GOVERNANCE AND THE EFFICIENCY OF ECONOMIC SYSTEMS
GESY

Discussion Paper No. 230

Is the veil of ignorance only a concept about risk? An experiment

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January 2008

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Financial support from the Deutsche Forschungsgemeinschaft through SFB/TR 15 is gratefully acknowledged.

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February 28, 2008

Abstract

We implement the Rawlsian veil of ignorance in the laboratory. Our experimental design allows separating the effects of risk and social preferences behind the veil of ignorance. Subjects prefer more equal distributions behind than in front of the veil of ignorance, but only a minority acts according to maximin preferences. Men prefer more equal allocations mostly for insurance purposes, women also due to social preferences for equality. Our results contrast the Utilitarian's claim that behind the veil of ignorance maximin preferences necessarily imply infinite risk aversion. They are compatible with any degree of risk aversion as long as social preferences for equality are sufficiently strong.

Keywords: veil of ignorance, maximin preferences, social preferences, efficiency, experiment

JEL classification: D63, D64, C99

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†I thank seminar participants at the Universities of Munich, Zürich, Stockholm, Göteborg, the Spring Meeting of Young Economists 2006, the SFB-TR 15 conference 2006 in Frauenwörth, the International Meeting on Experimental and Behavioral Economics 2007, the Behavioral Economics and Experimental Economics Conference of the French Economic Association 2007, ESA 2007, ESEM 2007 for helpful comments. I am particularly grateful to Klaus Schmidt and two anonymous referees for their insightful comments. I thank Kathrin Kolb and Björn Schildberg for help collecting the data. Financial support from the German Science Foundation through SFB-TR 15 is gratefully acknowledged.

1 Introduction

Our experiment explores the relationship between social preferences and Rawls' difference principle that economists have formalized by maximin preferences. In his book "A Theory of Justice" (1971) the philosopher John Rawls coined the term "veil of ignorance" for the following thought experiment: Behind the veil of ignorance, nobody knows which future position in society he (as well as other individuals) will be assigned when deciding how to distribute resources across different positions. According to Rawls society would agree behind the veil of ignorance that the difference principle should constitute the basis of the social contract. The difference principle states that society should maximize the utility of the individual that is worst off. Utilitarians have asserted that being in favor of the difference principle is only strictly optimal for infinitely risk averse individuals and thus, have dismissed the difference principle and maximin preferences as unrealistic. However, the Utilitarian's argument assumes that everybody is only interested in his own material payoff. In contrast, theories on social preferences assume that people are self-interested to some degree, but also care about (the payoffs of) others.[1] In this paper, we argue that if people have social preferences, they could be in favor of an egalitarian distribution even if they are risk neutral.

Our experiment implements the veil of ignorance in the laboratory[2] and tests whether decisions behind the veil of ignorance are only driven by risk attitudes or also by social preferences. Assume decisions behind the veil of ignorance reflect (impartial) social preferences for equality in addition to risk aversion. Then the difference principle is consistent with any degree of risk aversion as long as social preferences for equality are sufficiently strong to make individuals opt for a completely equal distribution.

Implementing the veil of ignorance we measure social preferences that are free of self-interest in a narrow sense ("impartial social preferences"). In other words, impartial social preferences are an individual's preferences over distributions of pay-

[1] Focusing on the distribution of payoffs the notion of social preferences we use is most closely related to Fehr and Schmidt's (1999) and Bolton and Ockenfels' (2000) models of inequity aversion. For a recent survey on the literature on social preferences see Fehr and Schmidt (2006).

[2] With any implementation of the veil of ignorance in the laboratory subjects will know much more than in Rawls' original position, e.g. they will know their sex and ability. Still, the implementation of the veil of ignorance is perfect with respect to subjects' positions and implied payoffs. Hence, in our experimental setup we can measure subjects' risk attitudes and potential social preferences behind the veil of ignorance and this is what we aim at.

offs to himself and his reference group when favoring oneself over the others is not possible. Information on people's impartial social preferences can be useful for many aspects of policy design, e.g. the design of tax, social security or public health insurance systems. Imagine, as an example for eliciting social preferences, a survey in which you ask a poor person whether he is in favor of more redistribution. If you get the answer "yes" you cannot interpret it unambiguously: does this person prefer more redistribution because he is likely to profit from it? Or does this person have an innate preference for a more equal society? In contrast, if you had asked this person behind the veil of ignorance and had received the (now impartial) answer "yes" you would have known that the latter is true (or that this person is risk averse).

Our experiment uses a three treatment design: the *dictator game treatment* is a dictator game with a 50 % efficiency loss. A dictator game is a two player game in which the first player, the dictator, proposes a split of a given pie. The second player, the receiver, is passive. Both players are paid according to the dictator's proposal.[3] Our specific variant of the dictator game is characterized by an efficiency loss of 50 % for units that are transferred from the dictator to the receiver. Consequently, a trade off between equality and efficiency[4] arises: a more equal allocation can only be achieved by transferring more which in turn induces a larger efficiency loss. Our second treatment, the *veil of ignorance treatment*, is characterized by the same efficiency loss, but adds role uncertainty to implement the veil of ignorance: each participant decides how many units of a 12 unit pie the dictator will give away to the receiver *before* he is assigned the role of dictator or receiver with equal probability. Finally, each participant will be paid according to his own choice how many units the dictator will transfer to the receiver in the role he has been assigned, i.e. will earn either the dictator's or the receiver's payoff. Using role uncertainty to implement the veil of ignorance removes the possibility to favor oneself over the other player and, at the same time, introduces risk. The *risk treatment* serves as a control treatment to isolate a subject's risk preferences. It has the same efficiency loss and role uncertainty as the veil of ignorance treatment, but it is a one person game. In the risk treatment each participant decides how to allocate the pie across the states of being dictator or being receiver and is randomly assigned the position of either dictator or receiver afterwards. However, the position not assigned to the decision maker is not filled in by a second person. The money assigned to the empty position

[3]In this variant, the dictator game was first introduced by Forsythe et al. (1994).

[4]In this paper, we define a more efficient allocation to be an allocation with a higher sum of payoffs of both players (Kaldor-Hicks efficiency).

is not paid out. The efficiency loss enables us to tell apart subjects with different degrees of risk aversion. In terms of risk, the decision situation in the risk and the veil of ignorance treatment is identical, but impartial social preferences can only be an additional motive in the two person veil of ignorance treatment.

