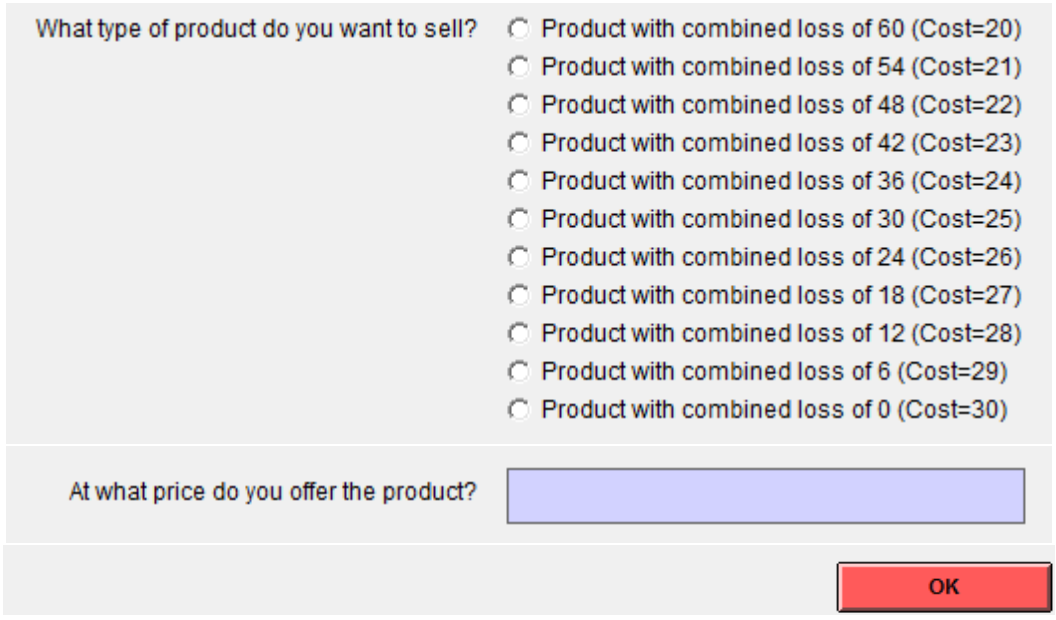
Please take a moment to look over the following table carefully. It is important for understanding how earnings in this study are determined.

Table 1: Types of products and corresponding production costs

Type of product (*Combined and individual losses for Cs produced by this product*)			Production cost
Combined loss of **60**	➔	Individual loss of **10**	**20**
Combined loss of **54**	➔	Individual loss of **9**	**21**
Combined loss of **48**	➔	Individual loss of **8**	**22**
Combined loss of **42**	➔	Individual loss of **7**	**23**
Combined loss of **36**	➔	Individual loss of **6**	**24**
Combined loss of **30**	➔	Individual loss of **5**	**25**
Combined loss of **24**	➔	Individual loss of **4**	**26**
Combined loss of **18**	➔	Individual loss of **3**	**27**
Combined loss of **12**	➔	Individual loss of **2**	**28**
Combined loss of **6**	➔	Individual loss of **1**	**29**
Combined loss of **0**	➔	Individual loss of **0**	**30**

► **<u>Market procedures</u>**

♦ Each **Participant A** (seller) can make **one sales offer** in each period, by entering it on the following screen:



More specifically, each Participant A must indicate:

- The type of product he would like to offer. To do this, he must click on the corresponding type of product.
- The price of the product. The corresponding number must be entered in the box. The price may be any integer between the production cost of the chosen product up to a maximum of 70.

Once a Participant A has made his decisions, he must click on the OK button at the bottom right of the screen. *Note that the type of product and the price can be changed until the OK button is clicked*.

Once all six Participants A have made their sales offers, they will be informed about the sales offers (price and type of product) made by all Participants A. This information will be on a screen like the one below:

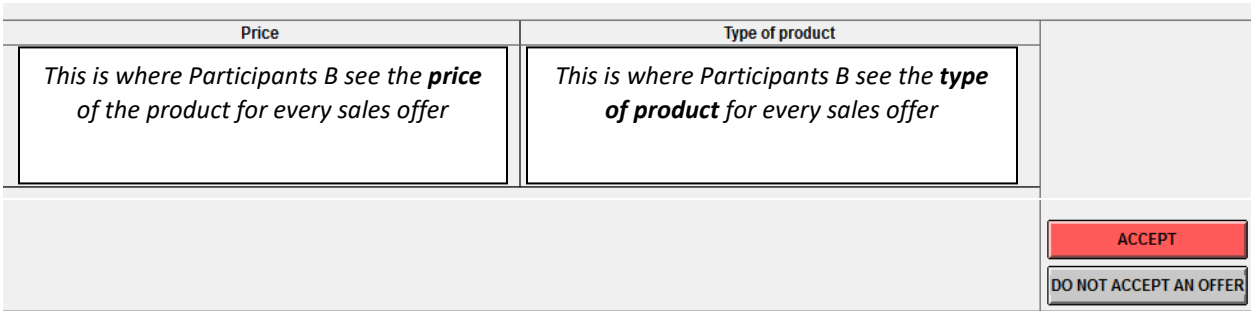
Price	Type of product	Quantity of products sold
*This is where Participants A see the **price** of the product for every sales offer*	*This is where Participants A see the **type of product** for every sales offer*	*This is where Participants A see the **quantity of products sold** for every sales offer*

A participant's own sales offer is always marked in blue. In the column on the right, Participants A will see how many Participants B (buyers) accept each of the offers, i.e. the quantity of the product sold by each of the six Participants A.

