The prevalence of distributive principles

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Abstract

A core question in the contemporary debate on distributive justice is how the fair distribution of income is affected by differences in talent and effort. Important theories of distributive justice, such as utilitarianism, strict egalitarianism, liberal egalitarianism and libertarianism, all give different answers to this question. The paper presents the results from a version of the dictator game where the distribution phase is preceded by a production phase. Each player's contribution is a result of an exogenously given talent and a chosen effort. Using maximal likelihood approach we estimates the prevalence of four main principle of distributive justice among the players as well the weights they attach to fairness considerations.

1 Introduction

People are motivated by fairness considerations and are willing to sacrifice pecuniary gains in order to avoid large deviations from what they consider a fair solution. This type of behavior has been extensively documented in laboratory experiments with games such as the ultimatum game and the dictator game (Camerer, 2003). However, while these games show us that

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a substantial fraction of the players are motivated by fairness considerations, they do not provide much information on the more general structure of people's fairness norms. In the standard versions of the ultimatum game and the dictator game, the money to be distributed by the players is essentially "manna from heaven", and it seems rather uncontroversial to assume that people view the fair solution to be to distribute money equally in these cases.

The core question in both the modern political debate on distributive justice and in normative theoretical reasoning, however, is how to understand fairness in more complex situations involving production. In particular, there is substantial disagreement about to what extent people should be held responsible for various factors affecting their production. The controversy between the left-wing and the right-wing of the political spectrum may to a large extent be interpreted as a disagreement about how differences in effort and talent should be allowed to affect the income distribution. Proponents of a strict egalitarian view argue that people should not at all be held responsible for their effort and talent, thus considering equal sharing as the fair solution also in cases involving production. Libertarians, on the other hand, defend the view that people should be held responsible for both their talent and effort, and thus that the fair solution is to give each person what he or she produces. There are also intermediate positions, for example that people should be held responsible for their effort but not for their talent. In the theoretical literature on distributive justice, this view is referred to as liberal egalitarianism, and it is traditionally defended by arguing that effort is within and talent beyond individual control (Roemer, 1998). The standard welfare economics approach is another possibility, where the fair distribution is established by maximizing a social welfare function (for example choosing the distribution that maximises the sum of welfare in society).

Which of these fairness ideals are more prevalent as a motivational source among people in society? Surprisingly, this question has not been carefully addressed in experimental economics. It is typically assumed that the structure of the fairness norm or the other-regarding considerations is the same across people, and that people only differ in the importance they assign to these considerations Bolton and Ockenfels (2000); Fehr and Schmidt (1999); Rabin (1993). This may be a reasonable assumption to make in the study of simple distributional situations where everyone agrees that fairness requires a particular solution (for example equal sharing in the dictator game), but it is certainly unsatisfactory in more complex and realistic cases. In general,

we should also expect substantial heterogenity among people with respect to what fairness ideals motivate them, and thus differences in observed behavior may be due to two different sources. People may differ both in the importance they assign to fairness considerations and with respect to what they consider to be a fair distribution.

The aim of this paper is to show how one may estimate both the prevalence of different principles of distributive justice in a particular distributional situation and the importance people attach to fairness considerations. In particular, we study a dictator game where the distribution phase is preceded by a production phase. The players differ both with respect to effort and talent and thus different fairness ideals provide different answers to what is a fair distribution of the production. Given a simple random utility model where people make a trade-off between pecuniary gains and fairness considerations when proposing a distribution of the production and assuming a restricted set of fairness ideals (strict egalitarianism, liberal egalitarianism, welfarism, and libertarianism), we estimate the share of the population motivated by each of the four fairness ideals and the mean value and the variance in the parameter measuring the importance people attach to fairness considerations.

The next section describes the basic model in more detail, including the four fairness ideals. Section 3 provides a discussion of the experimental design, whereas the results are reported in Section 4. Section 5 contains some concluding comments.

