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How do economists differ from others in distributive situations ?

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Abstract

There are mainly two conjectures on why economists may behave differently than others in distributive situations: the selection hypothesis and the learning hypothesis. In this paper the "Are economists different?" question is addressed. Potential differences in three dimensions are studied: the weight people attach to fairness considerations, the prevalence of fairness ideals, and how people react to communication about fairness. A dictatorship game experiment with a production phase and a communication phase is run with first-year economics and engineering students. This experimental design is particularly suited for examining differences in all three dimensions. To the best of the author's knowledge, no previous experimental study has been able to address this question as comprehensively as the current analysis.

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1 Introduction

Many studies have investigated whether economists are more selfish than non-economists. Since the seminal work by Gerald Marwell and Ruth E. Ames in 1981 on free-riding in a public good game, there have mainly been two conjectures on why economics students may behave differently in distributive situations than other students: either they may initially be more concerned with economic incentives than other students and therefore select the study of economics, or exposure to the self-interested model used in economics changes the extent to which people behave in self-interested ways. Marwell and Ames (1981) found that first-semester economics students were more inclined to free ride than other students. John R. Carter and Michael D. Irons (1991) presented the two conjectures as the selection hypothesis and the learning hypothesis, and tested both through an ultimatum game experiment. Carter and Irons (1991) concluded that "economists are born, not made".

In this paper the "Are economists different?" question is addressed. The aim of the paper is to examine whether economists differ from others in the following three dimensions: the weight they attach to fairness considerations, the prevalence of fairness ideals, and how they react to communication about fairness. To examine the issue a dictatorship game experiment is run with first-year students of economics and engineering where the distribution phase is preceded by a production phase and a communication phase.[1] This experimental design is particularly suited for examining differences in the three dimensions, and, to the best of my knowledge, previous experimental studies, have not been able to address the question as comprehensively as the current study.

The subjects in the study comprise first-year economics students from the Norwegian School of Economics and Business Administration (NHH) and first-year engineering students from Bergen University College (HiB). Since selection and learning may have taken place before the students entered either NHH or HiB, the data are not adequate to discriminate between the two hypotheses defined by Marwell and Ames (1981). However, I do not intend to test whether economists select the study of economics because they are by *nature* more concerned with economic incentives. In addition, I have no intention of controlling for the possibility of learning experience before the

[1] The experiment with the economics subject pool is reported in Astri Drange Hole (2007).

students enter NHH and HiB. In the following analysis, any difference that exists when the students enter the two institutions is defined as the selection effect. Hence, there could be a selection explanation for any differences between the two pools of first-years students in the study.

The following section provides an overview of previous research in this area. In section 3 the fairness ideals, the model and the hypotheses are presented. Section 4 describes the experimental design. In section 5 the results are reported, and section 6 concludes.

2 Previous research on the issue

Ten years elapsed between the first two papers that investigated the subject pool issue. Marwell and Ames (1981) introduced two conjectures for why economics students may behave differently in distributive situations than other students, and Carter and Irons (1991) presented the two conjectures as the selection hypothesis and the learning hypothesis. The experimental group in the study of Marwell and Ames (1981) consisted of first-semester graduate students of economics. The control group of non-economists consisted of high school juniors and seniors. Accordingly there was a systematic age difference between students in the experimental group and students in the control group. Hence, the data were inadequately suited to discriminate between the two hypotheses.

Carter and Irons (1991) ran an ultimatum game experiment with freshmen non-economists, who were not enrolled in an economics course (the control group) and freshmen economists enrolled in the first-semester macroeconomics course (the experimental group). They also compared the behaviour of senior non-economists, who had majored in a subject other than economics, and economists who had majored in economics. However, since they did not control for the learning experiences of the students before their freshman status, the claim that the results of the experiment support the selection hypothesis rather than the learning hypothesis may not be justified.

Many later studies have compared the distributive behaviour of economists and non-economists, and most of these have focused on the selection and learning hypotheses as defined by Marwell and Ames (1981). The studies represent different research designs including laboratory and field experiments, and questionnaires. Different laboratory experiments have also been employed including public good, prisoner's dilemma, ultimatum, dictatorship and principal agent games. Most of the work reviewed in this section claim to support the selection hypothesis, two studies claim to support the learning hypothesis, and two studies report that economists are more honest and less self-interested than non-economists.

Most of the studies that claim to verify the selection hypothesis argue that the two groups do not differ in their learning experiences because the subjects are first-year students. However, this may not justify the claim that the results support the selection hypothesis rather than the learning hypothesis, since the subjects may have been exposed to some economic theory before they entered university, thus, allowing selection and learning prior to university.

The following is an overview of previous research on this issue. I first present the debate between Robert H. Frank, Thomas Gilovich and Dennis T. Regan (1993, 1996) and Anthony M. Yezer, Robert S. Goldfarb and Paul J. Poppen (1996) on whether training in economics encourages self-interested behaviour in social dilemmas. Next I present two field experiments on honesty and giving behaviour, before I report the results of two dictator game experiments. Finally I report the results of four questionnaires on the attitude towards the fairness of price increases, on corruption, on the conflict between profit maximisation and welfare, and on the perception of fairness.

The discussion between Frank et al. and Yezer et al. Robert H. Frank, Thomas Gilovich and Dennis T. Regan (1993) conducted two questionnaires and a prisoner's dilemma game experiment to test if exposure to the self-interested model used in economics changes the extent to which people behave in self-interested ways. In one of the questionnaires they tested free riding in charitable giving and time spent in volunteer activities and the participants were college professors from various disciplines. In the other questionnaire they tested honesty and the participants were all students. The participants in the prisoner's dilemma game experiment were also students.

The questionnaire data of charitable giving supported the hypothesis that economists are more likely to free ride. The questionnaire data on volunteer activities, however, did not confirm the free rider hypothesis – economists spent as much time as others in volunteer activities. However, Frank et al. (1993) suggest that there could be self-interested reasons for volunteering because there is often social pressure involved in these sorts of decisions. The experimental data showed that the probability of an economics major defecting in a prisoner's dilemma game was almost 0.17 higher than the corresponding probability for a non-economics major.

Frank et al. (1993) also conducted a questionnaire on honesty to establish a learning explanation for the differences between economists and non-economists. For the same purpose they also tested if the defection rate in the prisoner's dilemma game experiment changed with exposure to training in economics. The authors claimed that the results of both the questionnaire and the prisoner's dilemma experiment supported the learning hypothesis as defined by Marwell and Ames (1981). However, as they did not control for learning experiences before the students entered university, they may only have a weak basis for this claim.

Anthony M. Yezer, Robert S. Goldfarb and Paul J. Poppen (1996) criticised the result found by Frank et al.(1993) that exposure to economic theory tends to encourage self-interested behaviour. The aim of the study by Yezer et al. (1996) was to test for honesty in a real-world setting, rather than using a questionnaire or a laboratory experiment. In a field experiment envelopes containing money were dropped in rooms before classes in economics or other subjects were scheduled to start. The return rate of lost letters was then used as a measure of honesty. The results showed that economics students were substantially more honest than students studying other subject, with a respective return rate of 56 percent (18 of the 32 letters were returned) and 31 percent (10 of the 32 letters were returned).

Yezer et al.(1996) argue that exposure to economic theory may encourage the more pro-social behaviour found in their field experiment, because economics students also learn about mutual gains from voluntary trade and exchange. However, as pointed out by Frank et al. (1996) in their reply to the critique by Yezer et al. (1996), both of these papers investigate behaviour in social dilemmas not voluntary market exchange.[2]

Yezer at al. (1996) also carried out a questionnaire, which was comparable to the questionnaire on honesty by Frank et al. (1993). In Yezer et al. (1996) the questionnaire data on honesty showed evidence of a very weak tendency toward less honest behaviour during the course of the study of economics, while in Frank et al. (1993) the questionnaire data showed evidence of a stronger tendency towards less honest behaviour. However, Yezer et al.

[2] Also according to Vernon L. Smith (1991) there is a tendency of competitive experimental markets to converge to the competitive prediction derived from assumptions of full rationality and self-interest; markets "reinforce, even induce individual rationality" (page 881).

(1996) did not claim that the results of the questionnaire supported the learning hypothesis.

Field experiments Richard O. Beil and David N. Laband (1996, 1999) conducted a field experiment to elicit what they referred to as real-world behaviour on cooperation. They found evidence that economists are no less cooperative than non-economists. The real-world behaviour studied by Beil and Laband (1996, 1999) was annual payments for membership in the American Economic Association (AEA), the American Political Science Association (APSA) and the American Sociological Association (ASA) during 1994. The three associations employ a "progressive" membership rate structure, and Beil and Laband (1996, 1999) compared the income distribution and payment behaviour of members of AEA, APSA and ASA to reveal "cheaters". A questionnaire was distributed to 500 randomly selected non-student, non-foreign "regular" members of each association asking them to reveal their annual income, year of doctoral degree, academic rank and if working in the non-academic, public or private sector. They found that the sociologists cheated most. At the high end of the income distribution 50% of ASA members, 67% of AEA, members and 83% of APSA members paid the correct dues. However, as Beil and Laband(1996, 1999) indicated, non-economists had a greater monetary incentive to cheat than economists. The maximum saving to an AEA member (professional economist) misrepresenting his annual income, was 29 percent of the annual dues, if income was correctly reported. The corresponding percentages for an APSA member (professional political scientist) and an ASA member (professional sociologist) was 48 percent and 83 percent, respectively.

