Preferences over Income Distributions - A Survey of Evidence from Pure Distribution Games

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Abstract

This Survey accompanies our paper "Preferences over Income Distributions - Experimental Evidence" (*Public Finance Review* 35, 2007, 285–310) and is based on a previous version of this paper. It extends the literature survey in Section 3 of this paper by providing a more detailed discussion of the relevant results in the literature and by incorporating recent articles. We discuss crucial evidence from two-player dictator games and provide an extensive survey of multi-player dictator games. The focus is on the relative performance of various models of other-regarding preferences.

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In this survey, we discuss the evidence of purely distributional games (i.e. games where players make simply one decision about the allocation of payoffs among themselves and others without any interaction or mutual influence) with the perspective of evaluating the performance of several crucial models of other-regarding preferences that are exclusively based on the distribution of payoffs.[1] The models are on the one hand those of inequality aversion by Bolton and Ockenfels (2000, henceforth B&O) and Fehr and Schmidt (1999, henceforth F&S) and on the other hand models based on altruism with more regard for the poor, the model of quasi-maximin preferences by Charness and Rabin (2002, henceforth C&R) and its non-linear generalization by Cox and Sadiraj (2006, henceforth C&S). For details of the models, see Engelmann and Strobel (2007). We discuss crucial results from variants of the two-player dictator game in Section 1 and multi-player dictator games, which are our focus since they allow for more direct tests of the models, in Section 2. We also include a few papers that are not plain dictators games, namely where players vote upon distributions. In this realm, our survey is not exhaustive and only takes into account a number of papers that shed some light on important results from pure distribution games.

1 Evidence from the Classic Dictator Game and Its Variants

In the dictator game, the first player ("dictator") simply chooses among a set of available allocations between him- or herself and the second player ("recipient"). In the classic dictator game (Forsythe et al., 1994), the total size of the pie the dictator can distribute is fixed, so that the decision of the dictator simply corresponds to splitting a fixed sum of money.[2] The original dictator game experiments were aimed at better understanding the results in the ultimatum

[1] In our discussion of the data, our focus will thus frequently differ from that of the respective authors.

[2] In an earlier dictator game (Kahneman, Knetsch, and Thaler, 1986), dictators could only choose between an equal split of $20 or keeping $18 and giving recipients $2. The 76% who chose the equal split are much higher than in other experiments, probably because only one very biased alternative was available.

game. The results suggest that a combination of both fairness and strategic concerns are required for an explanation of the ultimatum game, since offers in the dictator game were significantly lower than in the ultimatum game but also clearly larger than zero (on average about 20% with about 1/5 of dictators choosing the equal split and about 1/3 giving nothing). Positive giving is consistent with altruism (in particular maximin preferences) or inequality aversion, but both the models by Bolton and Ockenfels (2000, henceforth B&O) and Fehr and Schmidt (1999, henceforth F&S) have problems organizing the data.[3]

The basic dictator game has been intensively tested for robustness with respect to procedures (e.g. double blindness), subject pools and other factors, such as increased social distance. It appears that the dictator game is less robust to such variations than other games. Double blind procedures reduce giving by about half (Hoffman, et al., 1994, Hoffman, McCabe, and Smith, 1996). Further increasing social distance seems to lower dictator giving only slightly further.[4] In contrast, Bohnet and Frey (1999a,b) decreased social distance. Dictators could identify the matched recipients (but not vice-versa) and the recipients could provide some information about themselves. The mean increased to 52% and about 40% of dictators gave more than half. Charness and Gneezy (2006) find a significant increase in dictator giving if family names are revealed (average amounts sent increased from 18% to 27%), but no effect in ultimatum games.[5]

[3]The linear utility function in F&S is only consistent with the corner-point choices to keep the whole pie for $\beta < 1/2$ and to send exactly half for $\beta > 1/2$. The large share of the dictators giving some intermediate amount are only consistent with β being exactly 1/2. In contrast, the model of B&O cannot explain sending exactly 1/2 (at least if the strategy space is sufficiently fine), since the derivative of the (smooth) utility function with respect to the dictator's share is 0 at the 'fair share'. To remedy this problem, B&O allow the utility to be only weakly increasing (and weakly concave) in the dictator's payoff, but this leads to a contradiction of their assumption that the dictator strictly prefers more money given the same share.