2 The model

We study a situation in which the individuals differ both in effort and talent, and where effort is clearly within individual control and talent clearly beyond individual control. The production of individual i is given by $x_i = a_i q_i$, where q_i is the effort and a_i the talent of individual i. We will not model the choice in the production phase, but focus on the individual's choice in the distribution phase. The choice of distribution will always be in a two-person setting, where we will refer to the individuals as person 1 and person 2. The total production to be distributed is given by $X(\mathbf{a}, \mathbf{q}) = x_1(a_1, q_1) + x_2(a_2, q_2)$, where $\mathbf{a}$ is the vector of talent levels and $\mathbf{q}$ the vector of effort levels in the situation. All the fairness ideals satisfy the no-waste condition, and thus we can index the fair distribution such that m accrues to person 1 and $X - m$ to person 2.

2.1 Individual motivation: Money and Fairness

When proposing a distribution of the joint production, a person will be motivated both by a desire for pecuniary gain and by a desire not to deviate from what he or she considers to be a fair distribution. More precisely, we assume that a person i is maximizing the following utility function when determining the amount of money, y_i, she gives to herself:

$$V_i(y; \mathbf{a}, \mathbf{q}) = \gamma y - \frac{\beta_i}{2}\left((y - m^{k(i)}(\mathbf{a}, \mathbf{q})\right)^2, \; k(i) \in \{SE, U, LE, L\} \quad (1)$$

where the parameters γ and β_i determine the weight individual i gives to his own private income and to fairness considerations. Individual i's fairness ideal is given by $k(i)$. The marginal disutility of deviating from the ideal is increasing in the size of the deviation from the fair solution. Given an inner solution, The optimal proposal, y^*, is

$$y^* = m^{k(i)}(\mathbf{a}, \mathbf{q}) + \gamma/\beta. \quad (2)$$

For $\beta_i = 0$ the player will always keep all the money for himself.

2.2 Four principles of distributive justice

We assume that an individual endorses one of four principle of distributive justice; strict egalitarianism, welfarism, liberal egalitarianism and libertarianism. For any distribution problem with two individuals, 1 and 2 , each fairness principle specifies a unique distribution of income between the two individuals.

According to strict egalitarianism, the total production should be distributed equally among the two individuals independent of their effort and talent.

$$m^{SE}(\mathbf{a}, \mathbf{q}) = X(\mathbf{a}, \mathbf{q})/2. \quad (3)$$

This position can be interpreted as the view that individuals should not be held responsible for any of the factors that determine the individual's contribution to the joint production.

According to libertarianism (Nozick, 1974) the fair distribution is simply to give each player exactly what he produces,

$$m^{L}(\mathbf{a}, \mathbf{q}) = a_1 q_1 \quad (4)$$

The libertarian position can be interpreted as the view that people should be held responsible both for their effort and for their talent.

In order to derive the welfarist solution, we assume that all individuals derive the same welfare from income and that the marginal welfare is decreasing in income. Any weakly quasi-concave social welfare function distributes the joint production so as to equalize the net income individuals get from their investments. In order to achieve this the players should be compensated for their investment and then get an equal share of the net gain.

$$m^U(\mathbf{a}, \mathbf{q}) = q_1 + (X(\mathbf{a}, \mathbf{q}) - q_1 - q_2)/2. \tag{5}$$

In the absence of incentive considerations the welfarist solution thus implies that individuals are not held responsible for their talent and that they are compensated, but not rewarded, for their effort.

According to liberal egalitarianism, individuals should be held responsible for factors under their control, but not for factors outside their control (Roemer, 1998). In our context a reasonable interpretation of this view is that the joint production should be distributed according to each individual's share of the total investment,

$$m^{LE}(\mathbf{a}, \mathbf{q}) = \frac{q_1}{q_1 + q_2} X(\mathbf{a}, \mathbf{q}). \tag{6}$$

This principle is similar to what has been described as the accountability principle by Konow (2000).

It is useful to observe that since all four principle satisfy the no-waste condition, the mean value of the just income for the two individuals is equal to $X/2$ for all the four principles.

