

STRATEGIC BOARD DECISION-MAKING

A PILOT CLASSROOM EXPERIMENT IN EXECUTIVE
COMPENSATION

RESEARCH MEMORANDUM

seo • amsterdam economics

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1 Introduction

We perform a pilot classroom experiment in strategic decision-making in a group context.

1.1 Background and Questions

Executive compensation is a cornerstone issue in corporate governance and, as such, a hotly contested issue. Shareholders, stakeholders and (non-)executive directors commonly ponder, discuss, or argue over the (desired) pay level and structure of executives' compensation packages and their implied incentives, as well as the fairness of pay outcomes. In this debate, one side of the argument holds that current pay practices induce myopic behavior from executives solely focused on short-term (financial) gains to the detriment of long-term financial and/or ESG-outcomes, as well as (sometimes) expressing a general disbelief in the effectiveness of pay arrangement in directing executives' behavior and decision-making. The other side of the argument highlights the incentives and accountability provided by executive pay-for-performance and, as such, note the value of executive compensation as a key instrument in corporate governance. Both sides of the argument find support in practice and the academic literature: executive compensation does provide (strong) incentives for executive behavior and decision making, thus (potentially) driving firm performance, but, as such those incentive may also result in adverse outcomes for firms, shareholders, and stakeholders if incentives are structured poorly or governance is weak.

Against this backdrop, Reward Value – an NGO focused on reforming executive compensation practices – has commissioned SEO Amsterdam Economics to assess current and potential new models of executive pay. As such, this Research Memorandum is a follow-up to our prior studies into executive compensation. In these prior studies by SEO, we have established the empirical relation between pay and (non-)performance, both from an observational and an experimental perspective (for the experimental perspective, see Verheuvél et al., 2022). These prior studies highlighted that executive compensation may spur different firm outcomes (both in terms of long-term financial outcomes, as well as in the ESG space), but also left open questions, specifically regarding the role of collaboration in boards, the role of board composition, as well as way in which differences in firm outcomes are achieved through the process of discussing and determining firm strategy.

In response, this Research Memorandum documents the execution of a classroom experiment focused on directly measuring and assessing the behavioral and decision-making changes induced by compensation in a group decision-making context. We deem the execution of this classroom experiment a pilot for future larger scale experiments.

1.2 Setup and Initial Findings

Our experimental setup is a tournament game in which groups of participants ('boards') make strategic allocative decisions on firm resources subject to different incentive schemes. Different boards share a common objective, namely, to be ranked the best performing board at the end of the game. Boards progress on this ranking based on their firm's performance as well as the board's performance in relation to their (board-specific) incentive scheme. The game proceeds in eight rounds. In every round, boards deliberate and come to their decision on the allocation of their resources, after which the results for that round (including the current ranking) are revealed to the

participants. Before the next round starts, boards are asked to reflect on their performance, to outline their decision-making process, and to motivate their allocative decisions.

Experiment participants were sourced in two rounds from MBA courses at IMD Business School (Switzerland) and Nyenrode Business University (the Netherlands). In total 21 boards (62 students) participated in this pilot round of experiments. Before the start of the experiment, all participants completed individual questionnaires to assess participant preferences, experience, and knowledge. After the experiment, before the winning board was revealed to the participants, the participants engaged in a guided plenary discussion in order to reflect on performance and lessons learned, thus serving a secondary didactic aim of the experiment.

Tentative findings suggest that incentives directly affect group strategy discussions and decisions. The result of the experiment shows that participants with a profit target obtained the highest profits but that these boards also had the most negative impact on the environment and the lowest social impact. Boards with profit targets also address financial goals more commonly in their strategy discussions. A similar result holds for boards with an ESG target: they have the best environmental and social impact and focus more on ESG in their strategy discussions. Finally, boards with a R&D target have the highest outcome in R&D but do not mention necessarily mention R&D more in their strategy. These results are of note given that board could ignore their board-specific objectives and still win the game - in fact, dominating strategies existed.

1.3 Related Literature

Our experiment relates to the literature on board characteristics, executive personality, and tournament games.

Effects of CEO and group characteristics on strategic decision making

The literature on managerial influence has often focused on the impact of CEOs on organizational outcomes, especially through managerial ability - e.g. the efficiency with which CEOs use resources to generate revenue. Indeed, previous research has found associated positive links between high managerial ability and firm performance, based both on market measures of performance (Holcomb et al., 2009), as on managerial fixed effects (Demerijan et al., 2012). These findings highlight the importance of individual differences in the CEOs effectiveness and efficiency on firm outcomes.

Looking at managerial influence from a psychological perspective, research in this domain has also drawn a link between factors pertaining to individual difference between CEOs and strategic decision-making. Mitchell et al. (2011) found in a sample of 64 CEOs, that higher reported metacognitive experience, which was defined as the extent to which an individual believes they have the cognitive capacity and flexibility to allow them to successfully perform a certain task, was significantly related to more consistent strategic decision-making. These findings point toward a need to consider how factors relating to one's personality, can direct the way in which CEOs influence decision-making processes and indeed organizational outcomes. In fact, exhibiting certain stable personality characteristics, such as cognitive ability, tolerance of risk, intuition, and a propensity to act, has also been found to be instrumental in strategic decision-making processes (Wally & Baum, 1994).

In a similar vein, Papadakis et al. (1998) also investigated how personality characteristics of top managers played an important role in the strategic decision-making process. However, of note, they identified that whilst personality characteristics shape the strategic decision-making process, the nature and context of the decision environment had the most important impact on the process. In real-world situations, major decisions within organizations are not

taken solely by CEOs, but rather by top management boards and thus are governed by the personalities involved. Olson et al.'s. (2007) study provides credence to this view. They found that across 85 top management teams involved in strategic decision-making, cognitive diversity is significantly related to several core aspects of the strategic decision-making process, but this relationship is mediated by task conflict. Therefore, how board dynamics, in relation to the interplay of personality characteristics of top management, influence decision-making is an important avenue of investigation that our research will take.

The role of CEO characteristics in relation to CEO sensitivity to incentives

It is hypothesized that women and men respond differently to incentives, possibly widening the gender pay gap. Bandiera et al. (2021) find no evidence that performance pay does widen the gender earnings gap. They find that the gender response difference is close to zero and heterogeneity across studies is small. Thus, it can be concluded that both men and women respond rather similar to performance pay. Moreover, estimates indicate that performance pay does increase the output. The data thus support agency theory for men and women alike. Van Veldhuizen (2022) also does not find a gender gap in responsiveness to incentives but finds that the difference can be fully attributed to risk attitude and self-confidence. Aversion to competition does not seem to play a role.

However, other papers do find differences in response between men and women. Those papers find that women may respond less to incentive pay for a number of cultural and psychological reasons, such as differences in risk aversion or self-confidence. For example, women have been found to be more risk-averse than men (Charness & Gneezy 2012, Eckel & Grossman 2008a), less confident (Reuben et al., 2012; Niederle & Vesterlund, 2007), more altruistic (Croson & Gneezy 2009, Eckel & Grossman 2008b), and more averse to competition (Niederle & Vesterlund 2011). Importantly, moral hazard theory would predict that these traits affect the expected utility of effort and thus the response to performance pay. People with these traits are thus likely to respond less to incentive pay.

Some of these personality traits are correlated with a lower responsiveness to performance pay. Heite et al. (2019) found that subjects with low self-confidence react less strong to performance pay. In addition, Cadsby et al. (2007, 2016) both show that risk-averse subjects respond weaker to performance pay. The latter result can be connected to the study of Dohmen & Falk (2011). They study the impact of incentives on worker self-selection in a controlled laboratory experiment. Subjects face the choice between a fixed and a variable payment scheme. They find that output is higher in the variable-payment schemes compared to the fixed-payment scheme. This is largely driven by productivity sorting. Their study shows that different incentive schemes systematically attract individuals with different attitudes, such as the willingness to take risks, relative self-assessment as well as gender. They find that more risk averse people generally prefer a fixed-payment scheme. The variable-payment schemes generally attract fewer women. Burks et al. (2009) suggest that more egoist workers self-select performance pay firms.

Intrinsic motivation can also be a strong incentive for higher production, without corresponding performance pay. However, performance pay is more effective when there is a mission mismatch. Carpenter and Gong (2016) show in an experimental setting that when the intrinsic motivation of workers matches the firm's mission, productivity is higher than when there is a mismatch. Mission matched workers produce 72 percent more output than mismatched workers, this effect consists of a higher willingness to work, and a higher level of effort conditional on working. Offering pay-for-performance incentives raises output by 35 percent on average. However, the effect of incentive pay is almost seven times higher for mismatched workers than for matched workers (86 percent vs. 13 percent increase in output). This makes up two-thirds of the productivity loss due to the mismatch. Carpenter and Gong (2016, p.213) conclude that "high-powered incentives can substitute (albeit imperfectly) for mission matching between workers and employers."

Feedback timing in tournament experiments

An important element of dynamic tournaments is the decision whether to provide feedback or not, and what type of feedback to provide. Giving absolute feedback to participants gives an indication of the performance, but in a tournament setting, the relevant feedback is relative performance feedback. With relative performance feedback, participants can assess their position relative to other participants and evaluate their chances of winning the tournament, given the current strategy. Relative performance feedback generally raises efforts (Villevall, 2020). Apart from the monetary incentives, the “will to win”, “thrill of victory”, self-esteem, competitiveness and status are all relevant channels through which feedback can stimulate performance (Villevall, 2020, Klein & Schmutzler, 2021; Coffey & Maloney, 2010). Generally, feedback is more effective when participants with similar performance are grouped together, instead of a precise estimate of performance (e.g. rating A-F instead of decimal grades) (Goltsman & Mukherjee, 2011).