By comparing decisions in the risk and the veil of ignorance treatment we can test our hypothesis that the difference principle can be derived from any degree of risk aversion as long as impartial social preferences for equality are sufficiently strong. If decisions in these two treatments don't differ significantly only risk aversion determines behavior behind the veil of ignorance. Hence, the claim that the difference principle can only be derived from infinite risk aversion is correct. If, in contrast, differences between the two treatments are significant and impartial social preferences in the veil of ignorance treatment reflect equality concerns, then the difference principle is compatible with any degree of risk aversion if impartial social preferences for equality are sufficiently strong.

We find that subjects transfer significantly more in the veil of ignorance than in the dictator game treatment. Still, in the veil of ignorance treatment only a minority of subjects opts for the difference principle. In all three treatments we observe striking gender differences: women are more risk averse and have a stronger concern for equality than men. For men behavior does not differ significantly in the risk and the veil of ignorance treatment, i.e. for the vast majority of male subjects the veil of ignorance introduces only risk. In contrast, for women, impartial social preferences for equality are a second significant motivation besides risk in the veil of ignorance treatment. Our results for women imply that the difference principle can also be derived from impartial social preferences for equality and thus does not necessarily imply infinite risk aversion.

Some other economic experiments implement the veil of ignorance. Johannesson and Gerdtham (1995), Beckman et al. (2002), Johansson-Stenman, Carlsson and Daruvala (2002), and Carlsson, Gupta and Johansson-Stenman (2003) basically let subjects who do not yet know the place they (or their imaginary grandchildren) will occupy in a given society choose between societies that differ with respect to mean and distribution of income. Ackert, Martinez-Vazquez and Rider (2004) ask subjects to vote in favor of either a lump-sum or a progressive tax regime before they are randomly assigned a pre-tax payoff. To be able to interpret the observed behavior in terms of impartial social preferences, all mentioned experiments have to assume that subjects are risk neutral. Otherwise, the observed behavior can only be interpreted as the result of either risk aversion *or* impartial social preferences.

The new contribution of our experiment is that we are able to separate the effects of risk aversion and impartial social preferences in a veil of ignorance setting.[5]

Only few further experiments in economics have elicited impartial social preferences without referring to the veil of ignorance. In Engelmann and Strobel (2004) one of the decision maker's tasks is to choose among three different allocations of payoffs across himself and two further subjects that represent an efficiency-equality trade off. Since the decision maker's payoff is constant across all three allocations, the experimental design controls for self-interest. A constant payoff for the decision maker also implies that his choice has no monetary consequences for himself. In contrast, one crucial aspect of the veil of ignorance, our object of investigation, is that both the decision maker and his reference group are affected by choices made behind the veil of ignorance.[6]

The remainder of the chapter is organized as follows. The details of the experimental design and implementation are explained in section 2. Section 3 presents the hypotheses to be tested and links them to the experimental design. Results are provided in section 4 that also elaborates on the striking differences in the behavior of male and female subjects. In the last section, we conclude. The appendix contains instructions, control questions and the experimental data.

2 Experimental Design and Procedure

2.1 The three treatments

The experimental design is based on a dictator game. Since the receiver is purely passive, the dictator game is one of the simplest ways to elicit the dictator's social preferences that do not interfere with any strategic considerations. In our experiment, dictators have to decide how to split a 12 unit pie.

We use a three treatment design. The *dictator game treatment* is a standard

[5]The veil of ignorance has also been the subject of experimental inquiries in other disciplines such that political sciences and psychology (Brickman, 1977; Curtis, 1979; Frohlich, Oppenheimer and Eavey, 1987; Bond and Park, 1991; Mitchell et al., 1993).

[6]Being affected by one's own choice might influence behavior: First, the decision maker has monetary incentives to reveal his true preferences. Second, imagine a decision maker who prefers a very efficient, but highly unequal allocation. In a setup with a constant payoff for the decision maker, choosing the unequal allocation corresponds to "punishing" some of the other subjects while being on the safe side himself. In contrast, in our experiment, the decision maker himself risks getting a very low payoff when choosing an unequal allocation.

dictator game with one additional feature, an efficiency loss of 50 % for units transferred from the dictator to the receiver. The efficiency loss introduces a trade-off between equality and efficiency and can be interpreted as a deadweight loss that arises as the cost of redistribution. We choose an efficiency loss of 50 % because it is easy to calculate for the experimental subjects and makes our results comparable to those obtained in Andreoni and Miller (2002) and Andreoni and Vesterlund (2001). Since the dictator can only transfer integer units, the following allocations are possible results of the game:

Table 1: Possible allocations

dictator	12	11	10	9	8	7	6	5	4	3	2	1	0
receiver	0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6

There are two focal points among these allocations: the allocation (12,0) represents the most efficient one (and, at the same time, the one a selfish dictator would choose). An individual with a very strong concern for equality would choose allocation (4,4). Transferring more than necessary to achieve the equal split allocation (4,4) is hard to rationalize: the resulting allocations impose an enormous efficiency loss and add inequality. The dictator game treatment serves as benchmark, ensures comparability with related studies and measures social preferences.

The *veil of ignorance treatment* implements the veil of ignorance by introducing role uncertainty. It is a dictator game with the same 50 % efficiency loss as the dictator game treatment and additional role uncertainty. Role uncertainty means that first every subject decides how many units the dictator will transfer. *After this transfer decision roles (dictator and receiver) are randomly assigned* and pairs consisting of one dictator and one receiver matched. Finally, a subject that has been assigned the receiver (dictator) role will be paid the receiver's (dictator's) payoff according to his *own* decision how many units the dictator will transfer to the receiver. For example, imagine a subject that has first decided that the dictator will transfer 4 units. If this subject then gets assigned the receiver role he will receive a payoff of $\frac{1}{2} \times 4 = 2$, his matched subject in the dictator role will receive $12 - 4 = 8$ units. If this subjects gets assigned the dictator role he will receive a payoff of 8 units, his matched subject in the receiver role will receive 2 units. It is possible that *every* subject's decision is implemented as the dictator's choice (independent of whether the decision-maker has been assigned the role of dictator or receiver) because each subject also serves as a dummy player in another subject's decision.

Procedural details of our matching protocol are provided below.

Implementing the veil of ignorance as described above induces risk and potentially impartial social preferences. To test whether the veil of ignorance is only a concept about risk we have to be able to isolate potential impartial social preferences from risk considerations that jointly determine subjects' decisions behind the veil of ignorance.