Bruno S. Frey and Stephan Meier (2003, 2005) carried out a field experiment on giving behaviour. They used a data set on giving behaviour in connection with two social funds at the University of Zurich. This made it possible to study the behaviour of economics students in a natural settings and compare it with the behaviour of students of other disciplines, and analyse whether potential differences in behaviour was due to learning. They reported a difference between economists and non-economists from the moment the students entered university, and claimed that the greater selfishness of economics students was due to selection. They also controlled for economic training in high school, using a dummy variable for pre-university economic knowledge. However, Frey and Meier (2003, 2005) did not find a learning effect. They compared the behaviour of students at each stage of their studies, and the results did not support the conjecture that economic education has a negative impact on the willingness to contribute.

Frey and Meier (2003, 2005) also reported differences in contributions to the funds between two types of economics students; students of political economics (economics) and students of business economics (business administration). When the students enter the main stage of their studies of economics (after approximately two years) they are allowed to choose between the two majors. Frey and Meier (2003, 2005) found that students of political economics were on average not more selfish than other students, but students of business economics were more selfish than other students. In retrospect, the authors suggested that the identified selection effect was almost entirely due to the behaviour of business economics students.

Laboratory experiments Ernst Fehr, Michael Naef and Klaus M. Schmidt (2005) replicated a dictator game experiment run by Dirk Engelmann and Martin Strobel (2004) to test for a subject pool effect. They wanted to show that since the participants in the experiment were undergraduate students of economics and business administration, Engelmann and Strobel (2004) overstated the relevance of efficiency motives and understated the relevance of equity aversion. Fehr et al. (2005) found that non-economists preferred equity over efficiency.

Alexander W. Cappelen, Erik Ø. Sørensen and Bertil Tungodden (2006) tested the effect of learning on people's fairness preferences in a dictatorship game with a production phase. The main effect of learning, they concluded, appeared to be an increase in the number of participants among second-year and fourth-year students of economics and business administration, who offered nothing to their opponent.

Questionnaires Bruno S. Frey, Werner W. Pommerehne and Beat Gygi (1993) carried out a questionnaire on the attitude of students towards the fairness of price increases, claiming that the data were adequate to discriminate between the selection hypothesis and the learning hypothesis as defined by Marwell and Ames (1981). The method they used to discriminate between the two hypotheses was to distinguish students who had just started their study of economics from advanced students, treating each group as a subsample. If advanced students showed a higher preference for the price system than the beginners, the learning hypothesis was supported. To test the selection hypothesis a sample of the population was nominated as a third group. Frey et al. (1993) claimed they verified the selection hypothesis and rejected the learning hypothesis.

Bjørn Frank and Gunther G. Schulze (2000) reported a questionnaire on corruption. This was a principal-agent problem where the agent was given an incentive to favour a third party, in exchange for some compensation, at the expense of the principal. The bribers were fictitious, the agents were the participating students and the principal was the students´ film club. The students were implicit asked to bribe their film club, which they did, and economists were found to be more corrupt than non-economists. Frank and Schulze (2000) did not ascribe the result to learning rather to selection. Their implicit argument was the fact that 29 percent of the economics students and 30 percent of the non-economics students were first-year students.

Ariel Rubinstein (2006) conducted a questionnaire amongst undergraduate students on the conflict between profit maximization and the welfare of workers to be fired to achieve it. He found that economics students had a much stronger tendency to maximize profit than students of other subjects including business administration, and argued that the mathematical methods used to teach economics conceals the need to think about real-life problems. The data were inadequate for discriminating between the selection and the learning hypotheses.

Marco Faravelli (forthcoming) conducted a questionnaire with freshmen and senior students of economics and sociology as respondents. As in the current study, he also exposed the participants to different hypothetical distributive situations to test for differences in the perception of fairness between students of economics and students of sociology, and between freshmen and senior students in the two subject pools. He claimed that a selection effect exists: sociology students are more concerned with equality than economics students. He also claimed that a learning effect exists for economics students: senior students of economics prefer efficient resource allocation while freshman students prefer the equal distribution of resources. He did not, however, control for learning experiences prior to entering university.

As Faravelli (forthcoming), Marwell and Ames (1981) also tested for differences in the attitude to fairness between economists and non-economists. They asked participants in the public good experiment what they thought was a fair contribution to the public good, and whether they were concerned with fairness when they made their contribution decision. 75 percent of the non-economists thought that the contribution should be about half or more of the private endowment, and the remaining 25 percent thought that the whole endowment should be contributed. A comparison with economics students, however, was difficult because "More than one-third of the economists either refused to answer the question regarding what is fair, or gave complex, uncodable answers. It seems that the meaning of fairness in this context was somewhat alien to this group. In addition, the economics graduate students were about half as likely as other subjects to indicate that they were concerned with fairness in making their investment decision." (Marwell and Ames 1981, page 309).

Summing up Most of these studies conclude that economists behave more self-interested than non-economists. Two studies, Yezer et al.(1996) and Beil and Laband (1996, 1999), find that economists are no less honest than non-economists, a somewhat unusual pattern. However, in Beil and Laband's (1996, 1999) study, it is the monetary incentive structure that triggers and explains the result, and the honest behaviour of economics students in the "lost letter" experiment conducted by Yezer at al. (1996) does not necessarily contradict free-riding in public good game experiments or self-interested behaviour in dictator game experiments. Also, the market depends on property rights and economists may be more conscious of the importance of respecting these. However, there are relatively few observations in the Yezer et al. (1996) study, and it may therefore be difficult to draw any clear conclusions.

Frey et al. (1993) refer to a survey by three economic psychologists on the behavioural stages of children, which concluded that "an infant is clearly not a homo oeconomicus". In trying to explain the development of an individual from an "uneconomic" child to an "economic" adult the economic psychologists showed how children learnt step-by-step to cope with money and markets, and how fairness considerations concerning wages were influenced by information (S. L. Lea, R. M. Tarpy and P. Webley, 1987). This indicates that it is difficult to establish a benchmark to measure a learning effect against, and consequently it is also difficult to measure a pure selection effect. However, there is the possibility of arguing for a learning effect from the moment the students are exposed to university teaching and of defining any differences between the two subject pools that exist before this moment as a selection effect, and claim that it has external validity as such. In the analysis in section 5 the selection effect is defined as the difference that exists between the two pools of first-year students when they enter either NHH or HiB.

Marwell and Ames (1981) and Faravelli (2006) test for differences in the attitude to fairness between economists and non-economists. Marwell and Ames (1981) found a large difference, while Faravelli (2006) found only some difference. The main objective in the current study is also to test for differences in the attitude to fairness between economists and non-economists.

The various studies differ to a certain extent with respect to the theoretical, empirical and methodological issues involved. In fact only Cappelen et al. (2006) apply both a theoretical and an empirical approach. All the remaining studies are largely empirical. The data generating process also includes different methods such as laboratory experiments, field experiments and questionnaires. Regarding the causal factors, few studies systematically elaborate on the distinction between the learning and selection explanations of differences between economists and non-economists. The statistical and econometric methods also vary between the studies, ranging from descriptive statistics to statistical tests and more sophisticated econometric techniques. However, as most of the studies report a subject pool effect the research findings may be telling us something about the real world. Economists appear to behave more self-interested than non-economists in general, but as most of the studies do not establish a benchmark to measure a selection effect against, it appears difficult to tell why economists behave differently.

3 Theory and hypotheses

I study a situation where individuals differ in how much money they invest and in their rate of return on investment.[3] The amount of investment, q_i, is within individual control and the rate of return on investment, a_i, is beyond individual control. The individual rate of return on investment is either high or low, and thus, the income generated by an individual i is given by the product $x_i = a_i q_i$. I always consider a two-person setting and the individuals are referred to as person 1 and person 2. My main focus is on how to distribute total income $X(\mathbf{a}, \mathbf{q}) = x_1(a_1, q_1) + x_2(a_2, q_2)$, where $\mathbf{a} = (a_1, a_2)$ and $\mathbf{q} = (q_1, q_2)$, and each individual is to propose an amount of income y to himself and $(X - y)$ to his opponent. I assume that the individuals

[3] Section 3 overlaps to some extent with section 2 in Drange Hole (2007)

are motivated by both a desire for income and fairness. A fairness ideal, $m^{k(i)}(\mathbf{a}, \mathbf{q})$, specifies the amount that individual i holds to be his fair income.

3.1 The fairness ideals

It is assumed that an individual endorses either strict egalitarianism, liberal egalitarianism or libertarianism. According to the strict egalitarian fairness ideal total income should always be distributed equally amongst the individuals (see, for example, Kai Nielsen, 1985). Hence, inequalities arising from differences in both investment and rates of return should be eliminated; that is, individuals should not be held responsible for either their investment choices or their rate of return.

$$m^{SE}(\mathbf{a}, \mathbf{q}) = X(\mathbf{a}, \mathbf{q})/2 \tag{1}$$

The strict egalitarian view is closely related to the inequality-aversion models in the experimental literature, that assume that people dislike unequal outcomes (see Fehr and Schmidt, 1999).