Each Participant B will make his decision by selecting from one of the six offers, or deciding not to purchase a product. A maximum of 6 products can thus be sold in a given period. These products can be sold by the same or by different Participants A. Therefore, each Participant A can sell between 0 and 6 products in a period.

Once all Participants B have made their decisions, each Participant A will learn the payments of all Participants A. Participants A will also be informed about each Participant B's purchasing decisions and payments. Finally, Participants A will learn the losses incurred by Participants C due to the product(s) he sold.

♦ Each **Participant B** (buyer) can decide whether or not to accept at most one offer. In each period, they can see the six sales offers on a screen like the one below:



The prices appear in the left column of the table, and the type of product appears in the right column. Each offer is always in a separate row.

- If a Participant B wants to accept an offer, he must first click on the corresponding row. The marked row will then appear with a blue background. In order to accept the offer marked in blue, Participant B must click on the ACCEPT button. *Note that the choice of offer can be changed until the ACCEPT button is clicked*.
- If a Participant B does not want to accept any offer, he must click on the DO NOT ACCEPT AN OFFER button. *Note that even if a row had already been marked, all offers will be declined if the DO NOT ACCEPT AN OFFER button is clicked.*

When all Participants B have made their decisions, each Participant B will learn of his own payment and the corresponding losses incurred by Participants C based on his decision.

♦ **Participants C** cannot make any decisions during this study. We ask Participants C, however, to indicate in each period their expectations about the behaviors of Participants A (sellers) and B (buyers).

When all Participants A and B have made their decisions, Participants C will learn of their own payments, which are entirely dependent on the decisions of Participants A and B. These payments depend on the type of products exchanged: Each time a product is exchanged, each of the six Participants C incurs the associated individual loss from that product, which is between 0 and 10 points. Since up to 6 products can be exchanged, **the sum of the individual losses incurred by each Participant C is between 0 and 60 points**.

After all participants have been informed about their payments in a period, the next period will begin.

Note that, during each period, you will see a timer in the top right corner of your screen. Please use the time indicated by the timer to make your decision.

B. PAYMENTS OF PARTICIPANTS

In each period, each Participant A, B, and C initially receives an endowment of **100 points**. The payments in points of Participant A (seller), Participant B (buyer), and Participant C in a period are then determined as follows:

► Participant A's payment:

$$100 + \text{quantity sold} \times (\text{price} - \text{production cost})$$

where the production cost, between 20 and 30, depends on the type of product offered, as shown in Table 1.

Note: if no Participant B accepts Participant A's sales offer, A's payment is ***100***.

► Participant B's payment:

- If Participant B makes a purchase:

$$100 + 70 - \text{price}$$

- If Participant B does not make a purchase, his payment is ***100***.

► Participant C's payment:

$$100 - \text{sum of individual losses}$$

where the *sum of individual losses* is the sum of the individual losses for a Participant C resulting from all products that are exchanged.

Note: if all six Participants B purchase a product with the smallest possible individual loss (0) for Participants C or do not purchase a product, Participants C's payment is ***100***; if all six Participants B purchase a product with the largest possible individual loss (10) for each Participant C, Participant C's payment is ***40***.

C. EXAMPLES

► Example 1

Assume that a Participant A (seller) offers a product with a combined loss of 30 points (i.e. an individual loss of 5 points) at the price of 40 and **all six** Participants B (buyers) accept this offer. The following payments will result:

- A product with a combined loss of 30 points for Participants C costs 25 points to produce (see Table 1 on Page 3). The Participant A's payment is thus equal to:

  100 + quantity sold x (price – production cost) = 100 + 6 x (40 – 25) = 190

- Each Participant B purchased a product. Therefore, each Participant B's payment is equal to:

  100 + 70 – price = 100 + 70 – 40 = 130

- When a product with a combined loss of 30 points is sold, it imposes an individual loss of 5 points on each of the six Participants C. Since six products are sold, the sum of the individual losses for a Participant C is equal to 30 points (*6 x 5)*. Each Participant C's payment is thus equal to:

  100 – sum of individual losses = 100 – 6 x 5 = 100 – 30 = 70.