Giving feedback in intermediate rounds can dampen the effort in the final round, if the final round is less decisive for total performance (Goltsman & Mukherjee, 2011). Genakos and Pagliero (2012) find that the interim rank in tournaments has an inverted U-shape relationship with risk-taking. There is higher risk-taking when a participant is closely behind the leaders in the intermediate stage. Interim leaders generally reduce risk-taking, as they want to secure their position and not risk losing it (Genakos & Pagliero, 2012). Additionally, performance decreases when the subject is closer to the interim top, the authors suggest this is due to psychological pressure. Concluding, providing interim feedback has significant effects on performance and risk-taking. This should be considered when designing a tournament experiment, as not all results can be attributed to performance pay.

Shen and Zhang (2018) find that the larger the tournament incentive is for non-CEO executives, the more firms innovate, spend on R&D and issue patents. The tournament incentive in this case is the difference between CEO pay and non-CEO executive pay. These results indicate that the tournament incentive leads to higher effort and performance. The tournament incentive can be thought of as a block reward, as the winner only receives it when he/she becomes CEO.

2 Methodology

We perform a tournament-style classroom experiment in strategic decision-making with the objective of winning the game subject to an effort inducing mechanism and a differential treatment in the incentives provided.

2.1 Experimental setup

2.1.1 Overview of the experimental setting

Our experimental setup is a tournament game in which randomized groups of participants ('boards') make strategic allocative decisions on firm resources subject to different incentive schemes. One member of the board is randomly designated as the "CEO" in charge of finalizing group decisions. In the game, boards take control of identical firms known to them as the *Giant Rubber Corporation* (GRC). All boards share a common objective of becoming the best performing board by making strategic decisions on the allocation of firm resources. This is common knowledge to the participating boards. Boards progress on this ranking based on their firm's performance as well as the board's performance in relation to their (board-specific) incentive scheme. All boards receive a randomized incentive scheme for their performance. Whilst it is common knowledge to participating boards that individual boards receive randomized incentive schemes, boards do not know the incentive schemes of their competitors. The allocation of randomized incentive schemes is the treatment in the experiment.

The game proceeds in several rounds. Rounds last a (known) fixed amount of time. In every round, boards deliberate and come to their decision on the allocation of their resources, after which the results for that round (including the current ranking) are revealed to the participants. Before the next round starts, boards are asked to reflect on their performance, to outline their decision-making process, and to motivate their allocative decisions.

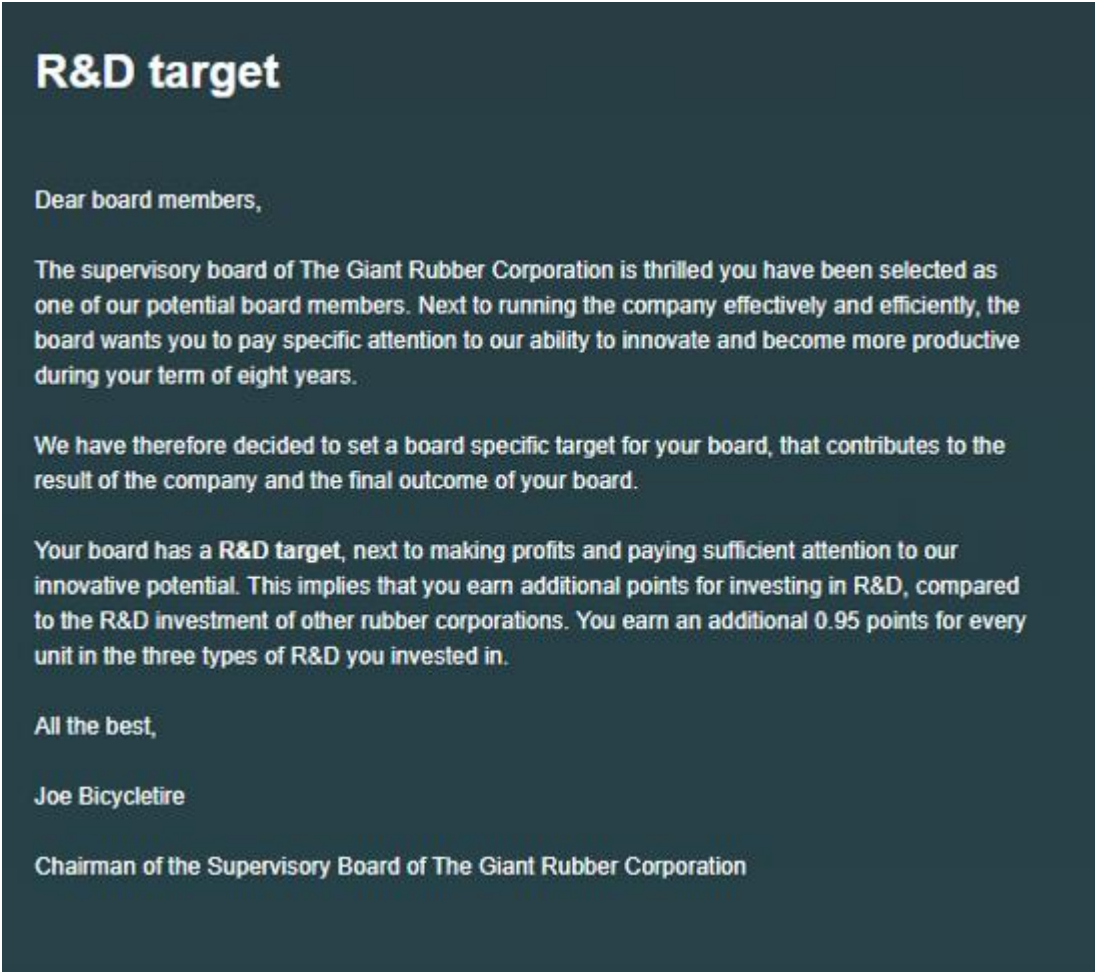
We induce effort from participating boards through indirect feedback on their performance. Specifically, every round boards know and directly observe their decision-making space (i.e., the allocative decisions they must make) and the projected results of their decision (e.g., projected profits). Boards, however, do not know the exact mapping of inputs to outcomes. As such, through repeated exposure over the rounds, boards must infer their optimal strategy. This inference is further complicated by the breadth of the input-space, as well as non-linearities in the mapping from inputs to outcomes, stochastics, and path-dependencies in certain inputs (see Section 2 below).

Practically, boards play the experimental game through a webpage. On this webpage, boards submit their decisions on the allocation of firm resources and receive feedback on their performance (both projected results of their actions during a round and the current ranking at the end of a round). Additionally, through this webpage boards also receive (additional) instructions on the game, their treatment, as well as an initial questionnaire and prompts after every round to reflect on their performance, to outline their decision-making process, and to motivate their allocative decisions.

Figure 1 illustrates the various features of the webpage employed during the experiment. Panel 1 of Figure 1 displays the administration of the treatment. Panel 2 displays the user interface for board decision-making during the experiment. For further details on the webpage employed during the experiment, please contact the authors.

Figure 1 Illustration of the experiment webpage

Panel 1: Admission of the treatment



R&D target

Dear board members,

The supervisory board of The Giant Rubber Corporation is thrilled you have been selected as one of our potential board members. Next to running the company effectively and efficiently, the board wants you to pay specific attention to our ability to innovate and become more productive during your term of eight years.

We have therefore decided to set a board specific target for your board, that contributes to the result of the company and the final outcome of your board.

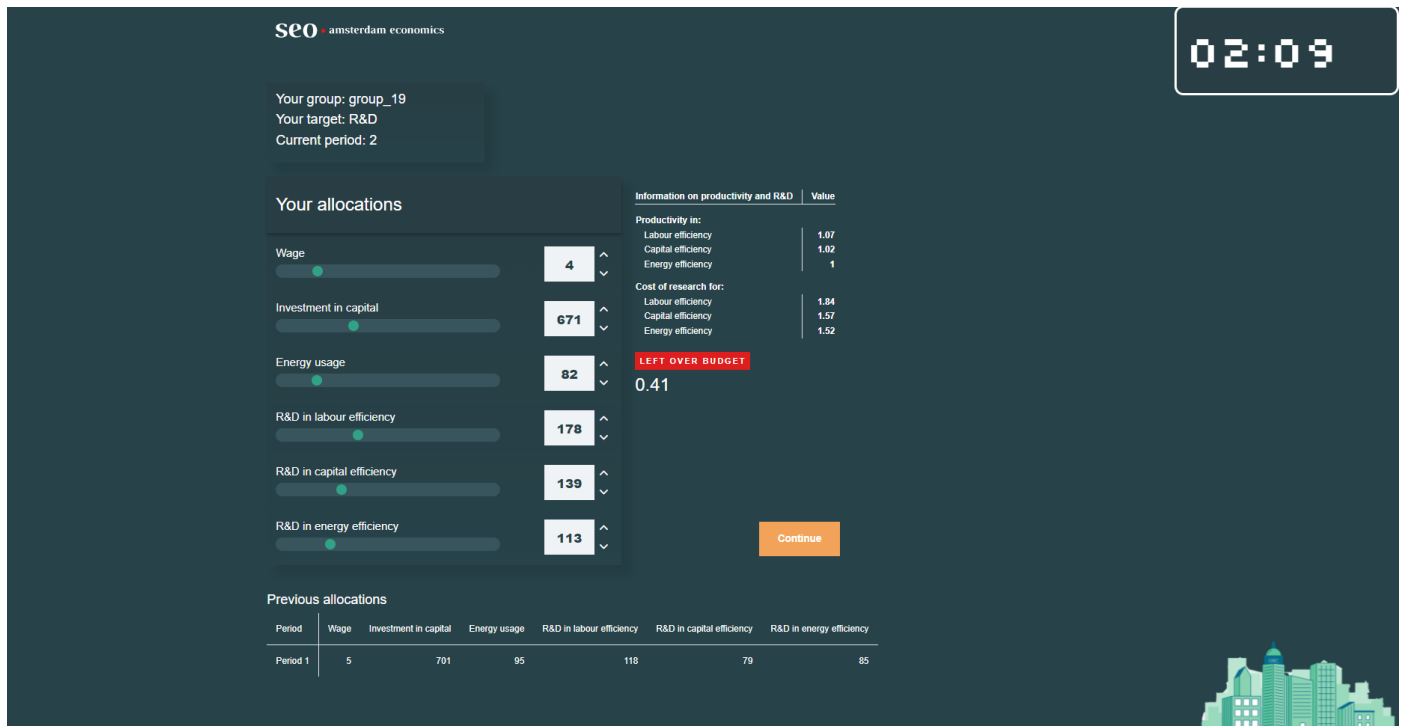
Your board has a **R&D target**, next to making profits and paying sufficient attention to our innovative potential. This implies that you earn additional points for investing in R&D, compared to the R&D investment of other rubber corporations. You earn an additional 0.95 points for every unit in the three types of R&D you invested in.