Liberal egalitarianism, on the other hand, defends the view that people should only be held responsible for their choices (Roemer, 1998). A reasonable interpretation of this fairness ideal is to view the fair distribution as giving each person a share of the total income equal to his share of total investment. .

$$m^{LE}(\mathbf{a}, \mathbf{q}) = \frac{q_i}{q_i + q_j} X(\mathbf{a}, \mathbf{q}) \tag{2}$$

This principle is equivalent to what has been described as the accountability principle (James Konow, 1996, 2000). It implies that if two persons make the same choice, then the fair solution is to give them the same income. Inequalities due to differences in rate of return should be eliminated; that is, individuals should be held responsible for their investment choice but not for their rate of return. Hence, liberal egalitarianism implies that an unequal distribution of income due to different investments is acceptable, but an unequal distribution of income due to different rates of return is not.

The libertarian fairness ideal lies at the opposite extreme to strict egalitarianism and does not assign any value to equality. According to libertarianism, the fair distribution is simply that each person is entitled to what he has produced (Robert Nozick, 1974).

$$m^{L}(\mathbf{a}, \mathbf{q}) = a_i q_i \tag{3}$$

Therefore, the libertarian solution may involve an unequal distribution of income due to differences in both investment and the rate of return; that is, individuals should be held responsible for both their investment choices and their rate of return.[4]

Even though the three fairness ideals provide different solutions to the distributive problem, it is important to notice that on average they instruct individuals to offer the same amount to the other person. In any distribution situation and for any fairness ideal k, the fair solution would be that person 1 offers $X - m^k$ to person 2 and person 2 offers m^k to person 1, which implies that the average fair offer in the distribution situation is $X/2$.

3.2 Distributive behaviour

Standard economic theory assumes that individuals exclusively pursue their material self-interest and do not care about fairness per se. However, I assume that the individuals have preferences that respond to both monetary payoffs and the perceived fairness of the outcome. In the following analysis it is important to distinguish between a *fairness ideal*, denoted m^k and an *overall fairness consideration*, denoted m^*. m^k is the fairness ideal an individual would endorse if there was no communication, where k denotes strict egalitarianism, liberal egalitarianism, or libertarianism. m^* is what an individual considers fair when proposing a distribution after the communication.

Hence, when proposing a distribution of total income an individual i is motivated by a desire for income and by fairness considerations, and maximizes the following utility function:[5]

$$U_i(y; \mathbf{a}, \mathbf{q}) = y - \frac{\beta_i}{2} \frac{\left[y - m_i^*(\mathbf{a}, \mathbf{q})\right]^2}{X(\mathbf{a}, \mathbf{q})}, \tag{4}$$

where the marginal disutility of deviating from the overall fairness consid-

[4] From equation (1)-(3) we can find that the fair private return from investment, $\frac{dm^{k(i)}}{dq_i}$, is $\frac{a_i}{2}$ under strict egalitarianism, $\left(\frac{3a_i}{4} + \frac{a_j}{4}\right)$ under liberal egalitarianism if individual i and individual j make equal investments and a_i under libertarianism. The different fair private returns from investment provide different incentives to the individual in the production phase. I return to this issue in section 4.

[5] The first element in the utility function captures the self-regarding motive and the second element captures the other-regarding motive (see also Ernst Fehr and Klaus M. Schmidt, 1999; Gary E. Bolton and Axel Ockenfels, 2000; and Cappelen et al., forthcoming.)

eration m_i^* is increasing with the size of the deviation from this fair amount.[6]

The parameter $\beta_i \geqslant 0$ determines the weight individual i gives to fairness considerations. If $\beta_i = 0$, individual i assigns no importance to fairness considerations, and keeps all the money. $X - m_i^*$ is individual i´s fair offer to individual j. Given an interior solution the optimal proposal in relative terms for an individual depends on his overall fairness consideration and the weight he attaches to fairness considerations:

$$\frac{y^*}{X(\mathbf{a},\mathbf{q})} = \frac{m_i^*}{X(\mathbf{a},\mathbf{q})} + \frac{1}{\beta_i} \tag{5}$$

3.3 Communication

What determines the overall fairness consideration m^*? Individual i and the opponent individual j have an opportunity to exchange information about fairness ideals before they propose a distribution, and the information exchange can be dealt with in different ways. Individual i´s overall fairness consideration, m_i^*, may be influenced by his own fairness ideal, $m^{k(i)}$, and by his opponent's fairness ideal, $m^{k(j)}$. Accordingly pre-play communication may potentially have different effects on individual behaviour. I present three models for how an individual may react to communication; the integrity model, the compromise model and the self-serving model.

$$\text{The integrity model: } m_i^* = m^{k(i)} \tag{6}$$

$$\text{The compromise model: } m_i^* = \alpha_i m^{k(i)} + (1-\alpha_i)[X - m^{k(j)}] \tag{7}$$

$$\text{The self-serving model: } m_i^* = \alpha_i m^{k(i)} + (1-\alpha_i)\max\{m^{k(i)}, X - m^{k(j)}\} \tag{8}$$

It follows that if $m^{k(i)} > X - m^{k(j)}$ the self-serving model and the compromise model coincide, and if $\alpha_i = 1$, all three models coincide.

In the integrity model an individual's overall fairness consideration is not affected by communication. The model predicts that an individual is committed to his own fairness ideal when he makes his proposal in the distribution phase.

In the compromise model individuals take their opponent's fairness ideal into account when they propose a distribution. The model predicts that an

[6] A robustness test of the particular functional form is given in the appendix, section 7.1.

individual's overall fairness consideration falls somewhere between his own and his opponent's fairness ideal. More formally individual i´s overall fairness consideration is a convex combination of his and his opponent's fairness ideal, where the parameter α_i represents the importance individual i assigns to his own fairness ideal $m^{k(i)}$.[7]

Alternatively, an individual's reaction to communication may be self-serving. It is well known from the literature that information exchange may cause individuals to make self-serving distortion of justice. They may bias their overall fairness consideration in favour of themselves (David M. Messick and Keith Sentis 1983, Linda Babcock, George Loewenstein, Samuel Issacharoff and Colin Camerer 1993, 1995, Babcock and Loewenstein 1997, Konow 2000, 2005, Jason Dana, Roberto A. Weber and Jason Xi Kuang 2004). In the self-serving model individuals also take their opponent's fairness ideal into account when proposing a distribution, but they do this only when the opponent's fairness ideal justifies a larger share to themselves than their own fairness ideal. More formally individual i´s overall fairness consideration is a convex combination of his own and his opponent's fairness ideal when the opponent's fairness ideal is more favourable to individual i than his own.[8]

Given an interior solution, the optimal proposal for each model is as follows:

$$\frac{y^*}{X(\mathbf{a},\mathbf{q})} = \frac{m^{k(i)}}{X(\mathbf{a},\mathbf{q})} + \frac{1}{\beta_i} \tag{9}$$

[7] The following example illustrates this. In a distributional situation where $a_i q_i = 4*200$ NOK, $a_j q_j = 2*100$ NOK and $X = 1000$ NOK the fairness ideals instruct individual i to keep 800 NOK $\left(m^L\right)$, 667 NOK $\left(m^{LE}\right)$ and 500 NOK $\left(m^{SE}\right)$. If individual i is a libertarian, individual j is a strict egalitarian and $\alpha_i = 0.6$, the compromise model predicts that individual i's overall fairness consideration is, $m_i^* = 0.6*800$ NOK $+0.4*500$ NOK= 680 NOK.

[8] The following example illustrates this. In a distributional situation where $a_i q_i = 2*100$ NOK, $a_j q_j = 4*200$ NOK and $X = 1000$ NOK the fairness ideals instruct individual i to keep 200 NOK $\left(m^L\right)$, 333 NOK $\left(m^{LE}\right)$ and 500 NOK $\left(m^{SE}\right)$. If individual i is a libertarian, individual j is a strict egalitarian and $\alpha_i = 0.6$, the self-serving model predicts that individual i's overall fairness consideration is, $m^* = 0.6*200$ NOK $+0.4*500$ NOK= 320 NOK. If on the other hand individual i is a strict egalitarian, individual j is libertarian and $\alpha_i = 0.6$, the self-serving model predicts that individual i's overall fairness consideration is, $m^* = 0.6*500$ NOK $+0.4*500$ NOK= 500 NOK.

$$\frac{y^*}{X(\mathbf{a},\mathbf{q})} = \alpha_i \frac{m^{k(i)}}{X(\mathbf{a},\mathbf{q})} + (1-\alpha_i)\left[1 - \frac{m^{k(j)}}{X(\mathbf{a},\mathbf{q})}]\right] + \frac{1}{\beta_i} \tag{10}$$

$$\frac{y^*}{X(\mathbf{a},\mathbf{q})} = \frac{m^{k(i)}}{X(\mathbf{a},\mathbf{q})} + (1-\alpha_i)\max\left\{0, 1 - \frac{m^{k(j)}}{X(\mathbf{a},\mathbf{q})} - \frac{m^{k(i)}}{X(\mathbf{a},\mathbf{q})}\right\} + \frac{1}{\beta_i} \tag{11}$$

If there is no opportunity to exchange information about fairness as in treatment 1, individual i has no knowledge about individual j´s fairness preferences, and we assume that the optimal proposal is in line with the integrity model.

3.4 Hypotheses

Economists may differ from others in how much importance they give to fairness considerations, in what they recognize as fair and in how they react to communication. Hence, we can formally state the following three null hypotheses on how economists differ from others:

Hypothesis I $\left(H_0^I\right)$*:* Economics students and engineering students do not differ in the weight they attach to fairness considerations.

Hypothesis II $\left(H_0^{II}\right)$*:* Economics students and engineering students do not differ in what they recognize as fair.