3 Experimental design

A version of the dictator game with joint production was designed so as to capture the features of the economy described above. We aimed at a very simple setup in which pairs of participants were asked about how they would share a joint product of $\sum_i a_i q_i$ in a setting where they could observe both their own and their opponents talent a_i and investment q_i without any room for strategic interaction.

The participants in this experiment were all recruited among first-year students at the Norwegian School of Business Administration. We had one

session of 20 participants, one of 12 and four sessions with 16 participants, 96 participants together. Each session ran for approximately 40 minutes. All participants were in the same computer lab, but all communication was anonymous and conducted with a web-based interface. After the experiment, participants mailed their bank-account numbers to accounting division of the Institute for Research in Economics and Business Administration (SNF) and the accounting division disbursed the earnings directly to the participants bank accounts. This procedure ensured that neither the participants or the experiment leaders could know how much each participant earned.

At the beginning of the experiment each participant was given money credits equal to 300 NOK (app. 50 USD). Each participant was randomly assigned a low or a high rate of return. Participants with a low rate of return doubled the value of any investment they made, while those who were assigned a high rate of return quadrupled their investment. We refer to this return as their "talent".

In a production phase the participants were then asked to determine how much they wanted to invest in two different games. Their choice alternatives were limited to 0, 100 and 200 NOK, and the total amount invested in the two games could not exceed the initial money credit they received. Any money they chose not to invest they could keep after the experiment ended.

In a distribution phase each participant was matched with a different participant for each of the two games. They were then given information about the other participant's talent, investment level and total contribution. The participants were asked to propose a distribution of the joint production for each of the two games. For each participant one of the two games was randomly selected, and one of the two proposals (his own or that of his opponent) was randomly selected to determine the outcome of the experiment for this participant. The participants in the experiment did not know the identity of the player they were matched with, they had no opportunity to reward or punish the other player, and the amount they proposed had no influence on the probability of it being realised.

Given the pay-off structure in this experiment, no individuals have incentives to not invest the full endowment. In Table 1 we see the distribution of investments in the first and the second game. No one kept all the money, one participant invested only 100 NOK and 10 participants spent 200 NOK. The remaining 85 spent the full endowment of 300 NOK they were given. Those who spent all the money are evenly distributed between investing $(200, 100)$ and $(100, 200)$.

[Table 1 about here.]

The players who were paired together in the distribution phase of the experiment could differ both with respect to their talent and with respect to their invest. This gave rise to four different distributional situations in the experiment. First, some players had to decide how to distribute the money in a situation where they were identical to the other player with respect to both their talent and their effort. In this situation all the four principles of distributive justice imply the same fair distribution, i.e., that both players get an equal share of the joint production. A second type of situation arose when the players had the same talent but differed in their investment level. In this type of situation the liberal egalitarian and the libertarian principles both imply that the fair distribution is that both players get their own contribution. According to the utilitarian principle the inequality should be equal to the difference in investment level and the strict egalitarian principle would maintain that equality even in this situation. A third type of situation is the situation in which both players have the same effort, but differ in their talent. In this situation all principles except libertarianism imply an equal distribution. Finally, we have the situations in which the players differ along both dimensions. In this situation the strict egalitarian and the libertarian principles imply the same distribution if the player with a high talent is the player with a low effort. Otherwise all the principle results in different ideal distributions.

In Table 5 we see the empirical distribution over these different cases. We see that there is an almost balanced design in these binary terms. In Figure 1 we have the pairwise scatter plots of how the various moral ideals correlate to each other in the data we have. We see that with the possible exception of the welfarist position (which is close both to the strictly egalitarian and the liberal egalitarian positions) there is considerable variation in what distributions imply.

[Figure 1 about here.]

[Table 2 about here.]

Each participant was paired with a player who had the same talent in one game and with a player who had a different talent in another game. The experiment employed a no feedback design to ensure that the players in the

second game were not affected by their experience in the first game. The participants were therefore not informed of the outcome of the first game before the second game was completed.