► Example 2

Assume that **four** Participants B (buyers) accept an offer for a product with a combined loss of 18 points (i.e. individual loss of 3 points). The remaining **two** Participants B accept an offer for a product with a combined loss of 42 points (i.e. individual loss of 7 points). Here we focus on the payments to each Participant C:

When a product with a combined loss of 18 points is sold, it imposes an individual loss of 3 points on each of the six Participants C. Since four products of this type are sold, each Participant C thus incurs a loss of 12 points (*4 X 3*) from these products.

In addition, when a product with a combined loss of 42 points is sold, it imposes an individual loss of 7 points on each of the six Participants C. Since two products of this type are sold, each Participant C thus incurs a loss of 14 points (*2 X 7*) from these two products.

Each Participant C's payment is thus equal to:

100 – sum of individual losses = 100 – (4 x 3) – (2 x 7) = 100 – 12 – 14 = 74

Instructions for Part II

A. THE MARKET GAME

As previously announced, the market activity remains the same in Part II.

► **Participants A** are sellers. At the beginning of each period, each Participant A makes an offer to sell a product. To do so, he has to determine the price and the type (i.e. the losses for Participants C) of the product he would like to offer.

► **Participants B** are buyers. Each Participant B can then choose to buy one product from one of the Participants A, or can choose not to buy a product.

► **Participants C** can neither sell nor buy, but they can incur losses due to the transactions between Participants A and B.

Your role in Part II is the same as it was in Part I.

B. PAYMENTS OF PARTICIPANTS

In Part II, the way payments are determined by the market activity is the same as in Part I.

In each period, each Participant A, B, and C initially receives an endowment of 100 points as in Part I.

The payments of Participant A (seller), Participant B (buyer), and Participant C in a period are thus determined as follows:

► Participant A's payment:

100 + quantity sold x (price – production cost)

where the production cost, between 20 and 30, depends on the type of product offered, as shown in Table 1.

Note: if no Participant B accepts Participant A's sales offer, Participant A's payment is ***100.***

► Participant B's payment:

- If Participant B makes a purchase:

100 + 70 – price

- If Participant B does not make a purchase, his payment is ***100***.

► Participant C's payment:

100 – sum of individual losses

where the *sum of individual losses* is the sum of the individual losses for a Participant C resulting from all products that are exchanged.

Note: if all six Participants B purchase a product with the smallest possible individual loss (0) for Participants C or do not purchase a product, Participants C's payment is ***100***; if all six Participants B purchase a product with the largest possible individual loss (10) for each Participant C, Participant C's payment is ***40***.

To summarize: Part II is identical to Part I.

Do you have any further questions? If yes, please raise your hand. We will come to you at your workplace. Otherwise, we ask you to click the "OK" button.

Instructions for Part II

A. THE MARKET GAME

As previously announced, the market activity remains the same in Part II.

► **Participants A** are sellers. At the beginning of each period, each Participant A makes an offer to sell a product. To do so, he has to determine the price and the type (i.e. the total loss for Participant C) of the product he would like to offer.

► **Participants B** are buyers. Each Participant B can then choose to buy one product from one of the Participants A, or can choose not to buy a product.

► **Participants C** can neither sell nor buy, but they can incur losses due to the transactions between Participants A and B.

Your role in Part II is the same as it was in Part I.

B. PAYMENTS OF PARTICIPANTS

In Part II, the way payments are determined is different than in Part I.

In each period, each Participant A and each Participant C initially receives an endowment of 100 points as in Part I. But the endowments of the Participants B now change. Specifically, each Participant B now receives an initial endowment of 200 points in each period.

The payments of Participant A (seller), Participant B (buyer), and Participant C in a period are thus determined as follows:

► Participant A's payment:

100 + quantity sold x (price – production cost)

where the production cost, between 20 and 30, depends on the type of product offered, as shown in Table 1.

Note: if no Participant B accepts Participant A's sales offer, Participant A's payment is ***100.***

► Participant B's payment:

- If Participant B makes a purchase:

200 + 70 – price

- If Participant B does not make a purchase, his payment is ***200***.

► Participant C's payment:

100 – sum of individual losses

where the *sum of individual losses* is the sum of the individual losses for a Participant C resulting from all products that are exchanged.

Note: if all six Participants B purchase a product with the smallest possible individual loss (0) for Participants C or do not purchase a product, Participants C's payment is ***100***; if all six Participants B purchase a product with the largest possible individual loss (10) for each Participant C, Participant C's payment is ***40***.

To summarize: Part II is identical to Part I except that the initial endowments of Participants B are higher.

Do you have any further questions? If yes, please raise your hand. We will come to you at your workplace. Otherwise, we ask you to click the "OK" button.

Instructions for Part II

A. THE MARKET GAME

As previously announced, the market activity remains the same in Part II.

► **Participants A** are sellers. At the beginning of each period, each Participant A makes an offer to sell a product. To do so, he has to determine the price and the type (i.e. the total loss for Participant C) of the product he would like to offer.

► **Participants B** are buyers. Each Participant B can then choose to buy one product from one of the Participants A, or can choose not to buy a product.

► **Participants C** can neither sell nor buy, but they can incur losses due to the transactions between Participants A and B.