[4]Recipients in Johannesson and Persson (2000) were randomly selected from the Swedish adult population and their allocations were mailed. The average given by dictators decreases a bit, but more importantly, the share of subjects giving something stays virtually identical at 1/3.

[5]The underlying reason behind the increase might be that it is more credible that the recipient really exists

While it might be most surprising to an economist that double-blind procedures do not reduce the share allocated to the recipient to 0, it is noteworthy that the effects are stronger than for similar variations in the ultimatum game.[6] A possible explanation is that these variations affect distributional concerns, but not other considerations like strategic thinking or reciprocity and hence the effects are strong if only distributional concerns matter but can be dominated by other concerns when they come into play.

The most dramatic effect was found by Cherry, Frykblom, and Shogren (2002). They let dictators earn the original pie through a quizz. Depending on the number of questions they answered, they could distribute either \$10, or \$40. Combining earned income with double-blind procedures increases the number of zero allocations to 92% (low earnings) and 97% (high earnings), with no subject giving more than 20% of the pie.

Bardsley (2008) discovers behavior that is inconsistent with any model of distributional preferences by comparing standard dictator games (except that recipients had a positive endowment) with "taking games" where the dictator can only take money from the recipient (with the same initial endowment as in the dictator game). Clearly, all the models discussed imply that dictators who give positive amounts in the standard dictator game should not take any money in the taking game. Bardsley finds, however, that the share of subjects giving money in the dictator game is significantly larger than that taking zero in the taking game.[7] We note, however, that the share of subjects who make the most egoistic choice is almost exactly the same in both

and is paid. This credibility is less of an issue in ultimatum games as it is probably plausible to subjects that experimenters are interested in both players' decisions whereas it might appear strange to dictators that the experimenters pay another subject for doing nothing. The decrease of dictator-giving with double-blind procedures, in turn, might be driven by a stronger suspicion that recipients do not exist (see Frohlich, Oppenheimer, and Moore, 2001).

[6] See Camerer (2003) for a detailed overview.

[7] He also observes (in his experiments 1 and 2) that introducing a take option in the dictator game lowers giving, though insignificantly.

games (about 45%) and that the number of those who equalize payoffs in the dictator game (about 25%) is of a similar magnitude as those taking zero in the taking game (about 15%).[8] The inconsistency between the two games appears thus to be primarily driven by the subjects making intermediate choices. While this is inconsistent with any of the outcome-based models, it could be rationalized as dictators trying to strike a balance between egoistic impulses and a desire to be fair or generous to the recipient, where the fairness is evaluated on the basis of the range of available choices.

The consistency of dictators' choices across several two-player dictator games with varying costs of giving has been addressed by Andreoni and Miller (2002), Fisman, Kariv, and Markovits (2007) and Blanco, Engelmann, and Normann (2006). Andreoni and Miller (2002) study behavior of subjects across 8 to 11 dictator games with different budgets and different costs of giving. They find that about 98% of their subjects make decisions that can be rationalized by a quasiconcave utility function. Among these, 47.2% are either strongly or weakly consistent with selfish preferences, 30.4% with Leontief preferences (which are consistent with both inequality aversion and maximin preferences in this case) and 22.4% with perfect substitutes (reflecting efficiency concerns). They also find in dictator games where the dictator cannot affect the distribution of tokens, but only the value of the tokens to both subjects, that 22%

[8] This difference of about 10% could be driven by a special appeal of an equal split. Given the initial endowments of £10 and £5 for dictators and recipients, an equal split costs £2.5 in the dictator game. In the taking game, an equal split is not feasible and even the most equal available split costs £3 because the dictator was allowed to take up to £3. Similarly, the difference in price of the equal split might contribute to the (not significant) differences in Bardely's experiment 2. If a taking option is introduced in a dictator game, then compared to the most selfish choice, the price of achieving an equal split increases. Thus players who are motivated by a mixture of own payoff and utility from perfect equality are less likely to choose the equal split. The difference between the two games in experiment 2 lies primarily in the decrease of the share of subjects choosing to equalize payoffs, consistent with this explanation. The relevance of this explanation could be assessed by a within-subjects design that allows to observe whether introducing the taking option generally reduced dictator giving or rather leads some players to move from the equal split to the most selfish choice.