All the best,

Joe Bicycletire

Chairman of the Supervisory Board of The Giant Rubber Corporation

Panel 2: User interface for input of strategic decisions



Source: SEO Amsterdam Economics.

2.1.2 Mathematical details on the mapping from inputs to outcomes

User inputs during the experiment are mapped to firm and board outcomes (and as such, the boards' rankings). Below, we outline this mapping. We index the time $t \in \{1, \dots, 8\}$. In every round, boards decide on six different inputs wages (w_t), capital (K_t), natural resources (E_t) and efficiency R&D in each input (R_{jt} with $J \in \{L, K, E\}$).

Production

The GRC produces output Y according to a nested CES production function in labor L , capital K , and environmental inputs (energy) E . Capital and labor accumulate in an intermediate input Q_t . Y_t is the amount of final produced products in period t .

$$Q_t = \{(A_{Lt}L_t)^{\sigma_Q} + (A_{Kt}K_t)^{\sigma_Q}\}^{1/\sigma_Q}$$

$$Y_t = \{(A_{Qt}Q_t)^{\sigma_Y} + (A_{Et}E_t)^{\sigma_Y}\}^{1/\sigma_Y}$$

Factor inputs in labor and energy are instantaneous. Firms can add to the capital stock according to a time-to-build technology subject to capital adjustment costs. K_t is the amount of capital in stock in period t and δ_{Kt} is the depreciation rate. $\mathbb{Q}_{t(1)}$ denotes the amount of capital generated from investment that is added to the stock.

$$K_t = (1 - \delta_{Kt})K_{t-1} + \mathbb{Q}_{t(1)}$$

$$\mathbb{Q}_{t(m)} = \mathbb{Q}_{t+1(m-1)} \quad m \in \{2, \dots, M\}$$

$$I_t = \sum_{m=1}^M \varphi_m \mathbb{Q}_{t(m)}$$

The time-to-build process determines how many periods it takes for an investment in capital to be added to the capital stock. To clarify the time-to-build notation, $\mathbb{Q}_{t(M)}$ are projects started at t with M periods to completion, $\mathbb{Q}_{t(M-1)}$ are projects at t with $M - 1$ periods to completion (i.e., projects started the previous period), etc. This implies that investing in capital in period t generates new capital in period $t + m - 1$. Note that $0 \leq \varphi_m \leq 1$, $m \in \{1, \dots, M\}$ and $\sum_{m=1}^M \varphi_m = 1$. During this process, capital adjustment costs are given by:

$$C(\mathbb{Q}_{t(M)}, K_t) = \frac{\eta_t}{2} \left(\frac{\mathbb{Q}_{t(M)}}{K_t} - \delta_{Ct} \right)^2$$

Capital adjustment costs form the additional costs for capital when new capital is implemented (thus in the period that capital is added to the stock). Capital adjustment costs are relatively small compared to total investment costs.

Factor inputs are subject to productivity terms A_J , $J \in \{L, K, E\}$. Factor productivity ("innovation, knowledge, and training") depreciates at rate $\delta_{A_J t}$. Firms can add to the productivity stock through research R_{Jt} with stochastic payoff $F(R_{Jt}, A_{Jt-1})$. So, while productivity depreciates each period, it is diminishingly increasing. This means that the higher the productivity level, the more firms need to invest in productivity through R_{Jt} to increase or maintain productivity the same productivity level. In short:

$$A_{Jt} = (1 - \delta_{A_J t})A_{Jt-1} + F(R_{Jt}, A_{Jt-1})A_{Jt-1} \quad \forall J$$

with $F(R_{Jt}, A_{Jt-1})A_{Jt-1} = \sqrt{(1,5 * R_{Jt})/80} * A_{Jt-1}$.

Factor costs

Firms are price takers in capital and pay a fixed rental rate of capital r_K . They are also price takers in natural resources paying a fixed rate p_E . Firms pay wages to labor, subject to a constraint on the minimal amount of labor they must employ. As such,

$$L_t = \max(10 * (-7 + 3 * w_t), 0)$$

Firms pay research costs $p_{R_{Jt}} \forall J$. Firms are price takers, but unit research costs are increasing in the stock of research (research closer to the knowledge frontier is more expensive):

$$p_{R_{Jt}} = \vartheta(A_{Jt-1})$$

with $\vartheta(A_{Jt-1}) = \frac{3}{2} * (A_{Jt-1})^3$.

Firm income statement

Firms sell output Y_t at world market prices p_{Yt} . Firm revenues then are

$$\mathcal{R}_t = \sum_i p_{Yt} Y_t$$

Costs are given as the sum of total labor costs, capital adjustment costs, investments costs, the costs of energy, the costs of all types of research and development and some fixed costs.

$$C_t = w_t L_t + r_{Kt} K_t + C(\mathbb{Q}_{t(M)}, K_t) + I_t + p_{Et} E_t + \sum_J p_{Rj} R_{j_t} + \text{fixed costs}$$

Pre-tax profits are revenue minus all costs plus the part of the budget not spent:

$$\Pi_t = \mathcal{R}_t - C_t + \text{leftover budget}$$

Post-tax profits then are:

$$\Pi_t^n = (1 - \text{tax rate}) * \Pi_t$$

ESG outcomes

In addition to profits, the game tracks ESG outcomes, specifically the environmental footprint of the firm and its social impact.

Every unit of energy and capital has an environmental footprint, where ω_{Et} and ω_{Kt} are CO₂ emission factors per unit of energy and capital respectively. One unit of Energy has a larger negative effect on the environment than capital.

$$\mathcal{F}_{ECt} = -\omega_E E_t - \omega_K K_t$$

Both wages and investment in labor productivity are beneficial for the social impact. First, we discuss the investment in labor productivity. Workers reap non-financial benefits from A_{Lt} such as knowledge, on the job training and safe working conditions. The firm's labor (social) footprint is increasing in A_{Lt} . The benefit of R&D in labour is described as:

$$f(A_{Lt}, L_t) = 0.1 A_{Lt} L_t$$

In addition, higher wages increase the happiness of workers and this social impact. Wages in the rubber industry can be set below the minimum wage \tilde{w}_t but never below 3. The firm's labor (social) footprint is decreasing in wages below the living wage.

$$\begin{aligned} \mathcal{W}(w_t - \tilde{w}_t) &= 0.1 * (w_t - \tilde{w}_t) \text{ if } w_t > \tilde{w}_t \\ \mathcal{W}(w_t - \tilde{w}_t) &= 2 * (w_t - \tilde{w}_t) \text{ if } w_t \leq \tilde{w}_t \end{aligned}$$

The impact of the wages and the investment in labor productivity together is the total social impact.

$$\mathcal{F}_{Lt} = f(A_{Lt}, L_t) = \mathcal{W}(w_t - \tilde{w}_t) L_t$$

Treatment and scoring points for the ranking

Participants are randomly assigned to a board and boards are randomly assigned to one of three treatments. The first treatment focuses on making profit, the second treatment focuses on ESG-performance, and the third treatment on R&D. The ESG treatment rewards both the environmental and social impact. With the profit treatment boards are

simply encouraged to make more profit as this results in additional reward. Boards with the R&D treatment are rewarded higher on their investment in R&D.

The reward, or the compensation package, is translated into points that groups can earn. These points are stated in the *management agreement*. One part of the points that boards can obtain are similar for participating groups. This reflects the common environment of all participating boards. The second component of points earned depends on the treatment. Boards with a profit treatment earn relative more points with making profit, as similarly, boards with an ESG objective earn more points for ESG performance and boards with a R&D package obtain more points when investing in R&D.

The ranking that constitutes the treatment thus is determined by two components: a common component of firm performance, and a board-specific component consisting of aligning with *management agreement* objectives. As such, the treatment allows boards to deviate from their board-specific objective if they determine if that is in their (and the firm's) best objective, whilst being incentivized to meet their board-specific targets. Practically for the experiment, the common component of the treatment may dominate the board-specific component. The existence of dominating strategies means that compliance with the treatment is not necessary to win the game.

2.2 Experimental procedure

Experiment participants were sourced in two rounds from MBA courses at IMD Business School (Switzerland) and Nyenrode Business University (the Netherlands). In total 21 boards participated in this pilot round of experiments. The experiments in both cases were performed over two days.

2.2.1 Day 1

Before the start of the experiment, all participants completed individual questionnaires to assess participant preferences, experience, and knowledge. On day 1 personal codes are distributed to the participants. Participants are requested to login on the experiment webpage to read an introduction to the game, as well as to complete an individual survey. This individual survey covers participant knowledge, experience, and preferences for risk, time, and pro-social outcomes. Appendix A documents the individual survey. The individual survey is completed by individual participants outside of the classroom setting.