Your role in Part II is the same as it was in Part I.

B. PAYMENTS OF PARTICIPANTS

In Part II, the way payments are determined is different than in Part I.

In each period, each Participant A and each Participant C initially receives an endowment of 100 points as in Part I. But the endowments of the Participants B now change. Specifically, each Participant B now receives an initial endowment of 400 points in each period.

The payments of Participant A (seller), Participant B (buyer), and Participant C in a period are thus determined as follows:

► Participant A's payment:

100 + quantity sold x (price – production cost)

where the production cost, between 20 and 30, depends on the type of product offered, as shown in Table 1.

Note: if no Participant B accepts Participant A's sales offer, Participant A's payment is ***100.***

► Participant B's payment:

- If Participant B makes a purchase:

400 + 70 – price

- If Participant B does not make a purchase, his payment is ***400***.

► Participant C's payment:

100 – sum of individual losses

where the *sum of individual losses* is the sum of the individual losses for a Participant C resulting from all products that are exchanged.

Note: if all six Participants B purchase a product with the smallest possible individual loss (0) for Participants C or do not purchase a product, Participants C's payment is ***100***; if all six Participants B purchase a product with the largest possible individual loss (10) for each Participant C, Participant C's payment is ***40***.

To summarize: Part II is identical to Part I except that the initial endowments of Participants B are higher.

Do you have any further questions? If yes, please raise your hand. We will come to you at your workplace. Otherwise, we ask you to click the "OK" button.

Instructions for Part II

A. THE MARKET GAME

As previously announced, the market activity remains the same in Part II.

► **Participants A** are sellers. At the beginning of each period, each Participant A makes an offer to sell a product. To do so, he has to determine the price and the type (i.e. the total loss for Participant C) of the product he would like to offer.

► **Participants B** are buyers. Each Participant B can then choose to buy one product from one of the Participants A, or can choose not to buy a product.

► **Participants C** can neither sell nor buy, but they can incur losses due to the transactions between Participants A and B.

Your role in Part II is the same as it was in Part I.

B. PAYMENTS OF PARTICIPANTS

In Part II, the way payments are determined is different than in Part I.

In each period, each Participant A and each Participant C initially receives an endowment of 100 points as in Part I. But the endowments of some Participants B now change. Specifically, four Participants B now each receive an initial endowment of 100 points and two Participants B now each receive an initial endowment of 400 points. The endowment that a particular Participant B receives will be randomly determined and will be the same for all of Part II. Each Participant B will be informed about the amount of their initial endowment on their screen once Part II begins.

The payments of Participant A (seller), Participant B (buyer), and Participant C in a period are thus determined as follows:

► Participant A's payment:

$$100 + \text{quantity sold} \times (\text{price} - \text{production cost})$$

where the production cost, between 20 and 30, depends on the type of product offered, as shown in Table 1.

Note: if no Participant B accepts Participant A's sales offer, Participant A's payment is ***100.***

► Participant B's payment:

If Participant B initially receives 100:

- If Participant B makes a purchase:

100 + 70 – price

- If Participant B does not make a purchase, his payment is ***100***.

If Participant B initially receives 400:

- If Participant B makes a purchase:

400 + 70 – price

- If Participant B does not make a purchase, his payment is ***400***.

► Participant C's payment:

100 – sum of individual losses

where the *sum of individual losses* is the sum of the individual losses for a Participant C resulting from all products that are exchanged.

Note: if all six Participants B purchase a product with the smallest possible individual loss (0) for Participants C or do not purchase a product, Participants C's payment is ***100***; if all six Participants B purchase a product with the largest possible individual loss (10) for each Participant C, Participant C's payment is ***40***.

To summarize: Part II is identical to Part I except that the initial endowments of some Participants B are higher.

Do you have any further questions? If yes, please raise your hand. We will come to you at your workplace. Otherwise, we ask you to click the "OK" button.

F. Experimental Instructions for Study 2

In the following, we provide the instructions for Part I, and the instructions for Part II for the treatments *Baseline*, *High (consumers)* and *High (consumers & firms)*.

General instructions

We are pleased to welcome you to this economic study.

Please read the following instructions carefully. You can—depending on your decisions and/or those of the other participants—earn money in addition to the **15 Swiss francs** that you receive as an initial participation payment. It is thus very important that you read the instructions carefully.

This study will have **two parts**. Part I lasts 10 periods and Part II lasts 20 periods. The entire study will thus last for **30 periods**.

In addition to the initial participation payment of 15 Swiss francs, you will be paid your earnings from **one randomly selected period**. That is, the computer will randomly select one period out of 30 at the end of the study to count for payment. Since you do not know which period the computer will randomly select, you must consider your decisions in each of the 30 periods very carefully.

During the study, we will typically not refer to Swiss francs, but instead to "points." The points you earn during the study will be converted to Swiss francs at the end of the study. The following conversion rate applies:

6 points = 2 Swiss francs

At the end of today's study, you will receive your payment **in cash**.