The *risk treatment* serves exactly this purpose. It differs from the veil of ignorance treatment in just one respect. It is a one person game and consequently, basically a lottery decision: first, each subject decides how to allocate the pie across the states of being dictator or being receiver. After that decision each subject is randomly assigned the role of dictator or receiver with equal probability. In contrast to the veil of ignorance treatment, there is no second subject who fills in the role that has not been assigned to the decision-maker. For example, imagine a subject that has first decided that the dictator will transfer 4 units. If this subject then gets assigned the receiver role it will receive a payoff of $\frac{1}{2} \times 4 = 2$, $12 - 4 = 8$ units will not be paid out. If this subjects gets assigned the dictator role it will receive a payoff of 8 units, 4 units will not be paid out. Since there is no second subject who is affected by the decision maker's choice, the decisions in the risk treatment simply reflect the individual degree of risk aversion and cannot be influenced by social preferences.

Table 2 summarizes the three treatments.

Table 2: The three treatment design

treatment	characteristics			what is measured?
	efficiency loss	role uncertainty	number of players	
dictator game	yes	no	2	social preferences
veil of ignorance	yes	yes	2	impartial social preferences with risk
risk	yes	yes	1	risk attitude

There are two reasons that make the efficiency loss an essential feature of our experimental design: First, in the risk treatment the efficiency loss introduces a cost of insurance which allows telling apart risk neutral and risk averse subjects as well as risk averse subjects with different degrees of risk aversion. With any efficiency loss, risk neutral subjects who maximize their expected payoff strictly prefer the (12,0) allocation over all other allocations. For each risk averse subject, we get an approximate measure of individual risk aversion: the more risk averse a subject is the more units $0 < x < 8$ he will transfer. Very strongly risk averse subjects transfer 8 units which results in the (4,4) allocation that provides full insurance. Without the efficiency loss, all possible allocations would have an expected payoff of 6 and every risk averse subject would choose the (6,6) allocation that provides full insurance at no cost. Risk neutral subjects would be indifferent between all possible allocations and thus might also choose the (6,6) allocation.

Second, to test whether the difference principle can also be derived from impartial social preferences for equal outcomes we have to be able to observe whether less than infinitely risk-averse subjects (i.e. subjects who transfer $x < 8$ in the risk treatment) transfer $x = 8$ in the veil of ignorance treatment. Since the only difference between the veil of ignorance and the risk treatment is the existence of the second person a higher transfer in the veil of ignorance treatment is caused by a concern for equality. With a 50 % efficiency loss, only few subjects will opt for full, but very costly insurance in the risk treatment. For all but these very strongly risk averse subjects there is still room for moving towards a more equal allocation in the veil of ignorance treatment. In contrast, if there was no efficiency loss, all risk averse subjects would choose the (6,6) allocation in the risk and the veil of ignorance treatment irrespective of whether they are purely selfish or have impartial social preferences for equality. Only for those risk neutral subjects who would transfer $x < 6$ in the risk treatment we could learn whether they have impartial social preferences for equality behind the veil of ignorance.[7]

2.2 Sessions

Due to matching requirements each subject participated in two of the three treatments: in the risk treatment and in one of the two two-player treatments, either the dictator game or the veil of ignorance treatment. At each time of the experiment half of the subjects played the risk treatment. These subjects were matched with the other half of subjects who played one of the two two-player treatments in the

[7] The experimental design cannot distinguish between subjects who are risk neutral and those who are risk loving. Both will choose the (12,0) allocation. This might be a flaw as, ceteris paribus, a more risk loving individual will let the dictator transfer less in the veil of ignorance treatment, a decision that we will interpret to reflect a preference for efficiency. To avoid this problem we could have run a second version of the risk treatment with an efficiency gain instead of loss to explicitly measure potential risk loving. We decided against this further treatment because we do not expect many subjects to be risk loving.

same room at the same time. This matching across treatments has two advantages: first, not only in the risk but also in the veil of ignorance and the dictator game treatment *every* subject's decision is in fact implemented (and every subject knows this[8]). We avoid introducing an additional source of risk in the veil of ignorance treatment, namely whether one's own decision or the decision of one's matched subject will be implemented. Second, we maximize the number of observations because we avoid paying passive players. As a result of the matching, each subject had three sources of payoff at the end of the session: the payoff from his own risk decision, a payoff from his own decision in one of the two two-player treatments and a payoff from a randomly assigned subject's decision in one of the two two-player treatments. Subjects were only informed about the last, additional source of payoff that they could not influence anyway at the end of the experiment.

In total we conducted nine sessions. In five sessions, all subjects played the risk and the veil of ignorance treatment, though in different orders. In the remaining four sessions, half of the participants first played the risk and then the veil of ignorance treatment, while the other half of participants first played the dictator game and then the risk treatment. The three treatment orders are depicted in table 3.

Table 3: Treatment orders

first treatment	second treatment	number of subjects
risk	veil of ignorance	83
veil of ignorance	risk	48
dictator game	risk	36

Before we pool the data obtained in one specific treatment, but from different treatment orders we have to make sure that there are no order effects. For the two treatment orders of the veil of ignorance treatment we use the Mann–Whitney test and for the three treatment orders of the risk treatment we use the Kruskal-Wallis test to check whether the distributions of transferred units obtained in different treatment orders are significantly different. Table 4 shows that we can pool all veil of ignorance and risk treatment data respectively for the whole sample as well as

[8] We told decision-makers in the dictator game and the veil of ignorance treatment in the instructions: "only half of the participants present in this room are taking part in the same experiment as you do. The other half of the participants is playing another experiment whose payoff does not affect you at all. You are assigned a participant from this other half".

for men and women separately.[9] In sum, we collected 131 observations on decisions in the veil of ignorance treatment, 167 in the risk and 36 in the dictator game treatment. The complete experimental data are displayed by treatment and sex in Appendix 6.2.

Table 4: No order effects

	veil of ignorance treatment (Mann-Whitney test*)	risk treatment (Kruskal-Wallis test*)
all	p=0.627 (131 obs.)	p=0.464 (167 obs.)
men	p=0.810 (40 obs.)	p=0.729 (59 obs.)
women	p=0.505 (91 obs.)	p=0.816 (108 obs.)

*: The reported p-values refer to two-tailed tests and are adjusted for ties.

2.3 Experimental procedure and subjects

The order of events during each experimental session was the following: Subjects were welcomed and randomly assigned a cubicle in the laboratory where they took their decisions in complete anonymity from the other subjects. The random allocation to a cubicle also determined the individual treatment order. Subjects were handed out the instructions for their first treatment and answered several computerized control questions that tested their understanding of the decision situation. Only after providing and explaining the right answers on the computer screen, we proceeded to the decision stage of the first treatment. After all subjects had made their first decision, we announced that there would be a second and at the same time last experiment. To avoid income effects we did not give subjects any feedback on the result of the first treatment before they were paid at the end of the whole session. The second treatment followed with the same procedures. We finished each experimental session by asking subjects to answer a questionnaire on their demographic characteristics, the strategies they had used and their expectations concerning the behavior and risk attitudes of the other subjects.