2.2.2 Day 2

The actual experiment is performed on day 2 in a classroom setting. The execution of the actual experiment consists of several phases.

Introduction and instruction

In this phase the experiment leader explains how the experimental game works. For example, the experiment leader explains that participants will be divided into groups (boards) and that boards will play against each other. The experiment leader further explains that participants will receive a document ("the management agreement") with information regarding the experiment and the general targets. Moreover, (s)he clarifies that the experimental game consists of eight rounds and that boards are to make strategic decisions on the actions of the GRC.

Division of the participants into 'boards' and randomized allocation of experimental conditions to 'boards'

Participants are asked to log onto the webpage with their unique code and are divided into boards. One of the group members is automatically assigned as CEO, who is responsible for finalizing group decision making. The experiment leader encourages the boards to prepare for the experiment by reviewing and discussing the management agreement provided to them. The management agreement informs participants that they have a budget each period that they can spend on six inputs: wage, energy, capital investment and R&D in labor, energy and capital. It also gives a global overview how certain inputs interfere together. Consecutively, after the test round, a unique board identifier that states the boards unique compensation package is shown on the screen of every board (the board package).

Eight rounds of strategic allocation of firm resources

The game starts. Every round follows an identical pattern. The board is asked to review their board package and management agreement in relation to the current state of the firm and then to submit their strategic decisions the allocation of their budget. Thereafter it should outline their reasoning for their decision making according to a questionnaire. At the end of each round the outcome of these decisions is revealed to all boards.

Final questionnaire

After the eight rounds, participants are asked to fill in a **second individual questionnaire** about how participants experienced and played the experimental game. This questionnaire includes questions about the motivation for strategic decision-making and their appraisal of individual and group decision-making.

Download and revealing of the winning board

After the experiment, we proceed with a download phase. During this phase, performance and experiment results are revealed to the groups and the groups reflects and discusses outcomes, behaviors, and group dynamics. At this point, the educational component of the experiment takes the center-stage. Finally, at last, the final leader board is revealed, and the top performing board receives their well-earned praise and prize.

2.3 Collected data

During the experiment, we register group decisions on capital, labor, an energy-inputs, as well as choices on R&D in labor, capital and energy efficiency. Additionally, we log the resulting profits, environmental, and social impact and calculate the point obtained during every round. These results are displayed to the participating boards after every round for them to evaluate and to consider in their decisions for the next round(s).

Additionally, we collect data on the background and preferences of the participating board members, as well as their reflections on their collaboration and decision-making (process). To that end, we employ an initial survey, as well as survey questions after every round and at the conclusion of the game.

1.1.1 Table 1 presents summary statistics on our participating players. In total 62 students played the game. In total, we randomly formed 21 boards consisting of between 2 and 4 board members. On average, board members in the experiment are in their early thirties. Virtually all board members have prior working experience, and a majority of them have management experience as well (between 4 to 5 years on average). Board members at both IMD and Nyenrode self-reported moderately high preferences for time (patience), altruism and pro-social behavior, and slightly lower risk preferences. Additionally, we asked participants to highlight their view on key business objectives to assess their leaning towards achieving ESG outcomes. On average, non-ESG objectives are referenced more

commonly as key firm objectives, but participants do commonly report ESG objectives as essential to the firm as well.

Table 1 Characteristics and perseverance

	IMD	Nyenrode
Total number of students	40 students	22 students
Age	33,8 years	31,7 years
Gender		
• Female	15 students	12 students
• Male	23 students	10 students
• Unknown	2 students	
Management experience		
• Yes	27 students (4,2 year on average)	11 students (4,5 year on average)
• No	13 students	11 students
Working experience		
• Yes	40 students (9,0 year on average)	21 students (7,1 year on average)
• No	0 students	1 student
Risk	6,1 (out of 10)	6,2 (out of 10)
Time preference	7,3 (out of 10)	7,5 (out of 10)
Social altruism	7 (out of 10)	7,8 (out of 10)
Social donation	\$179 (out of \$1000)	\$321 (out of \$1000)
ESG score	1,6 (out of 6)	2,1 (out of 6)
Perseverance score	3,7 (out of 5)	3,7 (out of 5)

Source: SEO Amsterdam Economics based on two pilot classroom experiments at IMD Business School and Nyenrode Business University.

3 Results

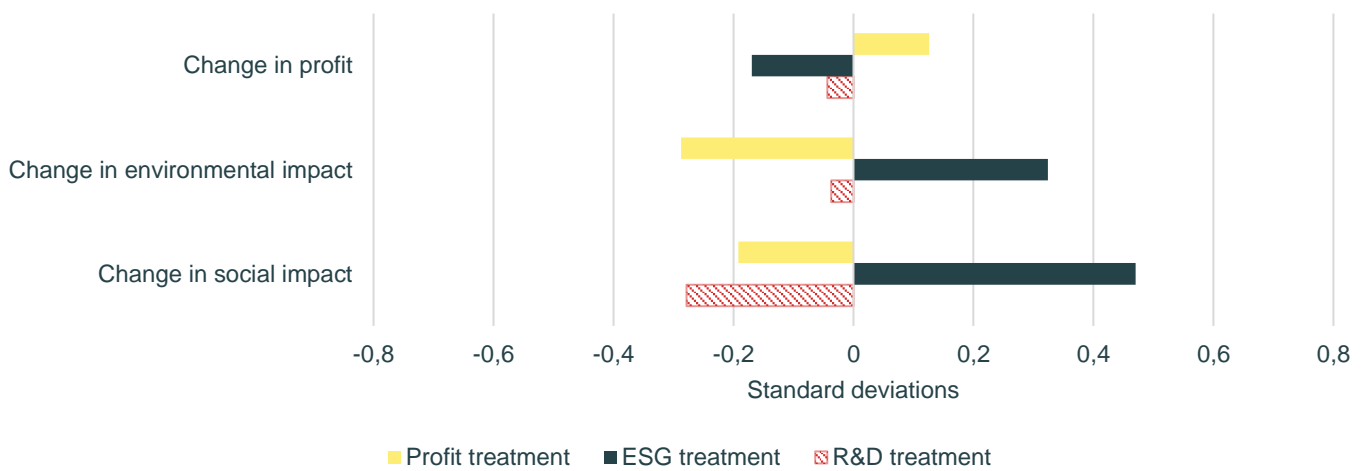
Incentives direct board focus and as such drive differences in firm outcomes.

3.1 Firm outcomes

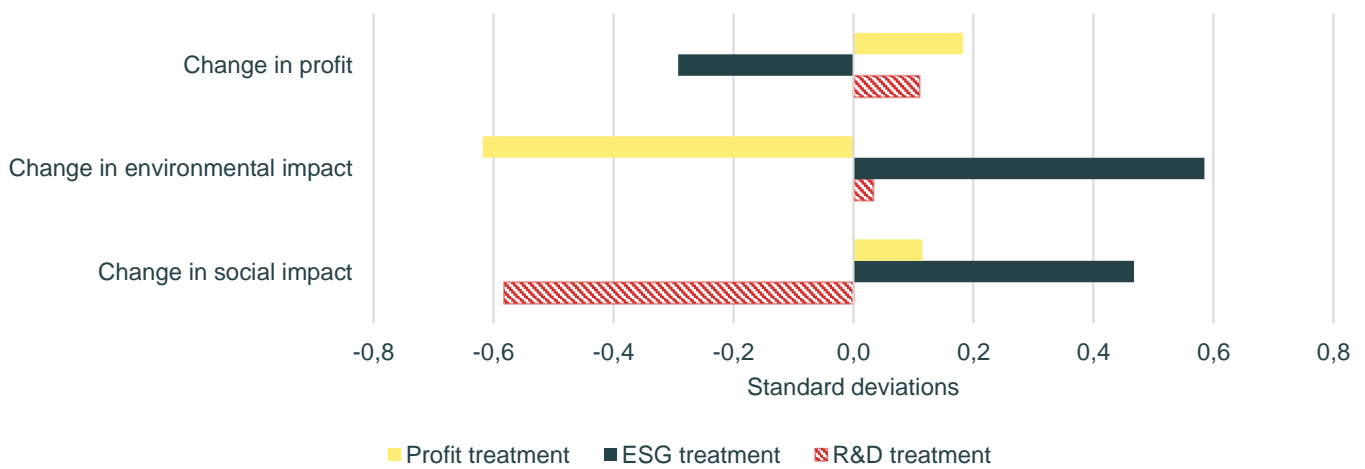
Board treatments are related to firm outcomes. Figure 1 reports differences in firm outcomes related to the treatments provided to the participating boards.

Figure 1 Board treatments are correlated with differences in firm outcomes

Panel 1: First six rounds



Panel 2: All eight rounds



Source: SEO Amsterdam Economics based on two pilot classroom experiments at IMD Business School and Nyenrode Business University.

Note: N = 21 boards in total. Results for the R&D treatment are shaded due to the fact that during the execution of the pilot at IMD Business School, the points calculation for the R&D-treatment contained an error during rounds 7 and 8 of the experiment. As a result, we also present two panels of results: a first for the first six rounds, and a second one for all rounds combined.

Figure 1 reports two panels of results. The first panel displays the differences in profit, environment, and social outcomes for the different treatments over the first six rounds of the experiments. The second panel reports the same results over the full eight rounds of the experiment. We report both panel due to the fact that during the execution of the pilot at IMD Business School, the points calculation for the R&D-treatment contained an error during rounds 7 and 8 of the experiment. As such, we highlight the tentative nature of the reported results of this pilot experiment.