Hypothesis III $\left(H_0^{III}\right)$*:* Economics students and engineering students do not differ in how they react to communication about fairness.

Hence, potential differences between economists and non-economists in three dimensions will be investigated. The distribution of the individual weights attached to fairness considerations may differ between the two pools, the prevalence of fairness ideals may differ between them, and the two pools may differ in the way they react to communication about fairness..

4 Experimental design

In order to test for subject pool effects, the participants were recruited from among economic students at the Norwegian School of Economics and Business Administration and engineering students at Bergen University College. The sample is restricted to first-year students. Since I argue for a selection effect as any difference that exists when the students enter the two institutions, there could be a selection explanation for any differences between the two subject pools.

The experiment is a version of a one-shot dictator game with a pre-play communication phase and production. Hence, the experiment has three phases: a communication phase, a production phase and a distribution phase. At the beginning of the experiment the participants were given information about how the three phases would proceed and about how the outcome of the experiment would be determined.

In the communication phase, the participants faced three hypothetical distribution situations and three different principles of what constitutes a fair distribution of income. The implications of the three principles in each of the three hypothetical distributive situations were also presented to them. They were asked to choose the principle they thought would imply the fairest distribution in situations like the hypothetical situation. The participants were also told that the alternative they chose would be communicated to other participants later in the experiment, but that the decision made in this phase would not restrict their choices later in the experiment. The decision that a player made in the communication phase was communicated to his opponents in the distribution phase. The design of the communication phase prevented strategic behaviour in the production phase and thus, also any clear incentive to report wrongly.

In the production phase, each participant was given credits equal to 300 Norwegian krone (NOK), approximately 50 US dollars. Production depended on factors both within and beyond individual control; investment was clearly within individual control and the rate of return on investment clearly beyond individual control. In the production phase each participant in both the experimental and the control group was randomly assigned a low or a high rate of return. Participants with a low rate of return would double the value of any investment they made, while those who were assigned a high rate of return would quadruple their investment. The participants were asked to determine how much they wanted to invest in two different one-shot games. Before they made their investment choice, they were told that they would be paired with players with different rates of return. Their choice alternatives were limited to 0 NOK, 100 NOK and 200 NOK, and the total amount invested in the two games could not exceed the initial credit they received. The design with two games was chosen to expose the participants to different situations in the distribution phase. Any money they chose not to invest was added to their total earnings from the experiment, and thus, they faced a genuine choice of investment. As shown in table 1 it was also perceived as a genuine choice. Of the 188 participants, 179 invested the full endowment of 300 NOK, evenly distributed between (200, 100) and (100, 200).[9] Given that most participants did invest the full amount there seems to be no incentive implications of the different private returns from investment under the three fairness ideals.

Table 1: Empirical distribution of investment in the two games

	Game 2			
Game 1	0	100	200	Total
0	2	0	1	3
100	0	4	92	96
200	2	87	.	89
Total	4	91	93	188

In the distribution phase, before the participants were asked to propose a distribution of total income produced, they were given information about the other participant's rate of return, investment level, total contribution, which fairness principle their opponent had chosen in the communication phase and the implication of this principle in this particular distributive situation. They were also reminded of their own choices in the communication phase and in the production phase. The participants were not informed about the outcome of the first game before the second game was completed, i.e. they considered the two one-shot games simultaneously. For each participant one of the two proposals (the participant's own or that of the opponent) in one of the two games was randomly selected to determine the final outcome. The total earnings from the experiment were given by the final outcome plus the amount of money not invested. Given that we assume that people's fairness ideals are defined on the final distribution of outcome, the chosen elicitation procedure is incentive-compatible.

At the end of the experiment, the participants were assigned a code and instructed to mail the code and their bank account numbers to the school's

[9] The empirical distribution of investment in the two games is only slightly different for the two subject pools; see the appendix, section 7.2.

accounting division. Independently, the research team mailed a list including the codes and the total payment to the accounting division, who then disbursed the earnings directly to each participant's bank account. This procedure ensured that neither the participants nor the research team were in a position to identify how much each participant earned in the experiment.

In the invitation the participants were told that they would initially receive 300 NOK to use in an experiment that would last about 40 minutes and that their total earnings from the experiment would depend partly on their choices. They were not informed about the purpose of the experiment. The hourly opportunity cost for most of these students would be about 100 NOK, while the average payout was 442 NOK for economics students and 507 NOK for engineering students. Each student was only permitted to participate once. There was one session with 12 participants and five sessions with 16 participants, comprising a total of 92 participants in the subject pool of economics, while there were six sessions with 16 participants, comprising a total of 96 participants in the subject pool of engineers.[10] The participants were in the same computer lab during a session, but all communication was anonymous and conducted through a web-based interface.

In the distribution phase, the paired players could differ with respect to both their rate of return and their investment, which implies that there were four different categories of distributive situations in the experiment.[11] As shown in table 2, there are 98 observations in the category where players are identical with respect to both their rate of return and their investment. In this situation all three fairness ideals imply the same fair distribution, namely that both players get an equal share of the total income. In the category where the players have the same rate of return but differ in their investment, there are 90 observations. In this situation the liberal egalitarian and the libertarian fairness ideals coincide, whereas strict egalitarianism would imply a different view of the fair distribution.

[10] 70 participants in the economics subject poool and 84 participants in the engineering subject pool were male students.

[11] They could also differ with respect to the fairness ideal they had reported in the communication phase. This is commented on in section 5.2.

Table 2: Number of observations in each category

	Investment		
Rate of return	Same	Different	Total
Same	98	90	188
Different	94	94	188
Total	192	184	376

In the category where the players made the same investment but differed in their rate of return, there are 94 observations. In this situation both the strict and the liberal egalitarian would consider an equal split a fair distribution, while the libertarian would consider an unequal split a fair distribution. In the category where the players differ in both dimensions there are also 94 observations. In this situation the strict egalitarianism and libertarianism imply the same fair offer if the player with a high rate of return is the player with a low investment (100 NOK). Otherwise, none of the fairness ideals coincide in this category.

5 Analysis

I compare the economics students and the engineering students in three dimensions; the weight they attach to fairness considerations, the prevalence of fairness ideals, and how they react to communication about fairness. Hence, I test the three null hypotheses from section 3.4.

5.1 Are economists more self-interested than engineers?

I discuss the differences in the average offer to opponent between the two subject pools before I examine the differences in the distribution of offers. The three fairness ideals provide different solutions to the distributive problem, but on average they instruct individuals to divide total income equally. Any difference in the average offer to opponent between the two subject pools should therefore reflect a difference in the distribution of the weight attached to fairness considerations, but will not say anything about differences in the prevalence of fairness ideals.[12] However, any difference in the standard deviation of offer may reflect differences in both the importance assigned to fairness considerations and the prevalence of fairness ideals. Hence, I also go beyond the difference in average offer and compare the degree of heterogeneity in the offer to the opponent in the two subject pools.

5.1.1 Difference in average offer

Table 3 provides the major statistical features of the data from the distribution phase. The average relative offer is 30.9 percent in the economics subject pool and 46.3 percent in the engineering subject pool.[13] This is a huge difference – the engineers offer on average almost 50 percent more to their opponent than the economists do.

Table 3: Descriptive statistics of offer made to opponent, by subject pool

Subject pool	Economists	Engineers	Economists	Engineers
Variable	Absolute	Absolute	Relative	Relative
Mean	280	420	.309	.463
Median	200	400	.333	.5
Mode	0	400	.5	.5
St. dev	243	213	.229	.164
Min	0	0	0	0
Max	800	800	.8	1
n	184	192	184	192

Note: The variables *Absolute* and *Relative* are offer made to opponent in NOK and in percentage of total income produced in each particular distributive situation.

The maximum relative offer is 80 percent in the economics subject pool and 100 percent in the engineering subject pool.[14] The minimum offer is zero

[12]This is correct if people do not behave opportunistically and if the two groups are equally restricted by corner solutions. This is explained in the appendix (section 6.3) in Drange Hole (2007)

[13]Descriptive statistics from the economics subject pool is also reported in section 4.1 in Drange Hole (2007)..

[14]Only one participant in each subject pool offered maximum.

in both subject pools. In absolute terms zero is also the most frequent offer amongst the economics students, while amongst the engineering students the most frequent offer is 400 NOK.[15] Hence, on average, economists appear to be substantially more self-interested than the engineers.[16]

To test H_0^I : that economics and engineering students do not differ in the weight they attach to fairness considerations, a regression with a subject pool dummy and a control variable is run.

Table 4: Test of the null hypothesis that there is no subject pool effect

Relative offer on	
constant	- .049
	(.039)
dummy	.179
	(.019)
own ideal	.656
	(.068)
sigma - u	.110
	(.014)
sigma - e	.176
	(.008)
n	376
log likelihood	- 5.201

Note: The variable *Relative* is offer made to opponent in percentage of total income produced in each particular distributive situation. *Own ideal* refers to the distributive implication of the player's communicated fairness ideal in percentage of total income produced in each particular distributive situation. The dummy identifies the engineers. Standard errors in parenthesis. sigma-u and sigma-e are the standard deviations between individuals and games, respectively.

[15] The full distributions of offer for the two subject pools in absolute and relative terms are shown in the appendix, section 7.3.