We will explain **the exact procedures for Part I on the next pages**. You will receive instructions about all changes, if any, to the procedures prior to the start of Part II. *Note that the decisions taken in Part I of the study do **not** influence the procedures for Part II.*

Communication with the other participants is strictly forbidden during the study. Violation of this rule will lead to exclusion from the study and loss of all payments.

For the sake of simplicity, we will always use male forms of pronouns for participants; the instructions obviously also refer to female participants.

A. THE MARKET ACTIVITY

In all periods in Parts I and II, you will participate in the same market activity, described below.

► Market participants

There are two types of participants in this study: Participants A and B. **Participants A are sellers and Participants B are buyers.**

The participants are divided into groups of 12 people. There are **six** Participants A (sellers) and **six** Participants B (buyers) in each group.

You will see whether you are Participant A or B on your screen at the beginning of the study. **Your role as Participant A or B will remain the same during the entire study**.

► Donation

Participants A and B can influence the size of a donation that will be made at the end of this study. Specifically, for each 12-person group (six participants A and six participants B), we generated a donation of 360 points to an organization called *Carbon Offsets To Alleviate Poverty* (COTAP). This organization supports certified forestry projects in under-developed countries, which help reduce CO_2 in the atmosphere and create life-changing income for the world's poorest people. More details about COTAP's mission are provided in Section C below. The initial size of this donation, 360 points, is the same for each group. However, the size of the actual donation made may change based on the choices of the 6 participants A and 6 participants B in your group, as explained in the instructions below.

► Market products

In the market activity, different types of products can be exchanged, i.e., sold and bought. The **type of product** refers to a **reduction**, or loss, that exchanging that particular type of product imposes on the size of the donation. A product only creates a reduction in the donation when it is sold by a Participant A (seller) to a Participant B (buyer).

Each possible type of product produces a particular reduction in the size of the donation, as shown in **Table 1**. The reduction produced by each type of product is between 0 and 60. For instance, one type of product (shown at the top) produces a reduction of 60 points from the total donation for your group. A different type of product (shown at the bottom) produces no reduction from the total donation for your group. Other types of products produce different reductions from the size of the donation, as shown in Table 1.

Each type of product entails a production cost for Participant A when the product is sold. The

production cost is **between 20 and 40 points** and **depends on the type of product**. Lower production costs imply higher reductions in the size of the donation. Specifically, each decrease in the production cost of 2 point induces a 6-point reduction to the donation. **Table 1** shows the exact production cost for each type of product.

All products are **worth 70 points** to Participants B (buyers) when they are bought, regardless of what type of product it is.

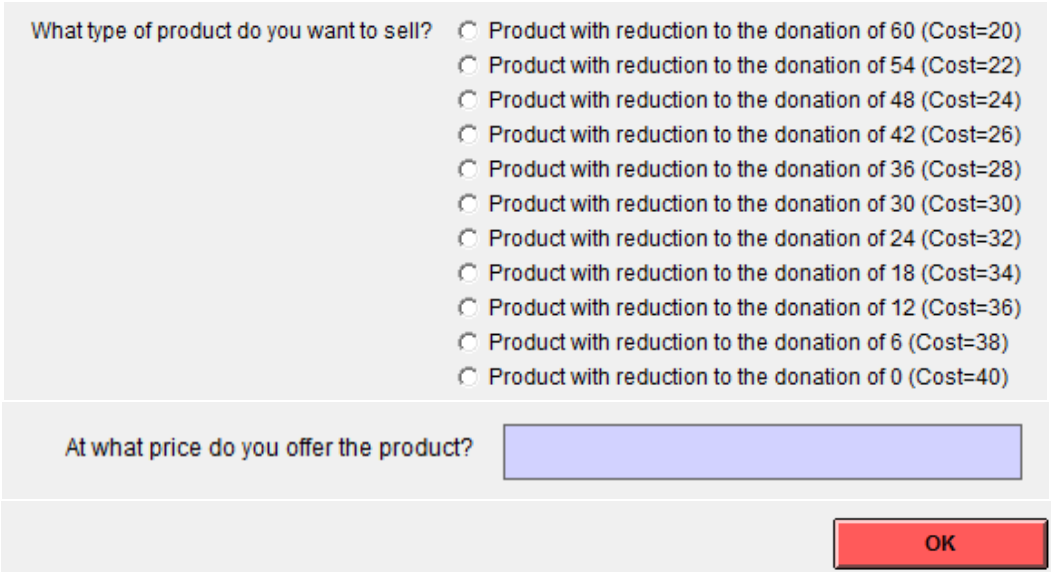
Please take a moment to look over the following table carefully. It is important for understanding how earnings in this study are determined.