Figure 1 reports that boards receiving a treatment focused on profits realize more profits relative to boards receiving a treatment focused on ESG or R&D outcomes. Conversely, these board typically perform worse on our measure of environmental or social performance. These observations are reversed for board that received the ESG treatment. Board subject to that treatment typically report lower profits, but higher environmental and social performance instead. Such findings are in line with our prior laboratory experiments (see Verheuevel et al., 2022), as well as the existing observational literature. These prior studies highlighted that targets for profits and/or ESG-outcomes in CEO and/or board compensation packages are (causally) related to differences in firm outcomes.

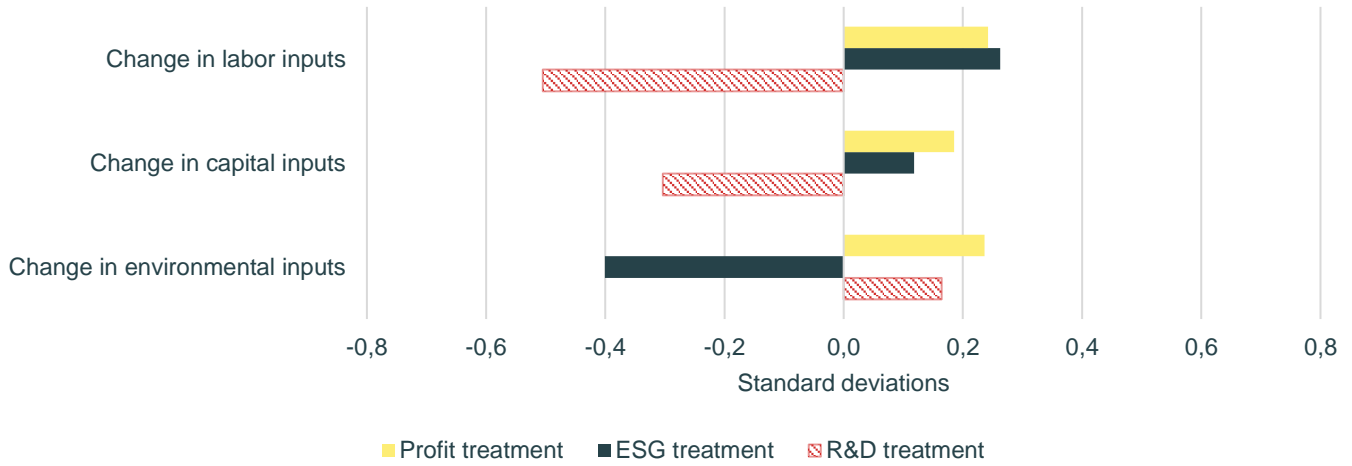
The differences in firm performance are driven by differences in board decisions.

Figure 2 shows the differences in average factor inputs per round over both the first six rounds and the full eight. Boards that are subject to a profit treatment on average use more of all factor inputs, thus prioritizing current production in order to boost financial returns. In their decisions for factor inputs, board subject to the profit treatment are especially energy intensive. Board subject to the ESG treatment on the other hand, are less intensive in current period factor inputs, and especially energy and capital inputs. As a result, they typically thus forego current production overall and aim to lower the contribution of energy and capital to total output.

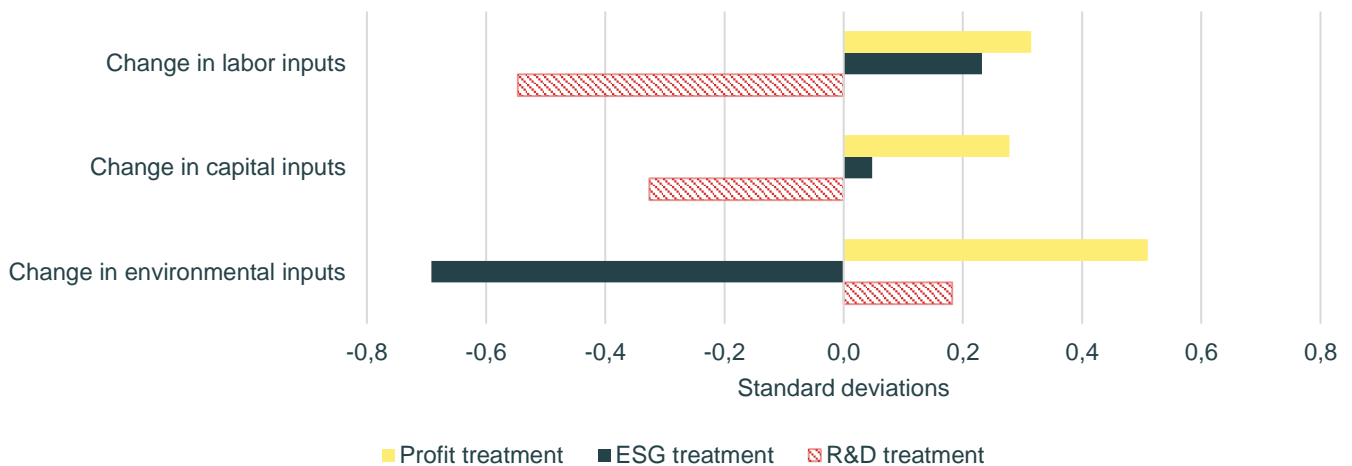
In addition to such substitution to other factors of production by boards subject to the ESG treatment, boards subject to this treatment also substitute more intertemporally through R&D. Figure 3 shows the average R&D allocations over the first six and the full eight rounds. Firms managed by a board with an ESG treatment invest more in labor and especially energy efficiency compared to other boards. This is in contrast to board subject to the profit treatment, who generally invest less in R&D in all factors of productions than other boards - and especially in labor and energy efficiency. Board with an explicit R&D-treatment on average respond to their target, and invest heavily in R&D in all factors of production - though we should stress the tentative nature of these results.

Figure 2 Choices for factor inputs

Panel 1: First six rounds



Panel 2: All eight rounds

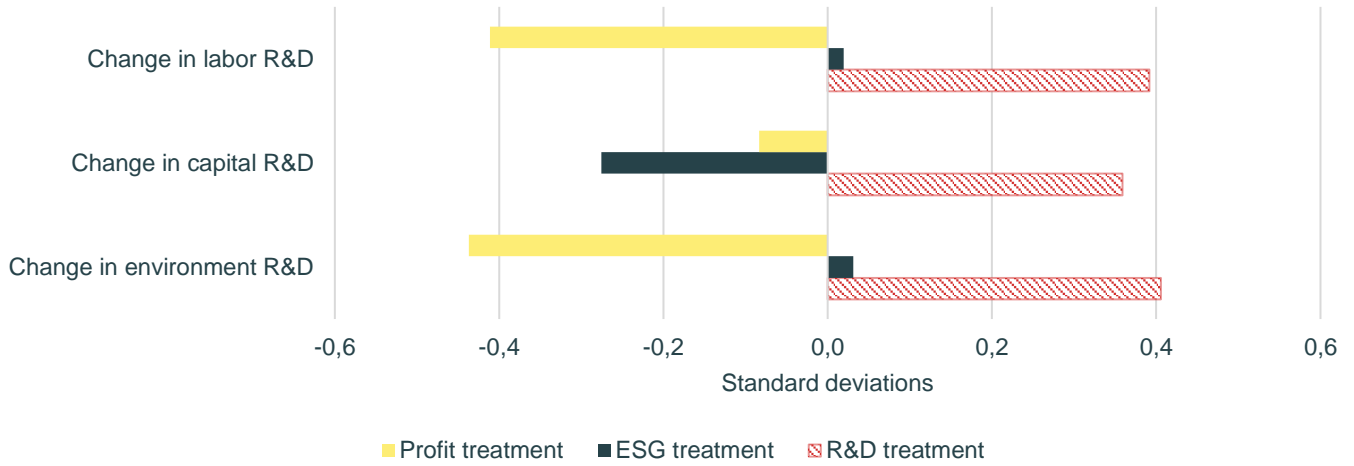


Source: SEO Amsterdam Economics based on two pilot classroom experiments at IMD Business School and Nyenrode Business University.

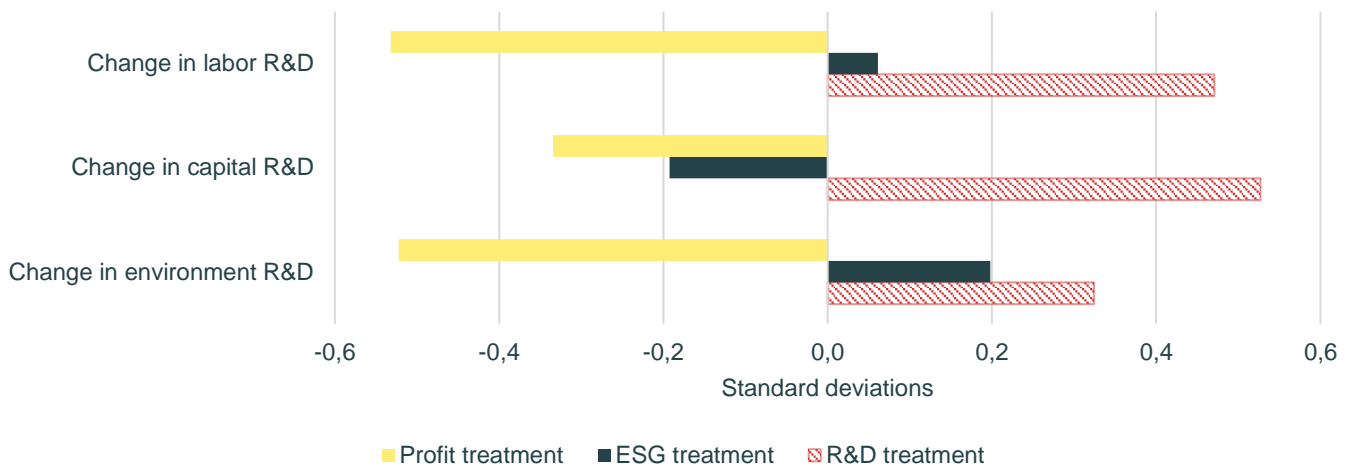
Note: N = 21 boards in total. Results for the R&D treatment are shaded due to the fact that during the execution of the pilot at IMD Business School, the points calculation for the R&D-treatment contained an error during rounds 7 and 8 of the experiment. As a result, we also present two panels of results: a first for the first six rounds, and a second one for all rounds combined.