reduce the value of the token if they have the lower number of tokens and 6% do so when they have the higher number of tokens. This behavior is consistent with inequality aversion, though not with the linear F&S model or the B&O model, since only one subject decreases the value of the tokens to 0.[9] On the other hand, also 6% reduce the token value if the distribution is equal, suggesting that there is some error involved. The results by Andreoni and Miller illustrate the heterogeneity of subjects' preferences. While almost all are rational for some utility function, the best-fitting utility functions differ substantially across subjects.

Fisman, Kariv, and Markovits (2007) extend Andreoni and Miller (2002) by allowing for non-linear (more specifically, step-shaped) budget sets. Their results for linear budget sets are similar to those of Andreoni and Miller, as a large majority of subjects are (nearly) consistent with maximization of a well-behaved utility function and there is a lot of heterogeneity. A majority of subjects prefer increasing the total payoff over reducing inequality. The tests with step-shaped budget sets reveal an interestingly high share of choices that are competitive[10] or at least indifferent to the other (82.6% of choices that reduce the other's payoff at no cost to self are inequality increasing, with slightly more than half of these giving nothing to the other player). These violate both inequality aversion and maximin preferences.[11] By contrast, all choices that reduce own payoff without affecting the other decrease inequality (consistent with $\beta > 1$ in F&S). Taken together, the choices that increase advantageous inequality or reduce it by throwing away own payoff make up nearly a quarter of all choices. Among the individuals that can be classified, 60% show lexicographic preferences, first maximizing own payoff and as a secondary criterion the other's payoff.[12] A further 13% are clearly consistent with quasi-maximin

[9] The inconsistency with the B&O model is more fundamental since all but one subject reduce only the payoff without affecting their share, whereas F&S only needs to be relaxed by allowing for concavity of the decision maker's utility function in his own payoff.

[10] Competitiveness is understood as a desire to maximize one's own relative payoff.

[11] There are, however, only three (out of 53) subjects that are consistently competitive.

[12] This is also consistent with efficiency concerns that put most weight on their own payoff. For example,

preferences. All the 17% that show patterns consistent with reducing inequality do this in at least one game by throwing away own payoff. A potential problem with the design of Fisman, Kariv, and Markovits (2007) (as with Andreoni and Miller) is that subjects receive payoffs from two games, one where they are the dictator and one where they are a recipient. Even a dictator who is inequality averse or has maximin-preferences might behave selfishly if he believes others to do so,[13] which could contribute to the high share of lexicographic preferences.

In the experiment by Blanco, Engelmann, and Normann (2006), dictators choose between an allocation of £20 for themselves and £0 for the recipient or £x for both, where x was varied between all integers from 0 to 20.[14] As Andreoni and Miller, they find that the vast majority of subjects (61 out of 72) are rational in the sense that if they prefer (x, x) over $(20, 0)$ and $y > x$, then they also prefer (y, y) over $(20, 0)$. They also find a large degree of heterogeneity as the cut-off values where subjects switch to the equal distribution vary from 0 (for two subjects, indicating extreme inequality aversion, even violating the $\beta < 1$ constraint in F&S) to 20 (for five subjects, indicating selfishness or lexicographic preferences), or no switching at all (for six subjects, suggesting competitive preferences or selfishness and randomizing at the (20,0) vs. (20,20) choice).

The dictator control experiment for the trust game by Cox (2004) separates dictator giving from inequality aversion. Both dictators and recipients have an initial endowment of $10 and dictators can send part of their endowment to the recipients, which was then tripled. 63% of the dictators sent part of their endowment which is inconsistent with inequality aversion since

dictators with lexicographic preferences would choose the efficiency maximizing allocation in the Engelmann and Strobel (2004) experiments discussed in the next section where their own payoff cannot be affected.