Table 1: Types of products and corresponding production costs

Type of product (*reduction to the donation produced by this product*)	Production cost
Reduction to the donation of **60**	**20**
Reduction to the donation of **54**	**22**
Reduction to the donation of **48**	**24**
Reduction to the donation of **42**	**26**
Reduction to the donation of **36**	**28**
Reduction to the donation of **30**	**30**
Reduction to the donation of **24**	**32**
Reduction to the donation of **18**	**34**
Reduction to the donation of **12**	**36**
Reduction to the donation of **6**	**38**
Reduction to the donation of **0**	**40**

► **Market procedures**

♦ Each **Participant A** (seller) can make **one sales offer** in each period, by entering it on the following screen:



More specifically, each Participant A must indicate:

- The type of product he would like to offer. To do this, he must click on the corresponding type of product.
- The price of the product. The corresponding number must be entered in the box. The price may be any integer between the production cost of the chosen product up to a maximum of 70.

Once a Participant A has made his decisions, he must click on the OK button at the bottom right of the screen. *Note that the type of product and the price can be changed until the OK button is clicked*.

Once all six Participants A have made their sales offers, they will be informed about the sales offers (price and type of product) made by all Participants A. This information will be on a screen like the one below:

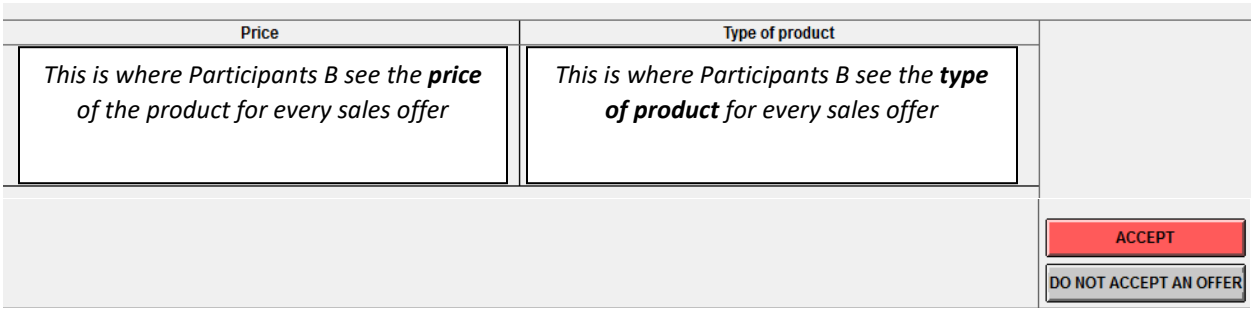
Price	Type of product	Quantity of products sold
*This is where Participants A see the **price** of the product for every sales offer*	*This is where Participants A see the **type of product** for every sales offer*	*This is where Participants A see the **quantity of products sold** for every sales offer*

A participant's own sales offer is always marked in blue. In the column on the right, Participants A will see how many Participants B (buyers) accept each of the offers, i.e. the quantity of the product sold by each of the six Participants A.

Each Participant B will make his decision by selecting from one of the six offers, or deciding not to purchase a product. A maximum of 6 products can thus be sold in a given period. These products can be sold by the same or by different Participants A. Therefore, each Participant A can sell between 0 and 6 products in a period.

Once all Participants B have made their decisions, each Participant A will learn the payments of all Participants A. Participants A will also be informed about each Participant B's purchasing decisions and payments. Finally, Participants A will learn the amount of the reduction imposed on the donation due to the product(s) sold.

♦ Each **Participant B** (buyer) can decide whether or not to accept at most one offer. In each period, they can see the six sales offers on a screen like the one below:



The prices appear in the left column of the table, and the types of products appears in the right column. Each offer is always in a separate row.

- If a Participant B wants to accept an offer, he must first click on the corresponding row. The marked row will then appear with a blue background. In order to accept the offer marked in blue, Participant B must click on the ACCEPT button. *Note that the choice of offer can be changed until the ACCEPT button is clicked*.
- If a Participant B does not want to accept any offer, he must click on the DO NOT ACCEPT AN OFFER button. *Note that even if a row had already been marked, all offers will be declined if the DO NOT ACCEPT AN OFFER button is clicked.* When a buyer does not purchase a product, there is no reduction to the size of the donation.

When all Participants B have made their decisions, each Participant B will learn of his own payment and the corresponding reduction to the amount of the donation based on his decision.

When all Participants A and B have made their decisions, they will all learn the total reduction imposed on the size of the donation of 360 points, and thus the total amount donated to COTAP in their group. The size of the donation is entirely dependent on the decisions of Participants A and B as it depends on the type of products exchanged: Each time a product is exchanged, the donation is reduced by the amount corresponding to that product type, which is between 0 and 60 points. Since up to 6 products can be exchanged, **the total amount of the reduction to the size of the donation for the group is between 0 and 360 points**.

After all participants have been informed about their payments in a period, the next period will begin.

Note that, during each period, you will see a timer in the top right corner of your screen. Please use the time indicated by the timer to make your decision.