A translated version of the instructions and the corresponding control questions can be found in Appendix 6.1. The experiment was programmed using the experimental software zTree (Fischbacher, 1999) and conducted at the experimental

[9] We present test results also by sex as gender differences will be important for the interpretation of our results.

laboratory of the SFB 504 at the University of Mannheim, Germany in November 2005. The experiments lasted about one hour and subjects earned about 16 Euros on average. All 167 subjects[10] were university students with a large variety of subjects. The main characteristics of the subjects are displayed in Table 5.

Table 5: Composition of treatments

	dictator game treatment	risk treatment	veil of ignorance treatment
number of observations	36	167	131
sex*	19 (F)/17(M)	59(F)/108(M)	40(F)/91(M)
mean age	23.56	23.77	23.82
knowledge in economics**	66.67 %	64.67 %	64.12 %

* F stands for female, M for male

** includes students studying economics or business administration as minor or major

3 Hypotheses

Let us first briefly turn to the growing literature on gender differences in risk attitudes and social preferences. Reviewing the vast economic literature on gender differences in risk preferences Eckel and Grossman (2006) conclude that women are characterized by a higher degree of risk aversion than men in field studies, while the results from laboratory experiments are less consistent. Similarly, Croson and Gneezy's (2004) survey summarizes that there is clear evidence that men are more risk-taking than women in most tasks and most populations. Camerer (2003, p.64) summarizes evidence on the effect of gender on social preferences and concludes that evidence is mixed.[11]

However the studies that are most closely related to our dictator game and veil of ignorance treatment indicate that gender differences are likely to matter in

[10] We admitted only an even number of subjects to the experiment but one subject left during the course of the experiment. His role was filled by one of the experimenters and the corresponding observations were deleted.

[11] Considering dictator games, for example, Eckel and Grossman (1998) find that women on average donate twice as much as men in a standard dictator game. Similarly, Dufwenberg and Muren (2005) present results of a dictator game in which significantly fewer men than women give non-zero amounts. In contrast, Bolton and Katok (1995) find no systematic gender differences in a standard dictator game.

our experimental setup. In Andreoni and Vesterlund (2001) subjects play dictator games with different levels of efficiency losses. They find that when it is relatively expensive to give, women are more generous than men. As the price of giving decreases, men begin to give more than women. With our 50 % efficiency loss, women are significantly more generous than men. The following two studies are, to some extent, related to our veil of ignorance treatment: they have an impartial decision maker as we do, but, in contrast to our study, the decision maker's payoff is fixed and independent of his own choice. Fehr, Naef and Schmidt (2006) replicate Engelmann and Strobel's (2004) experiment and find that women choose the most egalitarian allocation significantly more often than men. Dickinson and Tiefenthaler (2002) play an experiment with a disinterested third-party decision maker in which women are significantly more likely to choose an allocation resulting in equal payoffs while men are more likely to choose the most efficient allocation.

To check for the existence of gender differences in our experimental setup we formulate Hypothesis 1:

Hypothesis 1

Women and men do not behave significantly different in any of our treatments.

If we should reject hypothesis 1 gender differences in risk attitudes and social preferences are likely to affect all further results on differences between treatments. Consequently, we should then analyze the following hypotheses not only for both sexes jointly, but also for men and women separately.

Exploiting our three treatment design we can first compare transfers in the dictator game and the veil of ignorance treatment that have the same trade off between equality and efficiency.

Hypothesis 2

There is no significant difference between social preferences and impartial social preferences with risk that are measured in the dictator game and the veil of ignorance treatment respectively.

If we should reject hypothesis 2, we will ask next whether the observed difference can be completely explained by risk aversion: Is the veil of ignorance only a concept that introduces risk? Or, in contrast, are impartial social preferences an additional motivation behind the veil of ignorance?

Hypothesis 3

There is no significant difference between risk preferences and impartial social preferences with risk that are measured in the risk and the veil of ignorance treatment respectively.

The only difference between the risk and the veil of ignorance treatment is whether a second person exists who is affected by the decision maker's transfer decision. Since the degree of risk is held constant, the two treatments differ only in whether impartial social preferences can possibly motivate the observed transfer decisions. If we cannot reject hypothesis 3, the thought experiment of a veil of ignorance has correctly been perceived as a concept inducing only risk aversion. The only way to derive Rawls' difference principle is to assume infinite risk aversion. In contrast, if hypothesis 3 is rejected, impartial social preferences are a significant motivation behind the veil of ignorance. Consequently, the difference principle and maximin preferences can also be considered the result of impartial social preferences combined with any degree of risk aversion (assuming that impartial social preferences induce an increased concern for equality).[12]

This is investigated by hypothesis 4: given that impartial social preferences introduce an additional motive, do they induce an increased concern for equality or for efficiency? To what extent does a veil of ignorance like situation induce maximin preferences as predicted by Rawls?

[12] While the term "veil of ignorance" was coined by Rawls, Harsanyi (1953, 1955) already used the same thought experiment. Harsanyi interprets value judgments made behind the veil of ignorance to reflect choices involving just risk and assumes that agents are risk neutral. Consequently, he predicts efficiency seeking behavior to prevail behind the veil of ignorance. In terms of our experiment, Harsanyi's argument would be supported if we found that subjects do not transfer any units in the risk treatment (risk neutrality) and if differences in subjects' behavior across the risk and the impartiality treatment were not significant.

Hypothesis 4

In the veil of ignorance treatment subjects behave according to maximin preferences.

4 Results

4.1 Gender differences

Result 1

In our experiment, women are significantly more risk averse than men and choose more equal (and thus less efficient) allocations than men.

In total, we had 108 male (65 %) and 59 female (35 %) subjects. Table 6 displays average transferred units by sex and treatment as well as test results by treatment for whether medians and distributions of transferred units differ for men and women.

Table 6: Gender differences by treatment

treatment	mean men	mean women	Mann-Whitney test*	Median test*
dictator game	0.76 (17 obs.)	2.37 (19 obs.)	p=0.061	p=0.091**
risk	2.72 (108 obs.)	3.69 (59 obs.)	p=0.014	p=0.016
veil of ignorance	2.81 (91 obs.)	5.00 (40 obs.)	p=0.000	p=0.000

*: The reported p-values refer to two-tailed tests and are adjusted for ties.
**: In the dictator game treatment, the median corresponds to keeping all 12 units. To obtain a test result we treat observations that equal the median like observations greater instead of lower than the median as we do in all other Median tests reported.