[16] It is also interesting to notice that when individuals decide how to distribute income, it matters to them how the contribution to total production has come about. The correlation in the engineering subject pool between the individuals' distributive proposals and a) their own investment decisions, b) their opponents' investment decisions, c) their own rate of return and d) their opponents' rate of return are $r(y_i, q_i)$ =.7056, $r(y_i, q_j)$ =.1839, $r(y_i, a_i)$ =.4470 and $r(y_i, a_j)$ =.3114, respectively. The corresponding numbers for the economics subject pool are, $r(y_i, q_i)$ =.5164, $r(y_i, q_j)$ =.2711, $r(y_i, a_i)$ =.4703 and $r(y_i, a_j)$ =.2847

Since there is an unobserved weight attached to fairness considerations, assumed to be uncorrelated with the fairness ideal a person endorses, and since 15.6 percent of the participants in the pooled data set offered their opponent nothing, I run a random effect tobit regression.[17] The regression result is reported in table 4.

The null hypothesis can be rejected. There is a statistically significant subject pool effect on the average offer to opponent, which reflects a much higher weight attached to fairness considerations in the engineering subject pool than in the economics subject pool. The participants in the engineering subject pool act more generously than the participants in the economics subject pool. Hence, engineering students are on average less self-interested than economics students.

5.1.2 Different degree of heterogeneity in offer

To examine the degree of heterogeneity in the offer to opponent in each subject pool, I compare the standard deviations of offer in the two subject pools reported in table 3. The standard deviation is 0.229 in the economics subject pool and 0.164 in the engineering subject pool, reflecting a substantial difference in heterogeneity in distributive behaviour in the two subject pools. Figure 1, which shows the cumulative distribution of the relative offer made to the opponent for each subject pool, also depicts a substantial difference in heterogeneity in distributive behaviour in the two subject pools.

39.1 percent of the offers in the economics subject pool represent 0.25 of total income or less and 9.8 percent of the offers represent 0.5 of total income or more. The corresponding percentages for the engineering subject pool are 7.3 and 20.3. As can also be seen from the figure the distribution of offer in the engineering subject pool is unimodal, while the distribution of offer in the economics subject pool is bimodal; 47.9 percent of the observations in the engineering subject pool are participants who shared the production equally, and 5.2 percent of the observations are participants who offered nothing to the opponent. In the economics subject pool the corresponding percentages are 31.5 and 26.6.[18]

[17] The justification for the random effect assumption given in the appendix, section 7.4, for each data set, also applies to the pooled data set.

[18] This is also illustrated in figure A1 in the appendix, section 7.3.

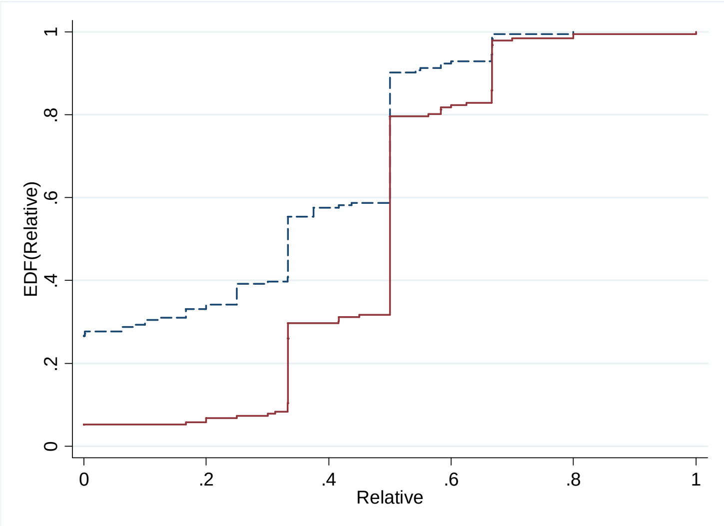


Figure 1: Cumulative distribution of relative offer, by subject pool
Note: Relative is offer made to opponent in percentage of total income produced in each particular distributive situation. The dotted and the straight lines are for the economics and the engineering subject pool, respectively.

Table 5 classifies the individuals in the two subject pools in three groups with respect to distributive behaviour. Column 1 reports the percentage of participants who offered nothing to their opponent. 26.6 percent of the economics subject pool and 5.2 percent of the engineering subject pool did so. Column 2 reports the percentage of participants who offered less to their opponent than the fair distribution they reported in the communication phase. 29.9 percent of the economics subject pool did so while the percentage for the engineering subject pool is 14.1. Column 3 reports the percentage of participants who offered exactly the amount they reported in the communication phase as the fair offer. The percentages are 43.5 and 77.6 for the economics and engineering students, respectively.

Table 5 also shows that there is substantially more heterogeneity in distributive behaviour in the economics subject pool than in the engineering subject pool. Many economists offered nothing to their opponent. However, a relatively large group of economists also offered the amount they reported as fair in the communication phase. The engineering subject pool is less polarised than the economics subject pool. Of the engineers 77.6% kept exactly the amount they reported as a fair amount in the communication phase, and only a very small group kept everything.

Table 5: Indicators of the value of the weight attached to fairness

	$m \leq y = X$	$m < y < X$	$m = y < X$
Economists	26.6	29.9	43.5
Engineers	5.2	14.1	77.6

Note: X is total income produced in each particular distributive situation. m is the fair distribution a player has chosen in the communication phase. y is money kept in the distribution phase. The numbers are percentages.

The degree of heterogeneity in distributive behaviour in a subject pool can be due to heterogeneity in fairness ideals, in the weight people attach to fairness considerations and in the distributive situations. To illustrate the different kinds of heterogeneity, table 6 and table 7 are provided.

Table 6: Standard deviation of fair offer in relative terms calculated for all observed distributive situations and each fairness ideal, by subject pool

	Economists	n	Engineers	n
Strict egalitarianism	0	184	0	192
Liberal egalitarianism	.163	184	.132	192
Libertarianism	.187	184	.162	192

Table 6 reports the standard deviation of the fair offer to opponent in relative terms if all the participants agree on what is a fair distribution of income and everyone offer exactly this fair amount. This is calculated for each fairness ideal in all the observed distributive situations, sorted by subject pool. To illustrate, if everyone in the economics subject pool were libertarians and also offered the fair amount (put all weight to fairness considerations), the standard deviation of the relative offer would be 0.187. On the other hand if everyone in the economics subject pool were strict egalitarians and also offered the fair amount (put all weight to fairness considerations), the standard deviation of relative offer would be 0. Hence, table 6 shows that even if there is no heterogeneity in the weight people attach to fairness considerations in the two subject pools, there can still be a different degree of heterogeneity in distributive behaviour in the two subject pools because of different conceptions of fairness. In general the libertarian offer represent greater variation than the liberal egalitarian offer, and the liberal egalitarian offer represent greater variation than the strict egalitarian offer.[19] [20]

To study if there is heterogeneity in the weight attached to fairness considerations, table 7 is provided. In table 7 the standard deviation of the relative offer in each subject pool is sorted by fairness ideal. From the table we can see that the standard deviations are larger in the economics subject pool than in the engineering subject pool for all fairness ideals. If we compare the standard deviation of the libertarian offer in the economics subject pool and the engineering subject pool in table 7, we see that the difference is 0.085. The corresponding differences for the liberal egalitarian and the strict egalitarian offer are 0.051 and 0.020, respectively. The differences are due to a different degree of heterogeneity in the weight attached to fairness considerations in the two subject pools and also to variation in the distributive situations in the two pools. Taking table 6 and table 7 together we can see that there is substantially more heterogeneity in the weight attached to fairness considerations in the economics subject pool than in the engineering subject pool.

Table 7: Standard deviation of offer to opponent in relative terms, by fairness ideal and subject pool

	Economists	n	Engineers	n
Strict egalitarianism	.203	30	.183	20
Liberal egalitarianism	.214	78	.163	116
Libertarianism	.246	76	.161	56
Total	.229	184	.164	192

[19] The following example also illustrates this. In a distributive situation, where $a_i q_i = 4*200$ NOK, $a_j q_j = 2*100$ NOK and $X = 1000$ NOK the fairness ideals instruct individual i to offer 0.2 $\left(m^L\right)$, 0.333 $\left(m^{LE}\right)$, and 0.5 $\left(m^{SE}\right)$. As relative offer is 0.5 on average for all the three fairness ideals, the standard deviations in this distributive situation are 0.3, 0.167 and 0 for m^L, m^{LE} and m^{SE}, respectively.

[20] Note also that if we compare the standard deviation of the libertarian offer in the economics and the engineering subject pools in table 6, we can see that the difference is 0.025. The corresponding difference for the liberal egalitarian offer is 0.031. The differences are due to the fact that the individuals in the two subject pools did not face exactly the same distributive situations in the experiment.

In summary, the engineering students are, on average, more generous than the economics students; they attach on average more weight to fairness considerations than economics students do. On the other hand there is substantially more heterogeneity in distributive behaviour in the economics subject pool than in the engineering subject pool due to greater heterogeneity in the weight students attach to fairness considerations.[21]

5.2 Do economists and engineers differ in what they consider fair?

In the communication phase, the participants were asked which of the three fairness ideals they considered the fairest: either to divide equally, to divide in proportion to investment or to divide by production. Table 8 gives the prevalence of fairness ideals in the communication phase for both subject pools. Of the economics students 16.3 percent reported strict egalitarianism the fairest ideal in the communication phase, while the remaining 77 students in this subject pool were evenly distributed between the liberal egalitarian and libertarian ideals. Of the engineering students 10.4 percent reported strict egalitarianism the fairest ideal in the communication phase, while 60.4 percent reported the liberal egalitarian ideal the fairest and 29.2 percent reported the libertarian ideal the fairest.