B. PAYMENTS OF PARTICIPANTS

In each period, each Participant A and Participant B initially receives an endowment of **100 points**. The payments in points of Participant A (seller) and Participant B (buyer) in a period are then determined as follows:

► Participant A's payment:

$$100 + \text{quantity sold } X \text{ (price } - \text{ production cost)}$$

where the production cost, between 20 and 40, depends on the type of product offered, as shown in Table 1.

Note: if no Participant B accepts Participant A's sales offer, A's payment is ***100***.

► Participant B's payment:

- If Participant B makes a purchase:

$$100 + 70 - \text{price}$$

- If Participant B does not make a purchase, his payment is ***100***.

C. DONATION

In each period, a donation to COTAP equal to 360 points is generated for your group. The size of the actual donation can change based on the types of products exchanged.

The mission of COTAP is to empower individuals and organizations in developed countries to address both **climate change** and **global poverty**. COTAP counteracts carbon emissions through certified forestry projects in under-developed regions, which create transparent, accountable, and life-changing earnings for rural farming communities where income levels are less than $2 per day.

COTAP sources carbon offset funds from those who care about both climate change and poverty alleviation, pools those funds, and transparently matches those funds with their partners' forestry projects in order to fill the forestry carbon finance gap, restore landscapes, and create direct, significant, verifiable, and lasting benefits for the most economically vulnerable people in the world.

Through COTAP, you are paying smallholder farmers in developing countries for planting and maintaining trees, which capture and store your CO2 emissions. A donation of 6 points (= CHF 2) offsets 0.2 tons of carbon dioxide (CO_2), or 200 Kg of CO_2.

► The total amount donated for your group:

360 – combined losses to the donation

where the *combined losses to the donation* equals the sum of the reductions to the donation resulting from all products that are exchanged.

Note: if all six Participants B purchase a product with the smallest possible reduction (0) for the donation or do not purchase a product, the total amount donated will equal ***360*** (CHF 120); if all six Participants B purchase a product with the largest possible reduction (60) for the donation, the total amount donated will equal ***0*** (CHF 0).

Remember that you will be paid your earnings from **one randomly selected period**. This selected period will also determine the actual donation that is made to COTAP.

At the end of today's session, you will have the possibility to request that we send you a receipt confirming the precise donation that we will make on behalf of your group to COTAP. To do so, you will be prompted to type in your e-mail address and we will send you a dated receipt indicating the donated amount. Thus, you can verify that COTAP actually receives the money donated on behalf your group. Your e-mail will not be used for any other purposes and will not be stored with the data from this study.

D. EXAMPLES

► Example 1

Assume that a Participant A (seller) offers a product with a reduction to the donation of 30 points at the price of 40 and **all six** Participants B (buyers) accept this offer. The following payments will result:

- A product with a reduction of 30 points costs 30 points to produce (see Table 1 on Page 3). The Participant A's payment is thus equal to:
  *100 + quantity sold **X** (price – production cost) = 100 + 6 **X** (40 – 30) = 160*

- Each Participant B purchased a product. Therefore, each Participant B's payment is equal to:
  100 + 70 – price = 100 + 70 – 40 = 130

- When a product with a reduction of 30 points is sold, the donation is reduced by 30 points. Since six products are sold, the combined losses for the donation are equal to 180 points (*6 **X** 30)*. The total amount donated is thus equal to:
  *360 – combined losses = 360 – 6 **X** 30 = 360 – 180 = 180.*

  The total amount donated for the group thus equals CHF 60.

► Example 2

Assume that **four** Participants B (buyers) accept an offer for a product with a reduction of 18 points. The remaining **two** Participants B accept an offer for a product with a reduction of 42 points. Here we focus on the total amount donated.

When a product with a reduction of 18 points is sold, the donation is reduced by 18 points. Since four products of this type are sold, the sum of the reductions to the size of the donation for these products is equal to 72 points (*4 **X** 18)*.

In addition, when a product with a loss of 42 points is sold, the donation is reduced by 42 points. Since two products of this type are sold, the sum of the reductions to the size of the donation for these products is equal to 84 points (*2 **X** 42)*.

The combined loss to the donation is thus equal to:

*360 – combined losses = 360 – (4 **X** 18) – (2 **X** 42) = 360 – 72 – 84 = 204.*

The total amount donated for the group thus equals CHF 68.

Instructions for Part II

A. THE MARKET GAME

As previously announced, the market activity remains the same in Part II.

► **Participants A** are sellers. At the beginning of each period, each Participant A makes an offer to sell a product. To do so, he has to determine the price and the type (i.e., the reduction to the donation) of the product he would like to offer.

► **Participants B** are buyers. Each Participant B can then choose to buy one product from one of the Participants A, or can choose not to buy a product.

Your role in Part II is the same as it was in Part I.

Participants A and B can influence the size of the donation that will be made to COTAP at the end of this study. As in Part I, the initial size of this donation, 360 points, is the same for each group.

B. PAYMENTS OF PARTICIPANTS

In Part II, the way payments are determined by the market activity is the same as in Part I.

In each period, each Participant A and Participant B initially receives an endowment of 100 points as in Part I.