In sum, we observe strikingly different transfer behaviors of male and female subjects: according to Mann-Whitney tests the distributions of units transferred differ significantly for men and women both in the risk and in the veil of ignorance treatment. The same is true for medians. In the veil of ignorance treatment, the absolute difference in means is largest and amounts to 2.2 units with 8 units being the maximal reasonable transfer amount. Women transfer more and thus are more concerned about equality while men care more about efficiency. Gender differences in the risk treatment are smaller in absolute amounts, but strongly significant: they indicate that, on average, women are more risk averse than men. Due to the small number of observations medians and distributions are only weakly marginally different in the dictator game treatment. Still, on average male dictators transfer less than one out of 8 units, female dictators transfer nearly 2.5 units. Furthermore, about 70 % of male dictators keep the whole pie, while only 37 % of women do. Carlsson, Daruvala and Johansson-Stenman (2005) run two different treatments to measure a given individual's risk and inequality aversion in the absence of risk. Similar to our results, they find that female subjects are more risk averse and more inequality averse than men.

In sum, male and female subjects do behave significantly different in our experiment. Consequently, we will focus on analyzing the data for men and women separately. We will also present a joint analysis for the sake of completeness and to guarantee comparability of our results in the dictator game treatment to other dictator game studies.[13]

4.2 Comparison of dictator game and veil of ignorance treatment

We now turn to hypothesis 2 and discuss whether stated preferences in front of and behind the veil of ignorance differ. If they do, we might want to question the use of people's stated social preferences from surveys and alike as a basis for "just" policy design. Our data would then suggest using impartially stated social preferences.

Result 2

There is a large and significant difference between social preferences and impartial social preferences with risk. Subjects transfer significantly more in the veil of ignorance than in the dictator game treatment.

Test results in Table 7 reject hypothesis 2: medians and distributions of units transferred differ significantly for the pooled data and for men and women separately. OLS regression results using the pooled dictator game and veil of ignorance

[13] Our results in the dictator game treatment are very close to those of other dictator games that vary the price of giving. In our dictator game treatment, subjects give away 13 % of the pie on average. With the same 50 % efficiency loss and a similar pie size, they transfer 10 % in Andreoni and Vesterlund (2001) and 21 % in Andreoni and Miller (2002). In Fisman, Kariv and Markovits (2007), for an efficiency loss of 30 % or above, 60 % of subjects transfer less than 5 % of the pie, 17 % transfer 5-15 % of the pie, 10 % 15-25 % of the pie and the remaining subjects transfer more. The corresponding figures in our dictator game treatment are very similar: 53 %, 17 % and 11 %, respectively.

Table 7: Test results for hypothesis 2

	mean dictator game treatment	mean veil of ignorance treatment	Mann-Whitney test*	Median test*
all	1.61 (36 obs.)	3.48 (131 obs.)	p=0.000	p=0.000
men	0.76 (17 obs.)	2.81 (91 obs.)	p=0.003	p=0.018
women	2.37 (19 obs.)	5.00 (40 obs.)	p=0.002	p=0.000

*: The reported p-values refer to two-tailed tests and are adjusted for ties.

treatment data in the first two columns of Table 8 confirm the test results: both men and women transfer significantly more in the veil of ignorance than in the dictator game treatment, about 2 units on average.[14] In both treatments, women transfer significantly more than men, a bit but not significantly more so in the veil of ignorance treatment.

One would have expected hypothesis 2 to be true only if (i) experimental subjects were risk neutral and (ii) they would behave impartially even if their role is known, i.e. if experimental subjects would not exhibit any egoism or subconscious self-serving bias in the dictator game treatment. Thus, the next step is to figure out where the significant differences between the dictator game treatment and the veil of ignorance treatment stem from: Are they due to risk aversion only, the prevalence of impartial social preferences in the veil of ignorance treatment as opposed to egoism in the dictator game treatment, or a combination of both? In the risk treatment, 68 % of all subjects (80 % of female and 61 % of male subjects) transfer a positive amount despite the large efficiency loss occurred. The average transfer amount is 3.1 for all subjects, 3.7 for women and 2.7 for men. The majority of our subjects clearly are risk averse.

4.3 Comparison of risk and veil of ignorance treatment

Can risk aversion account for the complete observed difference in transfers between the dictator game and the veil of ignorance treatment? Or do impartial social

[14] Curtis (1979) also compares individual distributional preferences in front of and behind the veil of ignorance but adds the issue of meritocracy: subjects have to decide how to distribute 3 dollars between a high and a low scorer in a motor skill test. When subjects know whether they are the high or the low scorer, 13 % behave consistently with maximin preferences, when they do not know 52 % do. Hence, concerns for equality are also stronger behind than in front of the veil of ignorance.

Table 8: Pooled OLS

dependent variable: transfer amount explanatory variables*	dictator game and veil of ignorance treatment data coefficient	p-value**	risk and veil of ignorance treatment data coefficient	p-value**
female	1.606	0.054	1.091	0.018
VoI	2.064	0.000	-0.059	0.901
female x VoI	0.741	0.443	1.308	0.053
sequence risk - VoI	-0.121	0.826	0.616	0.911
sequence VoI - risk	-	-	-0.166	0.802
VoI x sequence VoI** - risk	-	-	0.343	0.651
economist	0.242	0.599	0.397	0.262
age (in years)	0.028	0.961	-0.198	0.708
age squared	0.001	0.949	0.005	0.609
constant	-0.439	0.953	0.005	0.609
N	167		298	
R^2	0.176		0.087	

*: female = 1 if female, 0 if male; VoI = 1 if veil of ignorance treatment, 0 else; risk = 1 if risk treatment, 0 else; economist = 1 if economist, 0 else

**: based on robust standard errors

preferences additionally contribute to it?

Result 3

For female subjects impartial social preferences are a second significant motivation behind the veil of ignorance besides risk, while this is not true for men.

Table 9: Test results for hypothesis 3

	mean risk treatment	mean veil of ignorance treatment	Mann-Whitney test*	Median test*
all	3.07 (167 obs.)	3.48 (131 obs.)	p=0.203	p=0.484
men	2.72 (108 obs.)	2.81 (91 obs.)	p=0.773	p=0.980
women	3.69 (59 obs.)	5.00 (40 obs.)	p=0.011	p=0.047

*: The reported p-values refer to two-tailed tests and are adjusted for ties.