In all we had 96 individuals, playing two rounds each. In one round, a player entered an illegal amount and we exclude this observation.[1] We therefore have a total of 190 distributions from the 96 players.

4 Results

[Figure 2 about here.]

In Figure 2 we can see the distribution of offers made. 30% of all offers the opponent nothing, whereas the maximum offer is of 80%. 27% of the offers are exactly fifty-fifty. The average offer to the opponent is 27.1%, while the median is 29.2%. This is slightly higher than what is commonly observed (Andreoni and Miller, 2002; Camerer, 2003). We see that there are marked steps in the distribution. In fact, out of 190 proposed distributions 184 are of even 100 NOK amounts. The remaining 6 proposals are of even 50 NOK amounts.

[Table 3 about here.]

In Table 3 we have some descriptive regressions. We see that on average one demands almost the full own production ($a_1 q_1$) but only 65% of the opponent's production ($a_2 q_2$). This difference is statistically significant. We also see that ones own investment has a larger effect than the opponent's investment and that ones own talent has a larger effect than that of the opponent. This is consistent with the hypothesis that there are individuals who care about who owned the talent and who made the investment, but in itself these regressions are not very informative about the underlying structure of choices.

If one accepts the model outlined in Section 2 one would expect there to be identification from the fact that no one should ever demand *less* than that implied by their moral norm. If one observes a demand of less than one of the norms would imply, then we can rule out this particular norm for this

[1] Due to a bug in our software the player could circumvent the error-checking by entering the address of the next page directly in the address bar of the browser.

person. In Table 4 we see the distribution of individuals over the numbers of possible norms. We see that there are in fact 2 out of 96 individuals who make offers that are not strictly consistent with any of the fairness ideals. Estimation of any model that does not allow for some smoothing of choices will therefore fail. One the other hand, 75 out of 96 individuals make offers that are consistent with all of the moral norms. This shows that a revealed preference approach cannot elicit the prevelance of fairness ideals.

[Table 4 about here.]

4.1 Empirical model

The model outlined in Section 2 implies a unique solution for each individual, and if strength of moral persuasion is person specific it puts restrictions on repeated observations that we have shown does not hold in our. We therefore adapt the model to accomodate two necessary features: First, we need some source of random variation that is idiosyncratic to each choice. Second, the model needs to take into account that in our experiment students have a very strong tendency to choose round numbers. The model we propose has a mixed logit structure where each individual is characterised by their moral type, $k(i)$, as well as their personal moral strength β_i. We cannot classify individuals by (k, β_i), but we estimate the distribution of these characteristics.

As in Section 2 we assume that there is deterministic utility from the perspective of an i with moral type $k(i)$ of $V_i(y; \mathbf{a}, \mathbf{q}) = \gamma y - \beta_i \left(y - m^{k(i)}(\mathbf{a}, \mathbf{q})\right)^2 /2$. However, in line with the the experimental data, we restrict possible choices of y to the set $\mathbf{Y}_i = \{0, 50, 100, \ldots, X_i\}$. We also allow for choice-specific idiosyncratic random elements to each of these levels,

$$U_i(y; \cdot) = V_i(y; \cdot) + \varepsilon_y. \tag{7}$$

We assume that the ε_y's are iid extreme value distributed, and that individuals maximise utility by making a choice of the best y, call it y^*, such that $U_i(y^*; \cdot) \geq U_i(y; \cdot)$ for all y in $\mathbf{Y}_i$. Given the moral type and the moral strength of an individual, the choice problem now has a standard logit form. Since the type and the moral strength of an individual is unobserved by us, these will have to be integrated out for the unconditional choice probabilities as functions of the observed variables. We provide an appendix with the likelihood function.

4.2 Structural estimates

In Table 5 we have estimates of the structural model.[2]

[Table 5 about here.]