The payments of Participant A (seller) and Participant B (buyer) in a period are thus determined as follows:

► Participant A's payment:

$$100 + \text{quantity sold} \times (\text{price} - \text{production cost})$$

where the production cost, between 20 and 40, depends on the type of product offered, as shown in Table 1.

Note: if no Participant B accepts Participant A's sales offer, Participant A's payment is ***100.***

► Participant B's payment:

- If Participant B makes a purchase:

$$100 + 70 - price$$

- If Participant B does not make a purchase, his payment is ***100***.

C. DONATION

In Part II, the way donations are determined by the market activity is the same as in Part I.

In each period, a donation to COTAP equal to 360 points is generated for your group. The size of the actual donation can change based on the types of products exchanged.

► The total amount donated for your group:

$$360 - combined\ losses\ to\ the\ donation$$

where the *combined losses to the donation* equals the sum of the reductions to the donation resulting from all products that are exchanged.

To summarize: Part II is identical to Part I.

Do you have any further questions? If yes, please raise your hand. We will come to you at your workplace. Otherwise, we ask you to click the "OK" button.

Instructions for Part II

A. THE MARKET GAME

As previously announced, the market activity remains the same in Part II.

► **Participants A** are sellers. At the beginning of each period, each Participant A makes an offer to sell a product. To do so, he has to determine the price and the type (i.e., the reduction to the donation) of the product he would like to offer.

► **Participants B** are buyers. Each Participant B can then choose to buy one product from one of the Participants A, or can choose not to buy a product.

Your role in Part II is the same as it was in Part I.

Participants A and B can influence the size of the donation that will be made to COTAP at the end of this study. As in Part I, the initial size of this donation, 360 points, is the same for each group.

B. PAYMENTS OF PARTICIPANTS

In Part II, the way payments are determined is the same as in Part I, except for one change.

In each period, each Participant A initially receives an endowment of 100 points as in Part I. But the endowments of the Participants B is now different than in Part I. Specifically, each Participant B now receives an initial endowment of 400 points in each period.

The payments of Participant A (seller) and Participant B (buyer) in a period are thus determined as follows:

► Participant A's payment:

100 + quantity sold X (price – production cost)

where the production cost, between 20 and 40, depends on the type of product offered, as shown in Table 1.

Note: if no Participant B accepts Participant A's sales offer, Participant A's payment is ***100.***

► Participant B's payment:

- If Participant B makes a purchase:

400 + 70 – price

- If Participant B does not make a purchase, his payment is ***400***.

C. DONATION

In Part II, the way donations are determined by the market activity is the same as in Part I.

In each period, a donation to COTAP equal to 360 points is generated for your group. The size of the actual donation can change based on the types of products exchanged.

► The total amount donated for your group:

360 – combined losses to the donation

where the *combined losses to the donation* equals the sum of the reductions to the donation resulting from all products that are exchanged.

To summarize: Part II is identical to Part I except that the initial endowments of Participants B are higher.

Do you have any further questions? If yes, please raise your hand. We will come to you at your workplace. Otherwise, we ask you to click the "OK" button.

Instructions for Part II

A. THE MARKET GAME

As previously announced, the market activity remains the same in Part II.

► **Participants A** are sellers. At the beginning of each period, each Participant A makes an offer to sell a product. To do so, he has to determine the price and the type (i.e., the reduction to the donation) of the product he would like to offer.

► **Participants B** are buyers. Each Participant B can then choose to buy one product from one of the Participants A, or can choose not to buy a product.

Your role in Part II is the same as it was in Part I.

Participants A and B can influence the size of the donation that will be made to COTAP at the end of this study. As in Part I, the initial size of this donation, 360 points, is the same for each group.

B. PAYMENTS OF PARTICIPANTS

In Part II, the way payments are determined is the same as in Part I, except for one change.

The endowments of each Participant A and Participant B are now different than in Part I. Specifically, each Participant A and Participant B now receives an initial endowment of 400 points in each period. The payments of Participant A (seller) and Participant B (buyer) in a period are thus determined as follows:

► Participant A's payment:

400 + quantity sold X (price – production cost)

where the production cost, between 20 and 40, depends on the type of product offered, as shown in Table 1.

Note: if no Participant B accepts Participant A's sales offer, Participant A's payment is ***400.***

► Participant B's payment:

- If Participant B makes a purchase:

400 + 70 – price

- If Participant B does not make a purchase, his payment is ***400***.

C. DONATION

In Part II, the way donations are determined by the market activity is the same as in Part I.

In each period, a donation to COTAP equal to 360 points is generated for your group. The size of the actual donation can change based on the types of products exchanged.

► The total amount donated for your group:

360 – combined losses to the donation

where the *combined losses to the donation* equals the sum of the reductions to the donation resulting from all products that are exchanged.

To summarize: Part II is identical to Part I except that the initial endowments of Participants A and B are higher.

Do you have any further questions? If yes, please raise your hand. We will come to you at your workplace. Otherwise, we ask you to click the "OK" button.