Figure 3 Choices for R&D inputs

Panel 1: First six rounds



Panel 2: All eight rounds



Source: SEO Amsterdam Economics based on two pilot classroom experiments at IMD Business School and Nyenrode Business University.

Note: N = 21 boards in total. Results for the R&D treatment are shaded due to the fact that during the execution of the pilot at IMD Business School, the points calculation for the R&D-treatment contained an error during rounds 7 and 8 of the experiment. As a result, we also present two panels of results: a first for the first six rounds, and a second one for all rounds combined.

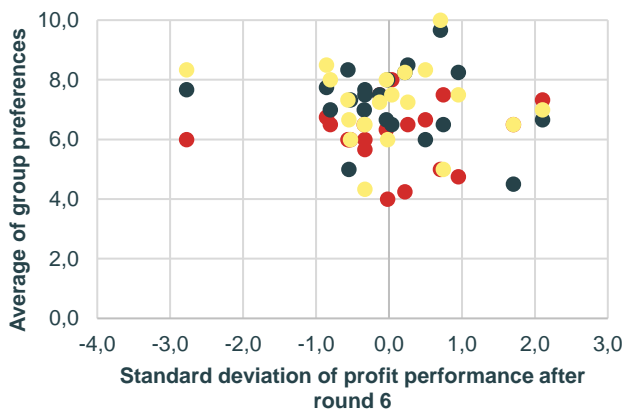
3.2 Board preferences and heterogeneity

Figures 1 through 3 establish that boards on average behave in line with their board-specific treatments. To what extent can this be co-accounted for by board composition, especially in average or heterogeneous preferences?

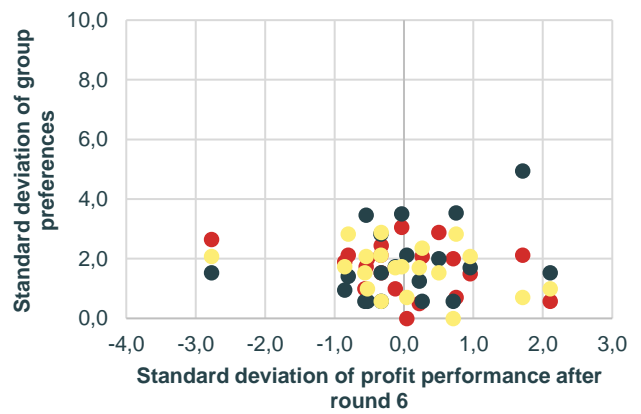
Figure 4 relates the profit performance, environmental performance, and social performance of boards to the average board preferences and the within-board spread of these preferences, specifically for risk, time and pro-social behavior. Such decompositions are motivated by our prior laboratory experiments in which preferences of the executive co-determined firm outcomes (see SEO, 2022). Figure 4 reports less evidence for the contribution of preferences to firm outcomes during the classroom experiment we report on here. Neither for risk, time or social preference, we report a clear relation between average group preferences and profit, environmental and social performance. The same holds when we consider the within group spread in preferences ('diversity'). Whilst such findings are at odds with our prior laboratory experiment, as well as the literature on board characteristics and composition, we highlight that our current classroom experiment is a pilot study, and as such, has a modest sample size. We will thus return to this question in a future larger-scale experiment.

Figure 4 Relation of performance to group characteristics

Panel 1: Profit performance

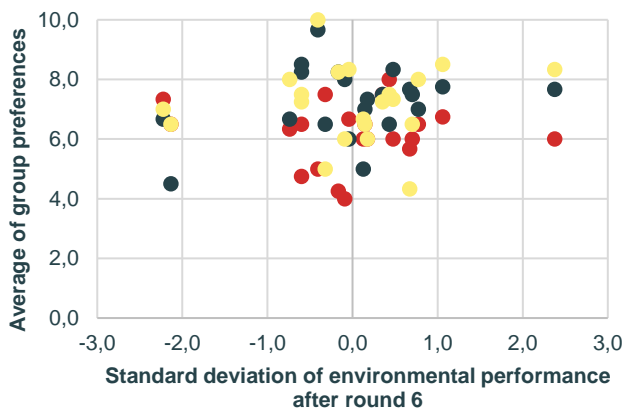


● Risk preference ● Time preference ● Pro-social preferences

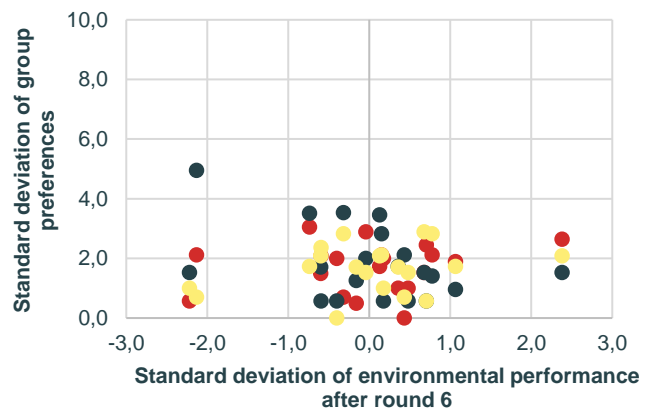


● Risk preference ● Time preference ● Pro-social preferences

Panel 2: Environmental performance

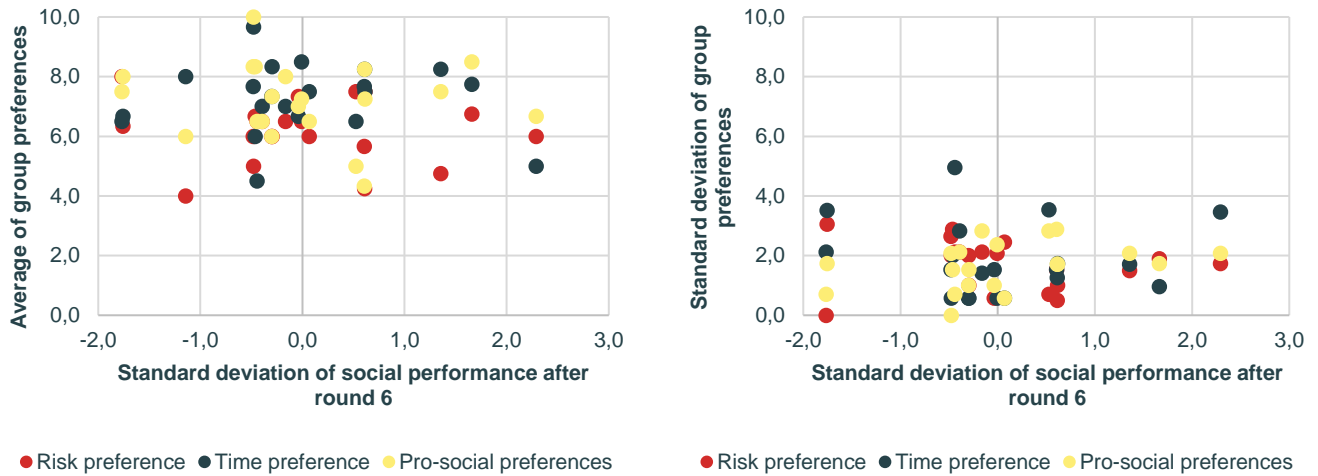


● Risk preference ● Time preference ● Pro-social preferences



● Risk preference ● Time preference ● Pro-social preferences

Panel 3: Social performance



Source: SEO Amsterdam Economics based on two pilot classroom experiments at IMD Business School and Nyenrode Business University.

Note: N = 21 boards in total. We report performance after round six due to the fact that during the execution of the pilot at IMD Business School, the points calculation for the R&D-treatment contained an error during rounds 7 and 8 of the experiment.

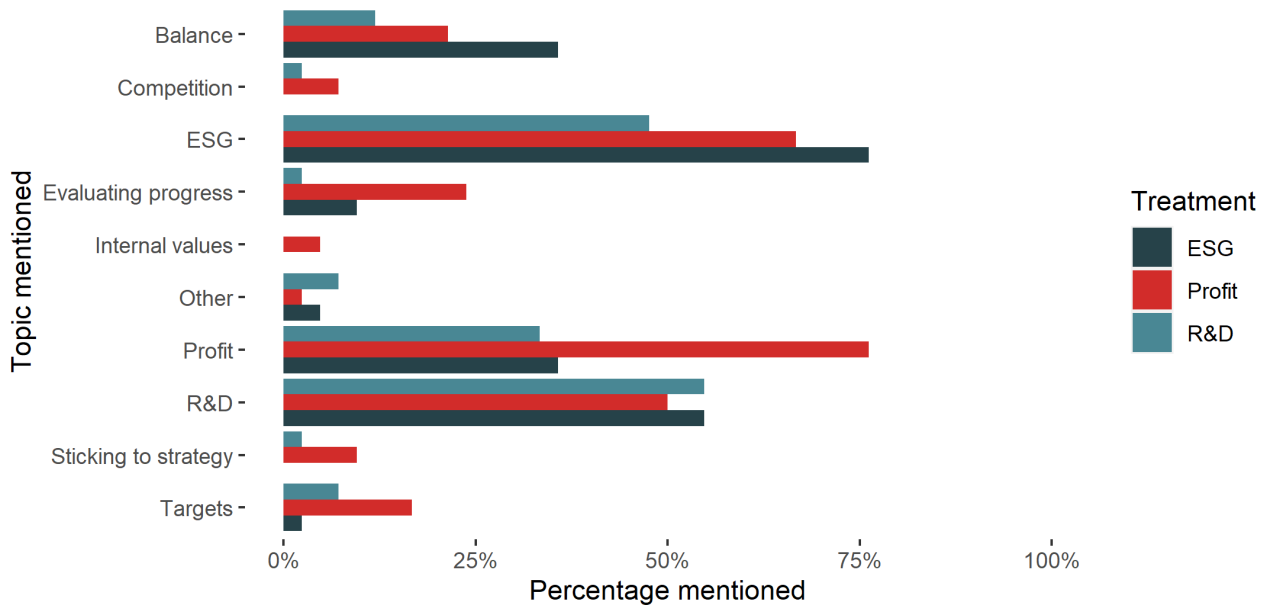
3.3 Self-reported strategic decision making

In order to better understand the decision-making process, we asked board to submit a summary of their deliberations and an explanation for their decisions at the conclusion of every round. Based on these self-reports, we assess the direct effect of introducing board-specific targets on firm decision-making (instead of the indirect effect that is measured by firm outcomes reported above).