In the first column we see that there is considerable heterogeneity in the moral type of individuals. Strict egalitarians, libertarians and welfarists are about equally prevalent, but liberal egalitarians is the most prevalent single type. In Table 5 the λ_k's are estimated populations shares, and we find that 44.1% of the population are liberal egalitarians.

The parameters in Table 5 are not by themselves easy to interpret. The distribution of β is assumed to be log-normal and characterised by (ζ, σ) and γ determines the relative weight given to deterministic utility relative to the smoothing implied from the extreme value distributed ε's.[3] To get a handle on the effect of moral strength implied by our estimates we provide Figure 3. For the inner deciles of the distribution of moral strength we have plotted deterministic utility, $V(y)$ for a hypothetical individual with a moral norm of 500 and a joint production to be distributed of 1000. Also plotted, as solid bars, are the implied choice probabilities for all even 50-NOK.

We see that the lower end of the population in terms of their moral strenght has no inner maximum and the most popular choice among these is to demand the full production for themselves. There is a middle third in terms of moral strength that is willing to make active trade-offs. For median moral strength, the most popular choice is to demand 150 NOK more than that implied by the moral norm. The upper third in terms of moral strenght are not asking for more than their fair share, but have most of their probability mass concentrated at 500 NOK. We can also note that the smoothing implied by the extreme value distributed ε's does not mean that many people give away *more* than their moral norm. Only a very small mass is to the left of central line indicating the norm. The smoothing does imply, however, that those of very weak morality tend to smooth choices between asking for everything and almost everything. To get a handle on why this may be the case, we can examine the component of utility that is deterministic to an individual. At the bottom (where β is very small), $V(y)$ is

[2]The model is estimated using the GSL maximisation routines (Galassi, Davies, Theiler, Gough, Jungmann, Booth and Rossi, 2003).

[3]The model is normalised by the constant variance of ε_i, which is $\pi^2/6$.

practically identical to its linear part γy. But if this linear shape was to result in individuals choosing to grab everything with almost certainty, there would have to be very little smoothing going on from the ε's, and γ would have to be very high. This would make it almost impossible to account for intra-individual variation in deviations from their moral norm. It is therefore not strange that we are not able to account for strong bunching at the bottom.

[Figure 3 about here.]

In columns 2-5 of Table 5 we have made robustness checks by dropping one of the moral ideals in turn. We see that with the exception of dropping the welfaristic ideal, this has a large impact on the log-likelihood values. On the other hand, dropping the welfaristic ideal has little effect on any other parameter than the share of strict egalitarians: It seems that the strict egalitarian and the welfaristic ideals are not well separately identified, although these two seem to be well separated from the libertarian and the liberal egalitarian view.

4.3 True heterogeneity or moral wiggling?

We have assumed that individuals have a constant moral ideal independent of which distributional situation they find themselves in. Alternative approaches emphasize self-deception (Konow, 2000) or "moral wiggling" (Dana, Weber and Kuang, 2004). Individuals may use ambiguity in the distributional situation to further their own ends at the expense of fairness. In a setting such as the one we are examining in this paper, a natural application of this train of thought is to allow for people to be unclear about what moral ideal they should adhere to, and decide on ideals *after* the distributional situations are known: They could then decide that they would first choose the moral ideals that would benefit themselves most.

A simple test for whether individuals have this self-interested forming of moral ideals is to see whether they consistently ask for more in situations where there is scope for such "moral wiggling". In situations where $a_1 = a_2$ and $q_1 = q_2$ all reasonable ideals of fairness would imply an equal sharing of the outcome, the moral wiggling is only applicable in those situations where there is some inequality in either talent or investments.

In Table 6 we see in the third column that in the "ambiguous" situations, where $a_1 \neq a_2$ and/or $q_1 \neq q_2$, choosing a moral ideal self-interestedly would

on average give 9.3 percentage points more to one-self of the total production. There is indeed a small difference between the amount demanded as well, of 2.2 percentage points. This difference is small and not statistically significant. We conclude from this that while we cannot rule out that some individuals exploit such scope for moral wiggling, there is little reason to suspect that is pervasive in a way that would invalidate our analysis in the previous subsection.