Table 9 compares all observations obtained in the risk and the veil of ignorance treatment. Analyzing only the data that are pooled for both sexes, we would conclude that hypothesis 3 cannot be rejected: both medians and distributions of transfer amounts do not differ significantly across the two treatments. The veil of ignorance treatment dummy is not significant in the right part of Table 8 that presents OLS regression results for pooling all risk and veil of ignorance treatment data. However, taking a closer look at the data we find that there are striking gender differences. While hypothesis 3 cannot be rejected for men at all, it actually can be rejected for women. For the female subjects, medians and distributions of transfer amounts do differ significantly in the risk and the veil of ignorance treatment. The regression results in Table 8 document that women transfer significantly (1.3 units) more in the veil of ignorance treatment than in the risk treatment.

In sum, for female subjects impartial social preferences are a major motivation behind the veil of ignorance, while this is not true for men. Impartial social preferences seem to increase equality concerns.

To check Rawls' prediction that maximin preferences prevail behind the veil of ignorance, Table 10 categorizes the data according to "strong types", i.e. the share of subjects who decide in favor of full efficiency or full equality in each of the two treatments.

Table 10: Strong types

	risk treatment			veil of ignorance treatment		
participants choosing		percentage	number		percentage	number
full efficiency	all	32.3 %	54/167	all	27.5 %	36/131
	men	38.9 %	42/108	men	35.2 %	32/91
	women	20.3 %	12/59	women	10.0 %	4/40
full equality, full insurance	all	4.2 %	7/167	all	13.7 %	18/131
	men	3.7 %	4/108	men	8.8 %	8/91
	women	5.1 %	3/59	women	25.0 %	10/40

Result 4

In the veil of ignorance treatment, only 8.8 % of men and 25.0 % of women act according to maximin preferences. Still, for women impartial social preferences clearly induce a concern for equality.

We observe that nearly all subjects react to the large efficiency loss in the risk treatment: only very few subjects choose full insurance by equalizing payoffs across states. In the veil of ignorance treatment, the share of subjects choosing full equality increases substantially, it doubles for men and is five times as high for women. Still, support for Rawl's difference principle is only limited: 8.8 % of men and 25.0 % of women choose full equality of payoffs. Related experiments that elicit paid impartial decisions behind the veil of ignorance also find low support for maximin preferences. In Carlsson, Gupta and Johansson-Stenman (2003) and Johansson-Stenman, Carlsson and Daruvala (2002) only 20 % and 19 % of subjects act in a way that is compatible with the difference principle. In Frohlich, Oppenheimer and Eavey (1987), who investigate paid group decisions, no group ever chooses an income distribution that maximizes the lowest income. Maximizing the average income plus a floor constraint is the most popular principle for choosing among income distributions. In contrast, in Curtis (1979) 52 % of subjects behave according to maximin preferences behind the veil of ignorance, in Mitchell et al. (1993) with unpaid decisions and compulsory participation between 65 % and 83 % of subjects (for differing degrees of meritocracy) opt for the difference principle.

In our experiment, a bit more than one third of men go for full efficiency in both the risk and the veil of ignorance treatment. In sharp contrast, the share of women opting for full efficiency halves in the veil of ignorance treatment. Compared to the situation in the one-person risk treatment, full efficiency now implies maximal inequality. All these findings underline major differences in the behavior of men and women: they show that in our experiment, women exhibit impartial social preferences for equality in a much stronger way than men.

The results presented above are confirmed by a within subject analysis where we compare a given individual's decision in the risk and the veil of ignorance treatment (and thus skip risk treatment data from the dictator game treatment - risk treatment sequence). Applying a Wilcoxon signed rank test to the pooled within subject data (131 observations) yields $p=0.037$ (two-sided), i.e. distributions of transfer amounts differ significantly in the risk and the veil of ignorance treatment. This result is purely caused by the behavior of female subjects. A two-sided Wilcoxon signed rank test reveals that female subjects transfer significantly different amounts in the risk and veil of ignorance treatment (p=0.006) while men do not (p=0.790).

Table 11 classifies subjects according to three "weak types", namely whether an individual does not react at all to the existence of the second person in the veil of ignorance treatment, whether it opts for more equality or for more efficiency as soon as the second person shows up.

Table 11: Within subject analysis

subjects who transfer ...	all	men	women
the same amount in the risk and the veil of ignorance treatment	44 %	53 %	22.5 %
more in the veil of ignorance treatment	35 %	24 %	60 %
less in the veil of ignorance treatment	21 %	23 %	17.5 %
number of observations	131	91	40

For more than half of the male subjects the existence of the second person does not add impartial social preferences as a motive, while this is only true for less than 1/4 of female subjects.[15] For those male subjects for whom impartial social preferences matter their effect is equally likely to point in the direction of an increased efficiency or an equality motive. 60 % of women transfer more in the veil of ignorance treatment than in the risk treatment (3.1 units on average), but only about 1/4 of men do (4.0 units on average). These findings confirm that for the vast majority of female subjects the veil of ignorance induces impartial social preferences for equality besides inducing risk. Our results for those 14 out of 131 subjects (7 men and 7 women) who do not opt for full insurance in the risk treatment, but choose full equality in the veil of ignorance treatment imply that the difference principle can be derived from impartial social preferences for equality and does not require that subjects are infinitely risk averse. Impartial social preferences for equality are even a more prominent motive for choosing the maximin allocation in the veil of

[15]Subjects who transfer the same amount in both treatments could also have a degree of risk aversion and impartial social preferences that imply the same transfer amount in the veil of ignorance treatment. While we cannot totally disapprove this possibility, we can be sure that these subjects' decisions are, on average, not driven by strong equality concerns: they transfer only 2.2 out of 8 reasonably possible units in the veil of ignorance treatment.

ignorance treatment. Only 3 subjects act according to maximin preferences in the veil of ignorance treatment because they are extremely risk averse, i.e. transfer 8 units in both the veil of ignorance and the risk treatment. These results contrast the utilitarians' claim that maximin preferences necessarily represent preferences with infinite risk aversion. We should keep in mind, however, that overall support for the difference principle is only limited.

While our results for women demonstrate that impartial social preferences for equality are one important motive behind the veil of ignorance there are also subjects - 23 % of men and 17.5 % of women - with impartial social preferences for efficiency.[16] Insofar our results are related to those of Engelmann and Strobel's (2004) taxation games that document that both concerns for efficiency and maximin preferences are important motives for impartial decision makers.