We classify and code the explanations for strategy by boards to various topics and stratify the responses by treatment. Figure 5 presents the results. For clarity, note that boards may mention multiple of the listed topics in their strategy. Figure 5 highlights that on average, board strategies directly and clearly reflect their treatments, especially for the profit and ESG treatments. Specifically, boards subject to the profit treatment are significantly more likely to reference profits in their strategy than boards subject to other treatments are. They also appear to be more competitive, more commonly referencing competition and targets. Firms subject to the ESG treatment on the other hand, mention ESG more often as well as attempting to take a balanced approach to achieving firm outcomes. Interestingly, firms subject to the R&D treatment do not report R&D markedly more often in their strategy than other boards. Instead, all boards commonly report R&D in their strategies.

The clear relation between the treatment and strategic considerations reported in Figure 5 highlights the attention directing effect of board-specific targets and treatments. This is especially noteworthy given the fact that compliance with the board-specific treatment was not a prerequisite to win the game and to become the best performing board. Indeed, in practice the game contained dominating strategies that increased the likelihood of winning irrespective of compliance with the board-specific treatment.

Figure 5 Participants with different treatment mention different topics in their strategy



Source: SEO Amsterdam Economics based on two pilot classroom experiments at IMD Business School and Nyenrode Business University.

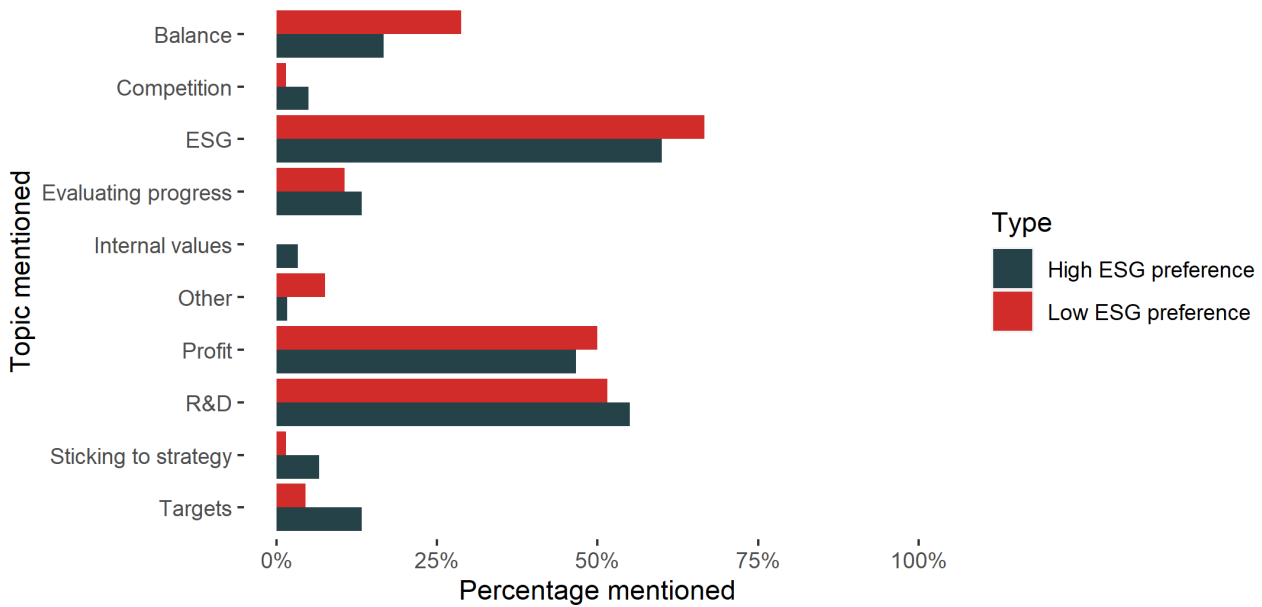
Note: N = 21 boards in total. Answers for explanation of general strategy and explanation of allocation decision are grouped together. We have classified these answers into 10 topics. Since groups gave open answers, they may mention multiple topics per answer.

Noteworthy as well is that boards appear to be highly cognizant of the effects of their board-specific targets in their decision-making. Both groups at IMD and Nyenrode mention that the board-specific target framed their decision making but that targets were not the only reason for the board to consider in the making of decisions. For example, participants mention that they were biased toward a certain input because of the additional bonus points they could obtain or that the targets were crucial to define the approach and the steps the board took. At the same time, boards continuously reference that other factors such as balancing the different performance yardsticks were of importance too. This balancing appears subject to experimentation, with boards mentioning that they sometimes adjusted their strategy based on their performance especially relatively to their peers.

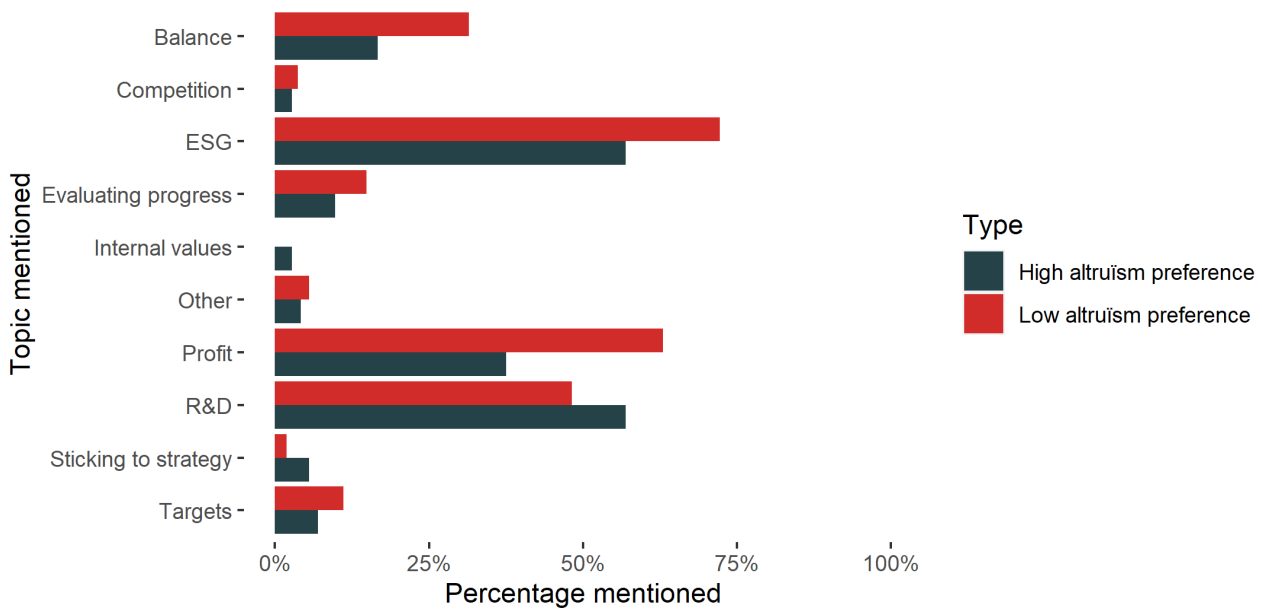
As the game progressed and was approaching the final rounds, boards faced increasing pressure to perform well. In response, boards reference that they tried to mimic strategies of competing boards, in some case materially altering the strategy. For instance, one board that initially focused on achieving high ESG performance gradually abandoned this goal in favor of winning the game, and as such, increasingly referencing that they were now aiming for profit maximization to win the game, and thus sacrificing environmental and social performance and ignoring their own internal values. Qualitatively, such pressures appear to be reported more often by boards subject to the profit and R&D treatments, and less by the boards subject to the ESG treatment. The latter group appears to more commonly stick to a strategy that aims to balance different firm performance yardsticks, sometimes explicitly referencing the desire to generate a positive ESG impact with only moderate profits are sufficient or that they do not want to compromise on ESG objectives (even if falling behind in terms of profits).

Figure 6 Participants who on average state more that businesses should focus on ESG objectives do not mention ESG aspects more in their strategy

Panel 1: Preferences of ESG objectives in firm objectives



Panel 2: Preferences for pro-social behavior



Source: SEO Amsterdam Economics based on two pilot classroom experiments at IMD Business School and Nyenrode Business University.

Note: N = 21 boards in total. Answers for explanation of general strategy and explanation of allocation decision are grouped together. We have classified these answers into 10 topics. Since groups gave open answers, they may mention multiple topics per answer.