[Table 6 about here.]

5 Concluding remarks

Our results support Andreoni and Miller (2002) in that it is important to allow for heterogeneity among individuals in terms of what they consider fair. Our estimates indicate that the most prevalent moral norm is the Liberal Egalitarian, but even this has support from less than 50% of the population. Unlike Andreoni and Miller (2002) we are also able to address the question of moral strength.

To be completed.

Appendix: The Likelihood function

In order to take into account that individuals make repeated choices, it is neccessary to introduce the notation J_i for the number of choices individual i makes. The likelihood contribution of a moral type k individual i of proposals of y_{ij} from the set of feasible proposals $\mathbf{Y}_{ij}$ given a parameter vector $\theta = (\lambda_1, \lambda_2, \lambda_3, \lambda_4, \gamma, \zeta, \sigma)$ the likelihood is what Revelt and Train (1998) call a "mixed logit with repeated choices",

$$L_{ik}(\theta) = \int_0^\infty \left(\prod_{j=1}^{J_i} \frac{e^{V^k(y_{ij};\mathbf{a}_{ij},\mathbf{q}_{ij},\beta,\gamma)}}{\sum_{s\in\mathbf{Y}_{ij}} e^{V^k(s;\mathbf{a}_{ij},\mathbf{q}_{ij},\beta,\gamma)}} \right) f(\beta;\zeta,\sigma)d\beta. \tag{8}$$

We assume that $f(\beta;\cdot)$ is log-normal, parametrised such that $\log(\beta) \sim N(\zeta, \sigma^2)$. The total likelihood, integrating over the distribution of unobserved moral type, is a finite mixture over the type distribution determined

by the discrete distribution induced by λ,

$$L_i(\theta) = \sum_{k=1}^{4} \lambda_k L_{ik}(\theta). \tag{9}$$

The numerical integration over is done by a 65-point quadrature rule.

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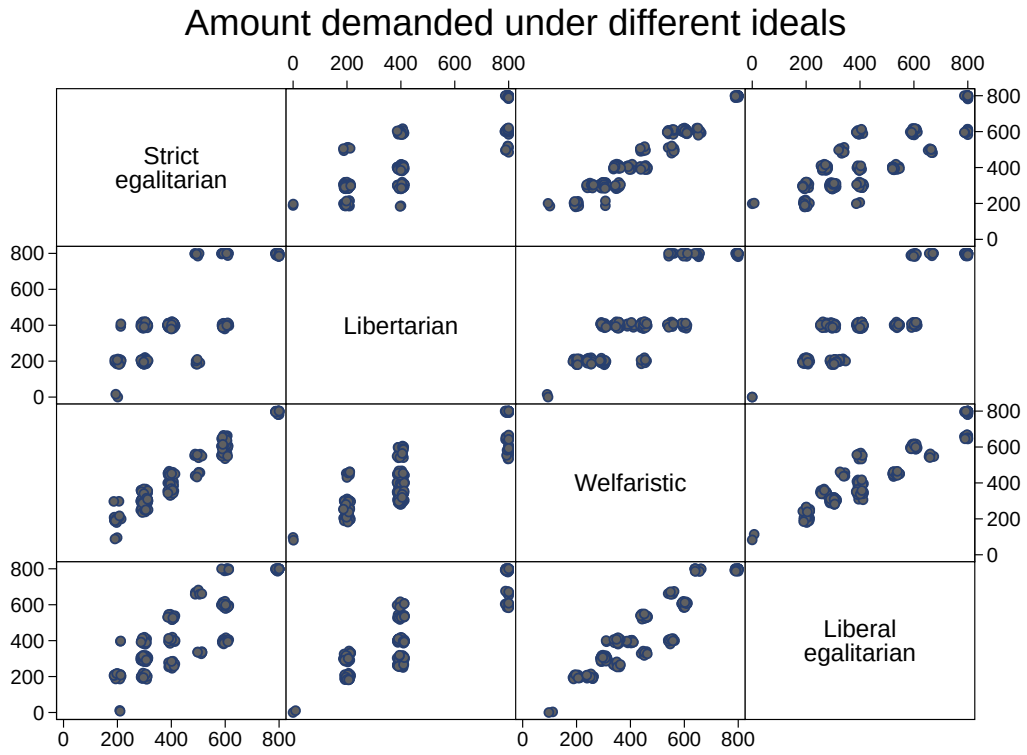