Table 8: Prevalence of professed fairness ideals, by subject pool

	Economists	Engineers
Strict egalitarianism	16.3	10.4
Liberal egalitarianism	42.4	60.4
Libertarianism	41.3	29.2

To test H_0^{II} : that economics students and engineering students do not differ in what they recognize as fair, I perform a *chi square test,* which tests if the frequencies of communicated fairness ideal in the two subject pools differ. The p-value is 0.002. Hence, the null hypothesis can be rejected. There is a strongly significant difference between the two subject pools as regards the prevalence of communicated fairness ideals. The data support

[21] A smaller part may possibly be assigned to differences in the prevalence of fairness ideals in the two subject pools. This is commented on in section 5.2.

the alternative hypothesis that economics students and engineering students differ in what they recognize as fair.

Accordingly, the prevalence of fairness ideals reported in the communication phase by the participants differs between the two subject pools. Moreover it is also important to notice that the study of economics does not attract a homogenous group of students. In fact, and in comparison with the engineers, the economists are more heterogeneous and have a larger share of both the polar cases, strict egalitarianism and libertarianism. Thus, the data do not support a common belief about economists that they are a very homogenous group with respect to value judgements.

Any attempt to justify the prevalence of fairness ideals reported in table 8 would be mere speculations. However, one conjecture could be that since libertarians accept the market institution as a fair allocator, it appears reasonable that people attracted by this fairness ideal will be less sceptical in regards to the economics curriculum than other people, and even select into the study of economics to learn more about it.

5.3 Do economists and engineers differ in how they take other people's concept of fairness into account?

In this section I compare the two groups of students in the third dimension: how they react to communication about fairness. I test if communication affects distributive behaviour differently in the two subject pools. To test H_0^{III} : that economics students and engineering students do not differ in how they react to communication about fairness, I estimate the three first order conditions from section 3, equation (9)-(11). The amount of money an individual keeps in the distribution phase relative to total income is regressed on the distributive implication of his own and his opponent's choice of fairness ideal in the communication phase.[22] A right censored random effect regression is run to allow for observations where the individual kept all and for the unobserved effect, which is assumed to be uncorrelated with the

[22] Six participants in the engineering subject pool offered - in one of the two games - more to their opponent than the amount they had communicated as the fair amount. Accordingly these observations do not fit into the theoretical model. However removing the six participants from the estimating sample has only a minor impact on the regression results.

explanatory variables.[23]

Table 9 reports that the estimated relationship between communication and distribution differs between the two subject pools.

Table 9: Random effect censored regressions

	Economists			Engineers		
y-share on	IM	CM	SM	IM	CM	SM
constant	.413	.384	.388	.136	.134	.137
	(.055)	*(.051)*	*(.050)*	*(.028)*	*(.029)*	*(.029)*
own ideal	.667	0.565	.704	.808	.780	.807
	(.082)	*(.134)*	*(.082)*	*(.050)*	*(.097)*	*(.051)*
opponent's ideal		.143			.033	
		(.138)			*(.096)*	
max ideal			.232			- .024
			(.182)			*(.133)*
sigma - u	.281	.296	.292	.099	.098	.099
	(.028)	*(.029)*	*(.029)*	*(.011)*	*(.011)*	*(.011)*
sigma - e	.111	.106	.107	.084	.084	.084
	(.010)	*(.009)*	*(.009)*	*(.006)*	(.006)	*(.006)*
log likelihood	- 21.733	-20.305	- 20.217	117.655	117.714	117.670

Note: *IM* stands for integrity model. *CM* stands for compromise model. *SM* stands for self-serving model. *y-share* refers to the amount of money a player keeps in the distribution phase relative to total income. *own ideal* and *opponent's ideal* refer to the distributive implication of the player's and his opponent's choice of fairness ideal in the communication phase, respectively. *max ideal* refers to the positive difference between the distributive implication of the opponent's and the player's choice of fairness ideal. The explanatory variables are in relative terms, and the denominators are total income produced in each particular distributive situation.

For all three models and in both subject pools table 9 reports a statistically significant relationship between what an individual reports in the communication phase and what he chooses in the distribution phase. However,

[23] To deal with panel data and unobserved effects I employ regression with a complex error structure. Two error terms are included in the econometric models. One error term u_i is person specific and common to each individual, but differs between them. The idiosyncratic error term e_{ig} is game-specific and unique to each of the individuals in each game. I use the subscript g for game. The econometric model I have applied is: $y_{ig} = \max(a + bx + u_i + e_{ig})$ where $u_i \backsim N(0, sigma\ u)$, $e_{ig} \backsim N(0, sigma\ e)$ and $cov(u_i, e_{ig}) = 0$. A justification for the random effect assumption in each data set is given in the appendix, section 7.4.

in all three models the relationship is strongest in the engineering subject pool. Hence, most of the participants in both subject pools were motivated by their reported fairness ideal when they proposed a distribution, indicating that they also reported correctly in the communication phase.

In both subject pools there is also a relationship between what an opponent reports in the communication phase and what an individual chooses in the distribution phase. However, in the engineering subject pool this effect is negligible.[24] The estimation of the self-serving model shows that in the economics subject pool there is an economically significant effect of the opponent's reported fairness ideal when that benefits the individual most, and this effect is greater than the effect of the opponent's reported fairness ideal in the composite model. One reason why the effect is not statistically significant could be that economics students appear to be a very heterogeneous group.

The estimation results in table 9 appear to indicate a difference between the two subject pools with respect to how the participants respond to communication about fairness. The engineering students show a stronger commitment to act upon their own fairness ideal than the economics students do, and there does not seem to be any self-serving bias in this group. Thus, the engineering students appear to be more or less unaffected by other people's concept of fairness when they propose a distribution, and consequently the integrity model explains their behaviour quite well. Economics students, on the other hand, appear to be a more heterogenous group. Some of these do take other people's concept of fairness into account when they propose a distribution, especially if it justifies a larger share to themselves than their own fairness ideal. Accordingly, the self-serving model appears to quite well explain the distributive behaviour of some of the economics students.

In summary, in the third dimension the economics and engineering students also appear to differ. Students of economics seem to be more inclined to bias the notion of fairness in favour of themselves, while engineering students appear to be more inclined to show integrity.

[24] This conclusion changes slightly when I remove from the estimating sample the participants who did not invest their entire endowment. A robustness test is provided in the appendix, section 7.5.

6 Conclusion

Economists are significantly more self-interested than engineers. Engineers offer, on average, 50 percent more to their opponent than economists. Since, also, on average, the three fairness ideals imply the same fair distribution, the engineers appear to assign greater importance to fairness considerations than economists. However, there is substantially more heterogeneity in the distributive behaviour in the economics subject pool than in the engineering subject pool. This is mainly a result of more heterogeneity in the weights attached to fairness considerations in the economics subject pool.

The prevalence of fairness ideals reported in the communication phase also differs between the two subject pools, and it is important to notice that the study of economics does not attract a homogenous group of students. In fact, and in comparison to the engineers, economists are more heterogeneous with respect to the prevalence of fairness ideal, and have a larger share of both polar cases; strict egalitarianism and libertarianism.

There is also a difference between the two subject pools with respect to how the participants respond to their opponent's communicated fairness ideal. The engineering students show a stronger commitment to act upon their own fairness ideal than the economics students, and there does not seem to be any self-serving bias in this group. The integrity model therefore appears to explain their behaviour quite well. The economics students appear to be a more heterogeneous group, and they seem to take other people's concept of fairness into account when they propose a distribution, especially if it justifies a larger share to themselves than their own fairness ideal. Accordingly, the self-serving model seems to explain the distributive behaviour of the economics students quite well.

In summary, I have compared the two groups of students in three dimensions; the weight they attach to fairness considerations, the prevalence of fairness ideals, and how they react to communication; they appear to differ in all three dimensions. In the economics subject pool there are those who put relatively little weight to fairness considerations and bias the conception of fairness in favour of themselves. The proportion of libertarians is also greatest in this group. In the engineering subject pool there are those who put relatively greater weight to fairness considerations and show integrity. The proportion of liberal egalitarians is also greatest in this group. Hence, there is a selection effect as defined in this paper: the two pools of first-year students differ in all three dimensions when they enter NHH and HiB.