5 Conclusion

Rawls' claim that a truly just allocation of resources can only be based on impartial judgments made behind the veil of ignorance is as intuitively attractive as disputable: democratic institutions rest upon the assumption that competition of vested interests is able to balance interests appropriately. It was not the aim of this paper to comment on this. Our experimental results simply show that preferences stated in front of and behind the veil of ignorance differ significantly. Behind the veil of ignorance, subjects prefer more equal distributions, but only a minority of subjects acts according to maximin preferences. Consequently, support for Rawls' difference principle is far from being unanimous. On a technical level, we have presented an experimental design that separates the effects of risk and impartial social preferences behind the veil of ignorance. We have found that men prefer more

[16] In our data, subjects who transfer less in the veil of ignorance treatment than in the risk treatment are substantially more risk averse than those who transfer more. A possible explanation for why subjects transfer less could be that subjects maximize the sum of their own and the second person's expected utility but do not have any distributional concerns. Subjects would then give away less (more) in the veil of ignorance treatment if they perceive themselves as more (less) risk averse than the average participant. In the final questionnaire we asked our subjects to assess whether they had transferred more or less than the average participant in the risk treatment. We run an OLS regression to explain the difference in transferred units in the veil of ignorance and the risk treatment. Controlling for subject characteristics, the individual perception of own risk aversion compared to average risk aversion is not significant. Consequently, our data reflect distributional concerns.

equal distributions mostly for insurance purposes. In contrast, women's choice of more equal allocations is also due impartial social preferences that value equality per se. Most importantly, our results for those subjects who act according to maximin preferences in the veil of ignorance, but not in the risk treatment challenge the utilitarians' claim that behind the veil of ignorance maximin preferences necessarily represent preferences with infinite risk aversion.

Our results also contribute to the growing literature on gender differences in economic behavior. Gender effects in our data are strong. They imply that women are more risk averse than men. Furthermore, when there is a trade off between equality and efficiency women seem to have stronger preferences for equal allocations while men have stronger preferences for efficient allocations.

6 Appendix

6.1 Instructions and control questions

Both instructions and control questions were originally in German. The translated instructions and control questions presented below are those of the veil of ignorance treatment. The instructions and control questions for the dictator game and the risk treatment are structured and phrased in the same way with just one exception: to explain the risk treatment in the most natural and easiest possible way the instructions did not mention the state of being participant A (dictator) or B (receiver), but described the two possible states by throwing a dice and getting either an even or an odd number. The instructions of the dictator game and the risk treatment are available from the author upon request.

6.1.1 Instructions

General explanations concerning the experiment

Welcome to this economic experiment.
If you read the following instructions carefully, you will be able to earn an amount of money that depends on your own decisions. Therefore, it is very important that you read these explanations carefully. If you have any questions, please do not hesitate to ask us. Please raise your hand, and we will come to your seat.
During the experiment you are not allowed to talk to the other participants, to use cell phones or to start any programs on the computer.

The neglect of these rules will lead to the exclusion from the experiment and all payments.
During the experiment we talk about points instead of Euros. Your total income will therefore be calculated in points first. At the end of the experiment, the total amount of points obtained during the experiment will be converted in Euros at an exchange rate of

1 point = 1 Euro.

At the end of the experiment, you will be paid your earned income that is the result of your decision in cash.
On the next pages we will explain the exact course of the experiment.

The Experiment

In this experiment there are **two participants**, A and B.
Participant A has an initial endowment of 12 points, whereas participant B has an initial endowment of 0 points. Participant A can transfer every integer amount between 0 and 12 points (0 and 12 included) to participant B. Every transfer leads to the loss of half of the transferred points. **This means that participant B receives only half of a point for every full point participant A transfers to him.** Participant B does not have any influence on the decision of participant A and the course of the game apart from being paid half of the points transferred to him by participant A at the end of the experiment. Participant A will be paid the amount of points that he does not transfer.
The following table shows all possible distributions of points for participant A and B at the end of the experiment:

A transfers to B	0	1	2	3	4	5	6	7	8	9	10	11	12
A's points	12	11	10	9	8	7	6	5	4	3	2	1	0
B's points	0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6

The course of the experiment is the following:
Stage 1:
First, you have to decide how many points participant A transfers to participant B. This can be done by entering the number of points that are transferred from participant A to participant B on the following screen and pushing the "OK"-Button afterwards. **Note that at this stage you do not know yet whether you will**

be a participant A or a participant B in stage 2. The computer has already randomly chosen another participant with whom you form a pair.
[screen]
Stage 2:
A random selection determines whether you are assigned the role of participant A or the one of participant B. When you are assigned the role of participant A, the participant assigned to you has the role of participant B. When you are assigned the role of participant B, the participant assigned to you has the role of participant A. **Every pair therefore consists of one real participant A and one real participant B.** Both during the experiment and afterwards neither you nor the participant assigned to you know who the respective partner is.
Stage 3:
Your decision in stage 1 will be realized in any case, independent from whether you are assigned to the role of participant A or B. (This is possible because only half of the participants present in this room are taking part in the same experiment as you do. The other half of the participants is playing another experiment whose payoff does not affect you at all. You are assigned a participant from this other half.)
Example 1: You decide that A transfers 5 points to B. B therefore obtains 5:2=2.5 points and A keeps 12-5=7 points. Afterwards, it is decided by drawing lots that you are participant B. Your decision is implemented: You obtain 2.5 points. The participant assigned to you obtains 7 points.
Example 2: You decide that A transfers 5 points to B. B therefore obtains 5:2=2.5 points and A keeps 12-5=7 points. Afterwards, it is decided by drawing lots that you are participant A. Your decision is implemented: You obtain 7 points. The participant assigned to you obtains 2.5 points.
This experiment is played only once. At the end of the experiment all participants A and B are paid their income **in cash**.
If you have any questions, please raise your hand. We will come to your seat to answer your question.

6.1.2 Control questions

Question 1: You decide that A transfers 3 points to B. It is decided by drawing lots that you are participant A.

How many points does B get?

How many Euros will you be paid?

How many Euros will your randomly assigned participant B be paid?

Question 2: You decide that A transfers 6 points to B. It is decided by drawing lots that you are participant B.

How many points does B get?

How many Euros will you be paid?

How many Euros will your randomly assigned participant A be paid?