Figure 1: Scatter plots of moral ideals. Pairwise plots of $m^k(\mathbf{a}, \mathbf{q})$ against $m^j(\mathbf{a}, \mathbf{q})$ for the data we have. Weight of dots indicate number of observations at that point.

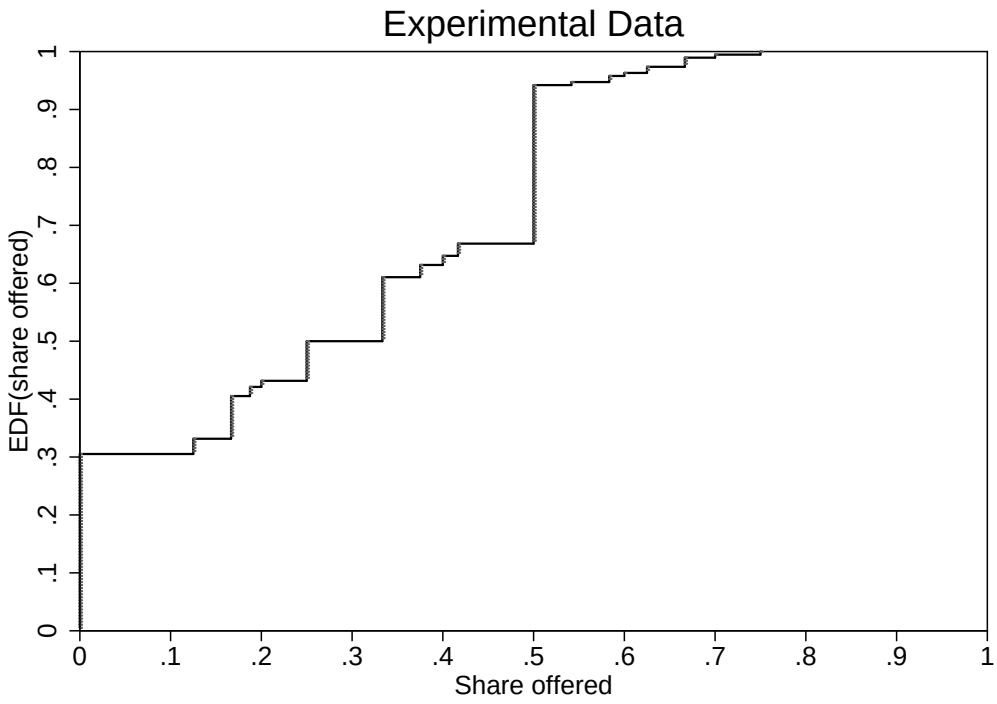


Figure 2: Empirical distribution of offers made (as a share of total production).