7 Appendix

7.1 Robustness test of the estimated parameters: three specifications of the utility function

I examine the effect on the estimated parameters of three specifications of the utility function. M-1 represents the utility function applied in the main body of the paper, whereas M-2 and M-3 defines utility in terms of relative and absolute deviation from the fairness ideal, respectively.

$$\text{M-1:} \qquad U_i(y; \mathbf{a}, \mathbf{q}) = y - \frac{\beta_i}{2} \frac{\left[y - m_i^*(\mathbf{a}, \mathbf{q})\right]^2}{X(\mathbf{a}, \mathbf{q})}$$

$$\text{M-2:} \qquad U_i(y; \mathbf{a}, \mathbf{q}) = y - \frac{\beta_i}{2} \left(\frac{y - m_i^*(\mathbf{a}, \mathbf{q})}{X(\mathbf{a}, \mathbf{q})}\right)^2$$

$$\text{M-3:} \qquad U_i(y; \mathbf{a}, \mathbf{q}) = y - \frac{\beta_i}{2} \left[y - m_i^*(\mathbf{a}, \mathbf{q})\right]^2$$

Given an interior solution the optimal proposals for the three specifications of the utility function are:

$$\text{M-1:} \qquad \frac{y^*}{X(\mathbf{a}, \mathbf{q})} = \frac{m_i^*}{X(\mathbf{a}, \mathbf{q})} + \frac{1}{\beta_i} \Longrightarrow \frac{y^*}{X(\mathbf{a}, \mathbf{q})} - \frac{m_i^*}{X(\mathbf{a}, \mathbf{q})} = \frac{1}{\beta_i}$$

$$\text{M-2:} \qquad \frac{y^*}{X(\mathbf{a}, \mathbf{q})} = \frac{m_i^*}{X(\mathbf{a}, \mathbf{q})} + \frac{X}{\beta_i} \Longrightarrow \frac{y^*}{X(\mathbf{a}, \mathbf{q})} - \frac{m_i^*}{X(\mathbf{a}, \mathbf{q})} = \frac{X}{\beta_i}$$

$$\text{M-3:} \qquad \frac{y^*}{X(\mathbf{a}, \mathbf{q})} = \frac{m_i^*}{X(\mathbf{a}, \mathbf{q})} + \frac{1}{X\beta_i} \Longrightarrow y^* - m_i^* = \frac{1}{\beta_i}$$

M-1 is insensitive to scaling of m and X. Hence, for a given $\boldsymbol{\beta}$, the relative deviation from the fair demand is constant. In M-2 the relative deviation from the fair demand is - for a given $\boldsymbol{\beta}$ - proportional to total income produced. In M-3 the absolute deviation from the fair demand - for a given $\boldsymbol{\beta}$ - is constant.

The tests are reported in tables A1.1 - A1.3.

Table A1.1: Robustness test of the random effect censored regressions, by subject pool. Integrity-mode (IM).

	Economists			Engineers		
y-share on	IM-1	IM-2	IM-3	IM-1	IM-2	IM-3
constant	.413	.475	.366	.136	.178	.074
	(.055)	*(.060)*	*(.054)*	*(.028)*	*(.033)*	*(.031)*
own ideal	.667	.652	.642	.808	.818	.824
	(.082)	*(.081)*	*(.082)*	*(.050)*	*(.050)*	*(.049)*
X		-.00006			-.00005	
		(.00003)			*(.00002)*	
1/X			43.245			40.179
			(19.425)			*(9.972)*
sigma - u	.281	.283	.280	.099	.099	.098
	(.028)	*(.075)*	*(.027)*	*(.011)*	*(.010)*	*(.010)*
sigma - e	.111	.109	.109	.084	.082	.079
	(.010)	*(.009)*	*(.009)*	*(.006)*	*(.006)*	*(.006)*
log-likelihood	- 21.733	-19.544	-18.689	117.655	120.556	125.925

Table A.1.2: Robustness test of the random effect censored regressions, by subject pool. Compromise-model (CM).

	Economists			Engineers		
y-share on	CM-1	CM-2	CM-3	CM-1	CM-2	CM-3
constant	.384	.458	.351	.134	.175	.068
	(.051)	*(.062)*	*(.055)*	*(.029)*	*(.033)*	*(.033)*
own ideal	0.565	.548	.527	.780	.776	.765
	(.134)	*(.136)*	*(.138)*	*(.097)*	*(.095)*	*(.092)*
opponents's ideal	.143	.132	.146	.033	.049	.070
	(.138)	*(.140)*	*(.141)*	*(.096)*	*(.095)*	*(.093)*
X		.00006			-.00005	
		(.00003)			*(.00002)*	
1/X			42.161			41.126
			(19.065)			*(10.114)*
sigma - u	.296	.286	.282	.098	.098	.098
	(.029)	*(.028)*	*(.027)*	*(.011)*	*(.011)*	*(.010)*
sigma - e	.106	.107	.107	.084	.082	.080
	(.009)	*(.009)*	*(.009)*	*(.006)*	*(.007)*	*(.006)*
log-likelihood	-20.305	-19.104	-18.168	117.714	120.708	126.211

Table A1.3: Robustness test of the random effect censored regressions, by subject pool.
Self-serving-model (SM).

	Economists			Engineers		
y-share on	SM-1	SM-2	SM-3	SM-1	SM-2	SM-3
constant	.388	.461	.315	.137	.178	.067
	(.050)	*(.063)*	*(.058)*	*(.029)*	*(.033)*	*(.033)*
own ideal	.704	.678	.683	.807	.819	.831
	(.082)	*(.084)*	*(.086)*	*(.051)*	*(.051)*	*(.050)*
max ideal	.232	.236	.283	- .024	.016	.084
	(.182)	*(.184)*	*(.185)*	*(.133)*	*(.132)*	*(.131)*
X		-.00006			.00005	
		(.00003)			*(.00002)*	
1/X			38.808			41.779
			(19.418)			*(10.293)*
sigma - u	.292	.278	.294	.099	.098	.098
	(.029)	*(.025)*	*(.035)*	*(.011)*	*(.011)*	*(.010)*
sigma - e	.107	.107	.108	.084	.082	.080
	(.009)	*(.009)*	*(.010)*	*(.006)*	*(.006)*	*(.006)*
log-likelihood	- 20.217	-19.120	-18.715	117.670	120.562	126.140

Note: In tables A1.1-A1.3 *y-share* refers to the amount of money a player keeps in the distribution phase relative to total income. *own ideal* and *opponent's ideal* refer to the distributive implication of the player's and his opponent's choice of fairness ideal in the communication phase, respectively. *max ideal* refers to the positive difference between the distributive implication of the opponent's and the player's choice of fairness ideal. The explanatory variables are in relative terms, and the denominators are total income produced in each particular distributive situation. X is total income produced. sigma-u is the standard deviation between individuals. sigma-e is the standard deviation between games. Standard errors in parentheses

From tables A1.1 to A1.3 we see that, for all the three communication models, the M-2 and the M-3 specifications of the utility function have only a small impact on the estimates. Also there is no important change in the log-likelihood values.

7.2 Empirical distribution of investment, by subject pool

Table A2 displays data from the production phase. The empirical distribution of investment in the two games is only slightly different in the two subject pools.

Two participants from among the economics students kept the whole endowment of 300 NOK, and five participants kept 100 NOK. One of the five participants who kept 100 NOK invested nothing in the second game. The two participants who did not invest anything and four of the five participants who invested 200 NOK were all assigned a low rate of return. 85 participants invested the full endowment of 300 NOK, reasonably evenly distributed between (200, 100) and (100, 200). From the seven participants who either invested nothing or kept 100 NOK two reported the strict egalitarian norm, two reported the liberal egalitarian norm and three reported the libertarian norm.

No one among the engineering students kept the whole endowment of 300 NOK. Two of the engineering students invested 200 NOK, one in the first game and the other in the second game, both were assigned a low rate of return. One of the two reported the liberal egalitarian norm in the communication phase and the other reported the libertarian norm. The remaining participants in this subject pool invested the full endowment of 300 NOK, evenly distributed between (200, 100) and (100, 200).

Table A2: Empirical distribution of investment in the two games, by subject pool

	Economists				Engineers			
Game 1	Game 2				Game 2			
	0	100	200	Total	0	100	200	Total
0	2	0	0	2	0	0	1	1
100	0	4	47	51	0	0	45	45
200	1	38	·	39	1	49	·	50
Total	3	42	47	92	1	49	46	96

7.3 Full distribution of offer in absolute and relative terms, by subject pool

Table A3 gives the empirical distribution of offer made to opponent in NOK, by subject pool.

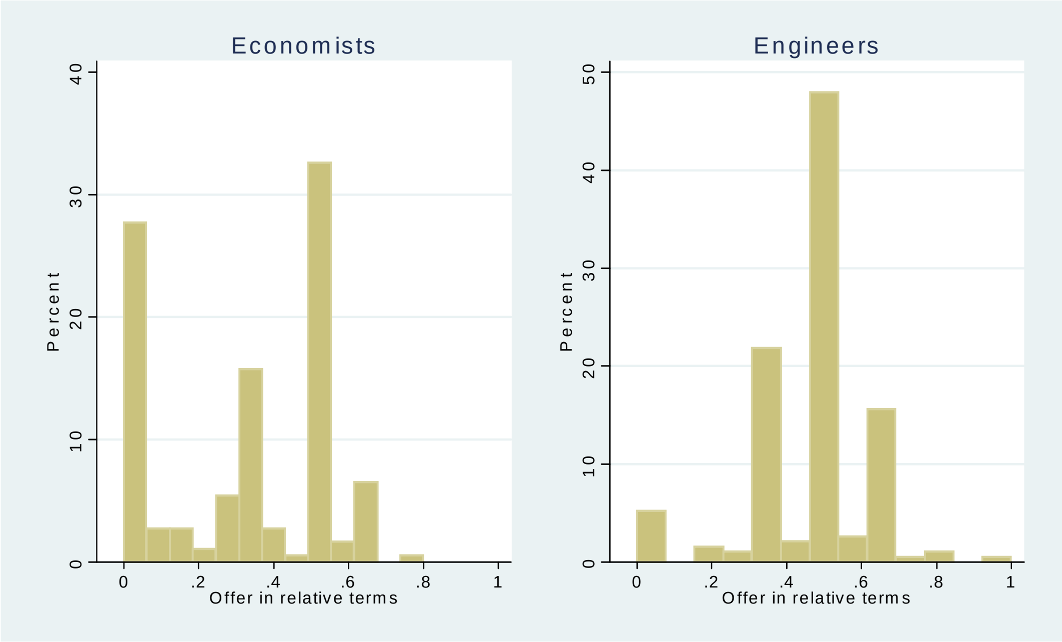
Table A3: Empirical distribution of offer made to opponent, by subject pool