As we have with firm outcomes (cf. Figure 4 above), we in Figure 6 investigate the relation between self-reported strategy and characteristics of board members, especially in the ESG-space. We divide boards into two groups of boards with on average individuals that in the individual survey stated that they believe ESG-related topics should be the most important business objectives. We translated this into a score on ESG preference. For boards the mean score is calculated. If boards score below the mean of all boards, they are assigned to the 'low ESG preference' category and if they score above to the 'high ESG preference' category. In our previous conducted lab experiment, we showed that participants with an ESG-oriented view on business invest more in clean production. However, Figure 6 clarifies that that boards with participants that on average believe businesses should especially focus on ESG related topics, do not mention ESG more in their strategy than those who didn't. This echoes the results presented in Figure 4 above (and the same caveats apply).

We perform a similar exercise for the pro-social preferences of individual participants, as measured by their preferences of altruism. This yields similar findings. The level of altruism is based on the question "*How would you assess your willingness to share with others without expecting anything in return, for example your willingness to give to charity?*" Boards that on average ranked themselves high are assigned to the 'high altruism preference' and vice versa. The altruistic view of the CEO can influence the level of corporate social responsibility (Borghesi et al., 2014). Furthermore, Haynes et al. (2015) conclude that managerial altruism in general leads to a focus on longer-term decisions and long-term firm performance. However, this is not visible in the written strategic approach of the participants. Figure 6 shows that people who see themselves as high altruistic do not consider ESG more often in their strategy than less altruistic people.

3.4 Group decision-making

After the experiment participants are asked to fill in a second individual questionnaire, where they are asked e.g. about the performance of their board and their role. With the written answers of boards (discussed above), we obtained insight in how groups make decisions, and on what they base their strategy. With the individual questionnaire at the end of the experiment aim to obtain insight how individual participants value their group decision making.

Participants respond that they generally are satisfied with the choices made by their board. A large share of participants answers that if they would be working on their own, they would not deviate from the decisions made in their group, but some participants mention that they would have made a different allocation of input factors but there is no general tendency towards a specific (set of) input(s). In general participants in boards seem to have made strategic decisions that all board members were satisfied with. They mention the value of making decisions in a group and highlight the effective and important role of groupwork to achieve optimal results. Participants state that making decisions in a group helps viewing decisions from different perspectives, and therefore makes it able to understand logics and get points of views that you might not have thought about. This can diminish biases and blind spots. In some cases, however, participants mention that if a person with stronger personalities was in the lead this person could sometimes override other opinions. In addition, participants mention that decisions could have been made more easily without group decision making.

Interestingly, both at IMD and Nyenrode, participants rate the average performance of their board members higher than their own performance during the experimental game. Participants mentioned that team members were engaged, that they generated fruitful discussions and contributed to new perspectives. The CEO of the board had the formal decision-making power to finalize strategic allocations, yet most participants wrote that they made decisions together and that roles were mostly equally divided. Most CEOs mention that they were open to all

possible outcomes and discussions and finally allowed the majority sentiment to take the final say, whilst only a small number of CEOs stated that they had more influence as they had could make the decisions final.

4 Discussion and next steps

Tentative findings suggest that incentives directly affect group strategy discussions and decisions. A future larger scale experiment will aim to corroborate these initial findings.

We have performed a pilot classroom experiment aimed at directly measuring the changes in board strategy discussions and decision-making processes. The main aim of the pilot study was to test the experiment and to ensure that the experiment results are useful and reliable. After the first experiment conducted at IMD we improved the experiment and conducted this new version at Nyenrode. Based on this experience, we will draft a new version of the classroom experiment for future use. The design of this updated experiment will be the topic of a separate note.

Tentative findings suggest that incentives directly affect group strategy discussions and decisions. The result of the experiment shows that participants with a profit target obtained the highest profits but that these boards also had the most negative impact on the environment and the lowest social impact. Boards with profit targets also address financial goals more commonly in their strategy discussions. A similar result holds for boards with an ESG target: they have the best environmental and social impact and focus more on ESG in their strategy discussions. Finally, boards with a R&D target have the highest outcome in R&D but do not mention necessarily mention R&D more in their strategy. These results are of note given that board could ignore their board-specific objectives and still win the game - in fact, dominating strategies existed.

In the pilot experiment, participant preferences, board composition and heterogeneity in board preferences seem unrelated to firm outcomes and board strategy discussions. This is at odds with our prior laboratory experiment (Verheugel et al., 2022), which documents a relationship between executive preferences for time, risk and pro-social behavior and firm outcomes. This non-result here may be due to the comparatively small sample size employed in this pilot version of the classroom experiment. We will return to this issue in a future paper.

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Appendix A Survey

Appendix A.1 Ex-ante individual questions

Demographics

1. What is your gender? [Male/female/other/rather not say]
2. What is your year of birth? [Numeric]
3. Do you have professional working experience? [Yes/No]
 - a. If so, for how many years? [Numeric]
4. Have you been in a management position? [Yes/No]
 - a. If so, for how many years? [Numeric]

Risk preference

5. How do you see yourself: are you a person who is generally willing to take risks, or do you try to avoid taking risks? [0-10]

Please use a scale from 0 to 10, where a 0 means you are "completely unwilling to take risks" and a 10 means you are "very willing to take risks".

Time preference

6. How do you see yourself: Are you a person who is generally willing to give up something today in order to benefit from that in the future? [0-10]

Please use the scale from 0 to 10, where a 0 means you are "completely unwilling to give up something today" and a 10 means you are "very willing to give up something today".

Social preference

7. How would you assess your willingness to share with others without expecting anything in return, for example your willingness to give to charity? [0-10]

Please use the scale from 0 to 10, where a 0 means you are "completely unwilling to share with others without expecting anything in return" and a 10 means you are "very willing to share with others without expecting anything in return".

8. Imagine the following situation: you win € 1 000 in a lottery. Considering your current situation, how much would you donate to charity? [Numeric integers, 0-1000]

Values between 0 and 1 000 are allowed. Please use whole numbers (e.g. 5) and avoid decimal numbers (e.g. 5,4 or 5.4).

View on business

9. In your view, on which three objectives should businesses focus? [Rankin] *(Presented in randomized order)*
 - Brand image
 - Climate change
 - Emissions reduction
 - Fair labor
 - Long-term profits
 - Providing living wages

- Sales growth
- Satisfying shareholder demands
- Short-term profits
- Social inequality
- Supporting local communities
- Technological innovation

Perseverance

Please indicate whether the following statements are true to you.

- A. Not like me at all
 - B. Not much like me
 - C. Somewhat like me
 - D. Mostly like me
 - E. Very much like me
1. New ideas and projects sometimes distract me from previous ones.
 2. Setbacks don't discourage me. I don't give up easily.
 3. I often set a goal but later choose to pursue a different one.
 4. I am a hard worker.
 5. I have difficulty maintaining my focus on projects that take more than a few months to complete.
 6. I finish whatever I begin.
 7. My interests change from year to year.
 8. I am diligent. I never give up.
 9. I have been obsessed with a certain idea or project for a short time but later lost interest.
 10. I have overcome setbacks to conquer an important challenge.
 11. I still am interested in achieving some of the goals I set myself in the past.
 12. I consistently work towards long-term goals.
 13. I often think about my long-term ambitions.
 14. I go out of my way to do things which will help me succeed in my future aims.

Appendix A.2 Ex-post individual questions

The ex-post questions are asked after completing all rounds. You have to complete these questions individually. Each question is answered on a scale from 0-10 and we kindly ask you to motivate your answers.

15. How would you value the decision-making process in your group? [0-10]
 - a. Please explain your answer. Did you see benefits to weighing your options as a group, rather than on your own? Did the group change your mind about anything?
16. Are you generally satisfied with the choices that your board made to reach the goals of the company? [0-10]
 - a. Please explain your answer. What would you have done differently if you weren't working in a group but on your own? Would this generate a better outcome? If so, why do you believe this is the case?
17. How do you rate the average performance of your board members? [0-10]
 - a. Please explain your answer.
18. How do you rate your own performance during the boardroom game? [0-10]
 - a. Please explain your answer.

19. To what extent did your contribution to the group influence the final decision making of the board? [0-10]
 - a. Please explain your answer. What was your role in the board? Did you have certain focus items? Have you been effective in convincing your fellow board members?
20. To what extent did your targets affect your contribution to the board's discussions? [0-10]
 - a. Please explain your answer. Could you please give an example of how your targets affected the discussion and the decision the board made?
21. How would you rate this boardroom game? [0-10]
 - a. Please explain your answer. How did you experience the game? What did you learn? What elements should be improved?

Appendix A.3 Questions during rounds

Please answer the following questions to explain your decision-making process. We kindly ask you to cooperate with the other board members when answering the questions. Please note that the leader has to submit the answers you have formulated as the board of The Giant Rubber Corporation. There is a limit of 250 words for each question.

Round one

1. Please explain briefly your general strategy for the boardroom game. What are your priorities to make sure you will be winning the game? Which production factors did you focus on and why?
2. Please describe the board's deliberation process when deciding about the allocation of resources?
3. What factor played a crucial role in making the board's final decision? How did weighting and discussing your opinions as a group affect the outcome?
4. How does your decision in this round relate to your general strategy as the board of The Giant Rubber Corporation?

Round two to seven

5. Can you explain the decision for this round's allocation?

Round eight

6. Please describe the board's deliberation process when deciding about the allocation of resources?
7. What factor played a crucial role in making the board's final decision? How did weighting and discussing your opinions as a group affect the outcome?
8. How does your decision in this round relate to your general strategy as the board of The Giant Rubber Corporation?
9. With the benefit of hindsight: what is your opinion about the effectiveness of the board's strategy? What is your opinion about the efficiency of the decision-making process you went through as a board? What alternative choices could/should you have made? Which choices do you regret most?