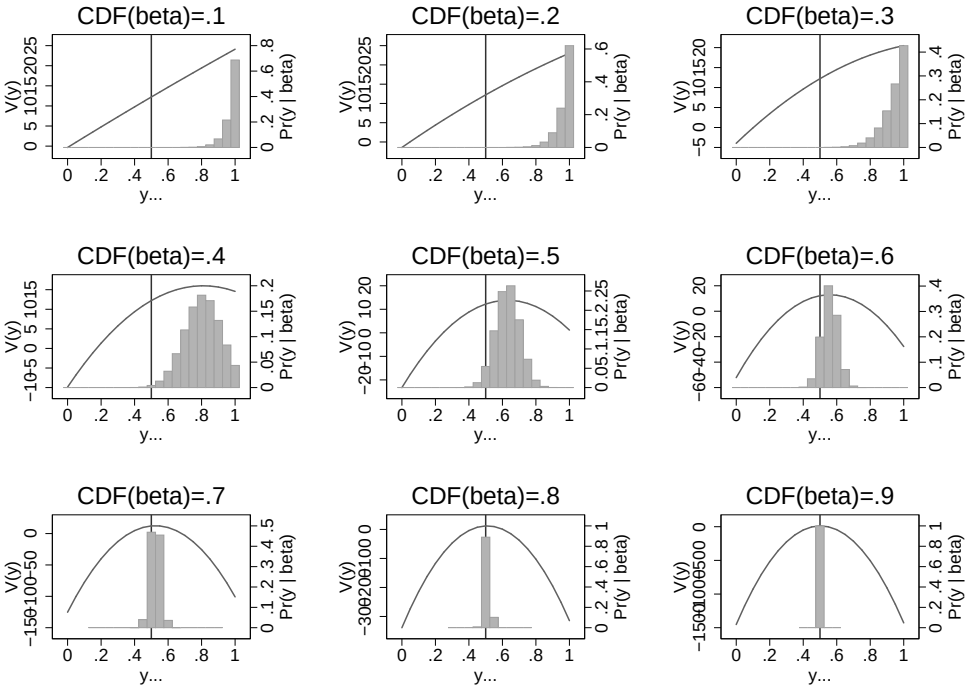


Figure 3: Deterministic utility, $V(y) = \gamma y - \beta(y-m)^2/2$, for an individual with $m = 0.5$ (marked by a vertical line). Calculated at the deciles of the estimated β distribution. Money, y, is measured in units of thousand of NOK.

	second game			
first game	0	100	200	total
0	0	1	0	0
100	0	9	39	48
200	1	46	·	47
total	0	57	38	96

Table 1: Investments in first and second game

	$I_{\{q_1=q_2\}}$		
$I_{\{(a_1=a_2\}}$	0	1	total
0	42	54	96
1	50	44	94
total	92	98	190

Table 2: Source of identification. ($I_{\{s\}}$ is an indicator for whether s is true.)

y_1 on	1	2	3	4
constant	-56.48	-260	-289	-798
	(39.60)	(90.3)	(78.3)	(81.7)
a_1q_1	0.936			
	(0.069)			
a_2q_2	0.667			
	(0.069)			
a_1		157		125
		(21)		(16)
a_2		143		101
		(21)		(16)
q_1			3.62	3.07
			(0.37)	(0.31)
q_2			2.84	2.19
			(0.37)	(0.31)
R^2	0.66	0.36	0.45	0.64

Table 3: Regressions

# of compatible morals				
0	1	2	3	4
2	7	6	6	75

Table 4: Distribution of individuals over possible moral norms.

	specification				
parameter	1	2	3	4	5
share strict egalitarian	0.17574		0.372	0.392	0.307
share libertarian	0.18953	0.196		0.165	0.278
	(0.07013)				
share welfarist	0.19404	0.408	0.093		0.415
	(0.11435)				
share liberal egalitarian	0.44069	0.397	0.535	0.443	
	(0.10081)				
ζ	5.19237	4.958	4.853	5.153	4.592
	(0.54360)				
σ	3.26323	2.859	2.949	3.228	3.061
	(0.72292)				
γ	24.44544	22.64	20.98	23.69	17.46
	(4.03259)				
Log likelihood	-359.56	-368.1	-368.9	-360.0	- 381.6

Table 5: Estimates of structural model. Standard errors calculated using the outer product of the gradient (Berndt et al., 1974) in parentheses. Note that there is no standard error on the share of strict egalitarians since this is calculated residually

	n	m^k/X	$\max_k m^k/X$	y/X
non-ambiguous	44	0.500	0.500	0.711
ambiguous	146	0.500	0.593	0.733
difference			0.093	0.022
p-value, t-test of no difference				0.559

Table 6: Scope for moral wiggling.