	Frequency		Percent		Cumulative	
Offer	Econ	Engin	Econ	Engin	Econ	Engin
0	49	10	26.63	5.21	26.63	5.21
1	2		1.09		27.72	
50	2		1.09		28.80	
100	8		4.35		33.15	
180		1		0.52		5.73
200	32	33	17.39	17.19	50.54	22.92
250		1		.52		23.44
267	4	7	2.17	3.65	52.72	27.09
300	11	15	5.98	7.81	58.70	34.9
333	2	5	1.09	2.60	59.78	37.5
350	2		1.09		60.87	
400	32	52	17.39	27.08	78.26	64.58
450		1		.52		65.1
467		1		.52		65.62
500	5	4	2.72	2.08	80.98	67.7
533	3	6	1.63	3.13	82.61	70.83
550	1		.54		83.15	
600	16	27	8.17	14.06	91.85	84.89
650	1		.54		92.39	
667	2	2	1.09	1.04	93.48	85.93
700	1	3	.54	1.56	94.02	87.49
800	11	24	5.98	12.50	100	100
	184	192	100	100		

Note: *Econ* stands for economics students. *Engin* stands for engineering students

Figure A1 shows the empirical distribution of the offer made to the opponent in the percentage of total income produced in each particular distributive situation, by subject pool. As discussed in section 5.1.2, figure A1 shows that the distribution of offer in the economics subject pool is bimodal, while the distribution of offer in the engineering subject pool is unimodal.

Figure A1: Empirical distribution of relative offer, by subject pool



7.4 Justification for the random effect assumption

The regression analysis reported in tables 4 and 9 applies a random effect estimator. The individual weight attached to fairness considerations, β_i, is person specific and as such is a fixed effect. However, what turns it into a random effect is that β_i is assumed to be independent of the fairness ideal, $m^{k(i)}$, an individual endorses, i.e. $cov(m^{k(i)}, \beta_i) = 0$. To justify the random effect assumption, table A4.1 and table A4.2 are provided.

Table A4.1: Indicators of the value of the parameter β, sorted by fairness ideal. Economics subject pool.

	$m \leq y = X$	$m < y < X$	$m = y < X$	$m < y < X$
	Percentage	Percentage	Percentage	$\frac{y-m}{X}$
mse	23.3	40.0	36.7	.255
mle	20.5	24.4	55.1	.170
ml	34.2	31.6	34.2	.238
n	49	55	80	55

Table A4.2: Indicators of the value of the parameter β, sorted by fairness ideal. Engineering subject pool.

	$m \leq y = X$	$m < y < X$	$m = y < X$	$m < y < X$
	Percentage	Percentage	Percentage	$\frac{y-m}{X}$
mse	15.0	5.0	80.0	.167
mle	5.2	11.2	80.2	.111
ml	1.8	23.2	71.4	.165
n	10	27	149	27

Note: *mse* is strict egalitarianism, *mle* is liberal egalitarianism, *ml* is libertarianism. *m* is the fair distribution a player has communicated. *y* is money kept in the distribution phase. *X* is total income produced in each particular distribution situation. $\frac{y-m}{X}$ is average deviation in relative terms from the fair distribution. n is number of observations

The information in the two tables indicates that the unobserved effect is uncorrelated with the explanatory variable in each subject pool, and accordingly that the random effect assumption is appropriate.

Table A4.1 and table A4.2 provide disaggregated information about the individual weights attached to fairness considerations for the economics and the engineering subject pool, respectively. The information in the four columns in the two tables is sorted by reported fairness ideal.

Column 1 reports the percentage of participants who offered nothing to their opponent. This indicates that the participants attach a low weight to fairness considerations. Column 2 reports the percentage of participants who offered less to their opponent than the fair distribution they reported in the communication phase, indicating a medium weight attached to fairness considerations. Column 3 reports the percentage of participants who offered exactly the amount they reported in the communication phase as the fair offer. This indicates that the participants put all weight to fairness considerations.

Column 4 reports the average deviation in relative terms from the fair distribution. From the first order condition in equation (5) in section 3.2 it can be seen that for participants, who attach the same weight to fairness considerations, the deviation from the fair distribution will be the same. Hence, if the weight individuals attach to fairness considerations is independent of the fairness ideal they endorse, equation (5) predicts that the average offer should be the same. As shown in table A4.1 and A4.2 the average deviation in relative terms from the fair offer is also almost the same for the strict egalitarians and the libertarians in both subject pools, although one could expect that the strict egalitarians gave more weight to fairness considerations than the libertarians.

In columns 1 and 2 in table A4.2, there are relatively few observations, and it may therefore be difficult to draw any clear conclusions. However, given that we should expect some noise in the data, the general picture emerging from tables A4.1 and A4.2 is that for the integrity model there is no large systematic differences in the distribution of the weight individuals attach to fairness between the fairness ideals, indicating that the weight individuals attach to fairness considerations is independent of the fairness ideal they endorse.

The same can be shown for the compromise model and the self-serving model. The general picture emerging from table A4.1 and table A4.2 is the same when I analyse the 130 observations in the economic subject pool and the 140 observations in the engineering subject pool, where the reported fairness ideal of both players implies the same distribution.

7.5 Estimating on the subset of those who invested the whole endowment.

Two participants in the engineering subject pool and seven participants in the economics subject pool did not invest the full amount. To see if this introduced any bias in the estimated parameters, I remove these participants from the estimating sample. The results are reported in table A5.1 for the engineering subject pool and in table A5.2 for the economics subject pool.

Table A5.1: Robustness test of the random effect censored regressions. Engineering subject pool.

y-share on	IM	IM-test	CM	CM-test	SM	SM-test
constant	.136	.098	.134	.088	.137	.090
	(.028)	*(.022)*	*(.029)*	*(.023)*	*(.029)*	*(.023)*
own ideal	.808	.874	.780	.771	.807	.884
	(.050)	*(.039)*	*(.097)*	*(.072)*	*(.051)*	*(.040)*
opponent's ideal			.033	.122		
			(.096)	*(.072)*		
max ideal					- .024	.120
					(.133)	*(.100)*
sigma - u	.099	.094	.098	.093	.099	.093
	(.011)	*(.009)*	*(.011)*	*(.009)*	*(.011)*	*(.009)*
sigma - e	.084	.060	.084	.060	.084	.060
	(.006)	*(.005)*	*(.006)*	*(.004)*	*(.006)*	*(.005)*
log likelihood	117.655	157.198	117.714	159.608	117.670	157.908

Note: *IM* stands for integrity model. *CM* stands for compromise model. *SM* stands for self-serving model. *IM-test, CM-test, SM-test* refer to the sub sample estimates in the three models. *y-share* refers to the amount of money a player keeps in the distribution phase relative to total income. own *ideal* and *opponent's ideal* refer to the distributive implication of the player's and his opponent's choice of fairness ideal in the communication phase, respectively. *max ideal* refers to the positive difference between the distributive implication of the opponent's and the player's choice of fairness ideal. The explanatory variables are in relative terms, and the denominators are total income produced in each particular distributive situation. *sigma-u* is the standard deviation between individuals. *sigma-e* is the standard deviation between games. Standard errors in parentheses.

From A5.1 we see that for the engineering subject pool, removing the participants that did not invest the whole endowment from the estimating sample, has some effect on the estimated parameters in the CM-model and in the SM-model. Also there is an effect on the log likelihood values.

Table A5.2: Robustness test of the random effect censored regressions. Economics subject pool.

y-share on	IM	IM-test	CM	CM-test	SM	SM-test
constant	.413	.348	.384	.284	.388	.330
	(.055)	*(.050)*	*(.051)*	*(.047)*	*(.047)*	*(.053)*
own ideal	.667	.728	0.565	.557	.557	.757
	(.082)	*(.082)*	*(.134)*	*(.135)*	*(.135)*	*(.085)*
opponent's ideal			.143	.215		
			(.138)	*(.144)*		
max ideal					.232	.259
					(.182)	*(.187)*
sigma - u	.281	.250	.296	.291	.292	.249
	(.028)	*(.026)*	*(.029)*	*(.032)*	*(.029)*	*(.027)*
sigma - e	.111	.110	.106	.103	.107	.108
	(.010)	*(.010)*	*(.009)*	*(.009)*	*(.009)*	*(.009)*
log likelihood	- 21.733	- 9.371	-20.305	- 8.004	- 20.217	- 8.464

Note: *IM* stands for integrity model. *CM* stands for compromise model. *SM* stands for self-serving model. *IM-test*, *CM-test*, *SM-test* refer to the sub sample estimates in the three models. *y-share* refers to the amount of money a player keeps in the distribution phase relative to total income. own *ideal* and *opponent's ideal* refer to the distributive implication of the player's and his opponent's choice of fairness ideal in the communication phase, respectively. *max ideal* refers to the positive difference between the distributive implication of the opponent's and the player's choice of fairness ideal. The explanatory variables are in relative terms, and the denominators are total income produced in each particular distributive situation. *sigma-u* is the standard deviation between individuals. *sigma-e* is the standard deviation between games. Standard errors in parentheses.

From A5.2 we see that for the economics subject pool, estimating on the subset of those who invested the whole amount has some effect on the log likelihood values in the three models, but only a small effect on the estimated parameters.

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