6.2 Data by treatment and sex

Figure 1: Transferred amount in the dictator game treatment by sex

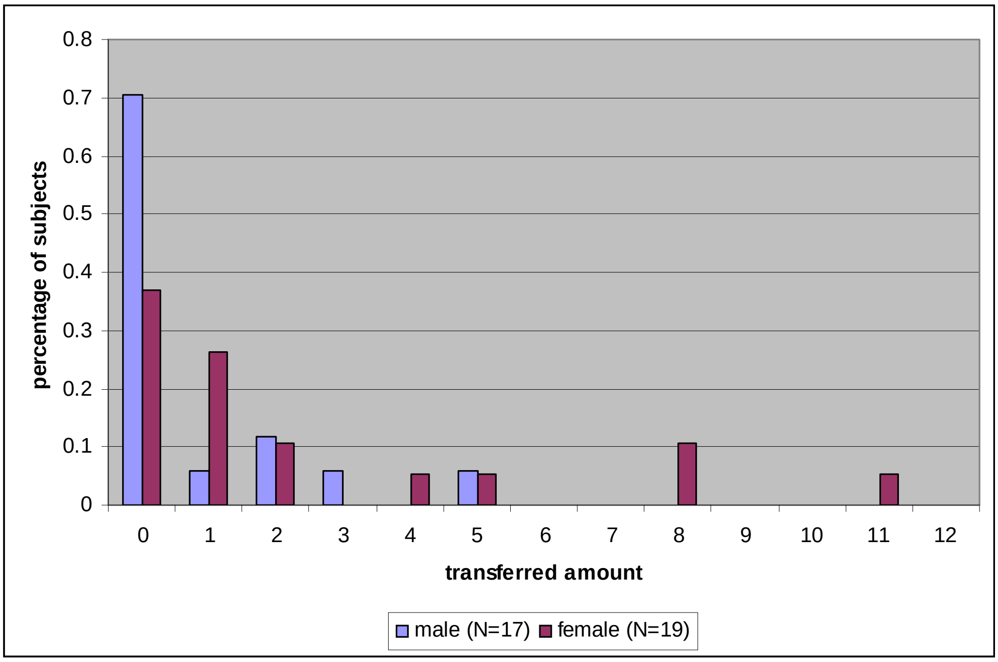


Figure 2: Transferred amount in the risk treatment by sex

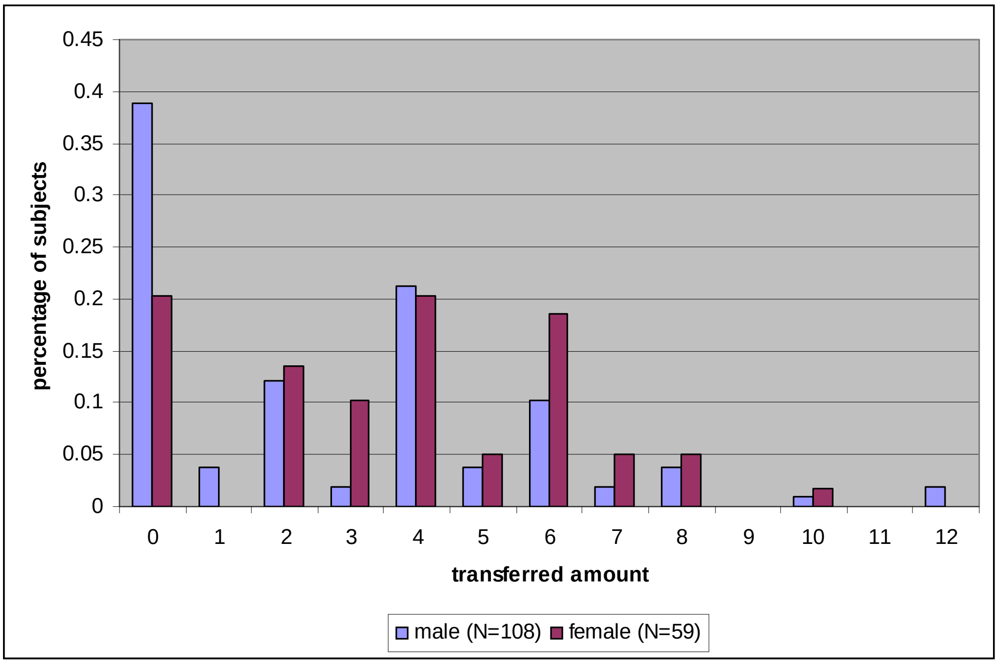
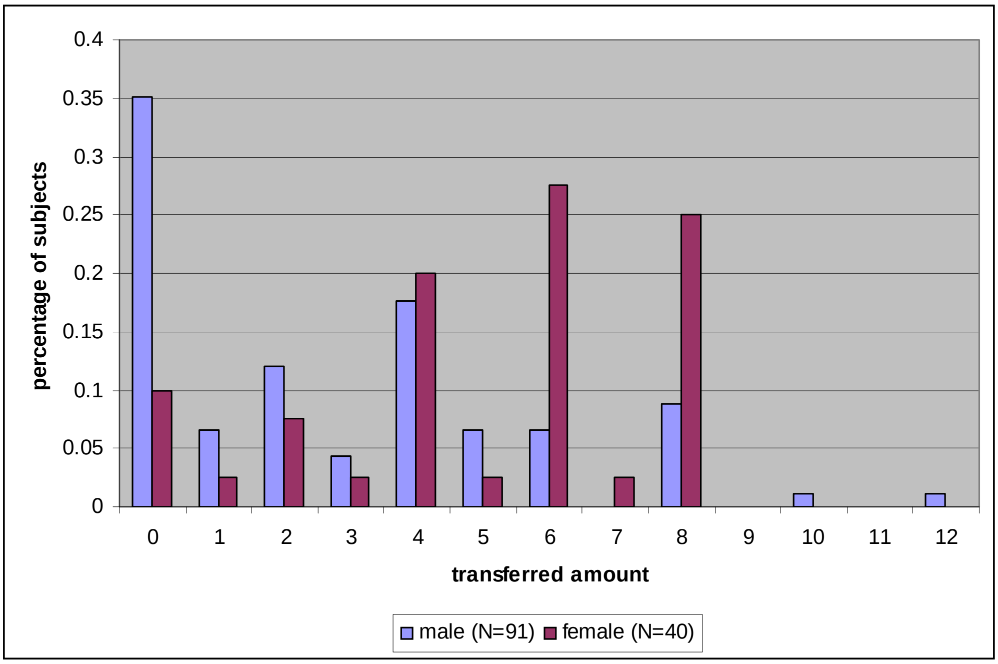


Figure 3: Transferred amount in the veil of ignorance treatment by sex



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