[13] This holds even though both games would not be played with the same other subject.

[14] The aim of this study is to check within-subjects consistency with F&S across dictator, ultimatum, prisoner's dilemma and public good games. To get a fine measure of the β parameter in F&S, subjects play 21 dictator games. Only one randomly chosen game was paid out and hence at most one of the dicator games. Overall, the results are not supporting within-subject consistency with F&S. For example, 38% violate the $\beta \leq \alpha$ constraint.

it generates disadvantageous inequality.[15] Since the linear quasi-maximin C&R model predicts that dictators would send either nothing or all \$10 and only 13% choose the latter, it does not add much explanatory power. Hence while this experiment suggests that a majority of subjects have altruistic preferences, the utility function appears to be concave and hence the data can only be rationalized by the C&S model.

Harrison and Johnson (2006) argue that many of the classical games that have influenced the literature on other-regarding preferences such as the trust game or the public goods game suffer from an efficiency confound.[16] They argue that participants in an experiment might perceive an experiment as a two-step process where they first try to maximize the money they extract from the experimenter and in a second stage are concerned about the distribution. To investigate this hypothesis, Harrison and Johnson study dictator games with various costs of giving where the recipient is either another anonymous participant or an anonymous charity. Treatments further differ with respect to the residual claimant of the maximal possible payout. It is either the experimenter or one randomly selected participant (if the recipient is the charity) or a charity (if the recipient is another participant). Consistent with the hypothesis that subjects want to maximize the money extracted from the experimenter, having a charity as residual claimant reduces the amount sent to another participant.[17] The difference between treatments, however, does not appear to increase with the returns to giving as it should if this is the explanation

[15] Kritikos and Bolle (2001) also find strong evidence in favor of efficiency concerns and contrary to inequality aversion in two-player dictator games where dictators choose between payoff allocations that are similar to the options for responders in ultimatum games. In none of their games did more than 26% of players choose to reduce a richer player's payoff, even if it was costless, and 58% preferred an allocation of (self: 10DM, other: 40DM) over (20DM, 10DM) in clear violation of F&S.

[16] In Engelmann and Strobel (2002, the working paper version of Engelmann and Strobel, 2004) we make the same point and argue in detail which results might partly be driven by efficiency concerns and which cannot or explicitly contradict efficiency concerns.

[17] An alternative explanation for this observation is simply that some subjects prefer to give to a charity rather than to another participant, which is consistent with the observations from the other treatments.

for the treatment difference. Furthermore, there is a substantial difference in the amount given at a rate of return of 1, where there should not be any because at a rate of return of 1, the amount given does not affect the amount obtained by the residual claimant, so the identity of the latter should be irrelevant. Moreover, having another participant as the residual claimant increases the amount of money given to the charity, which contradicts that giving is partly driven by the desire to maximize the money extracted from the experimenter. This result is in line with envy towards a rich subject, since the same person was the residual claimant for the whole session and hence received dramatically higher payoffs than the other participants. Again, however, the difference in rates of giving between the treatment with the experimenter and another participant as residual claimant does not increase with the rate of return, which it should for rational envious dictators (since reducing the residual claimants payoff becomes cheaper, though the residual claimant's expected payoff also becomes smaller) and is already present at a rate of return of 1 where the residual claimant is unaffected by the amount given to the charity. In any case, the results of Harrison and Johnson (2006) show that the identity of the residual claimant is potentially important for experimental choices.

In general, the inferences we can draw from two-player dictator games concerning the relevance of different distributional motives are limited, because in most cases several motives coincide, for example inequality aversion coincides either with maximin preferences (if advantageous inequality is reduced) or with competitiveness (if disadvantageous inequality is reduced).

2 Evidence from Multi-Player Dictator Games

Taking note of the limited ability of two-player dictator games to discriminate between different distributional motives (with the exception of Andreoni and Miller, 2002, and Fisman, Kariv, and Markovits, 2007), it is surprising that there is a relative sparsity of dictator experiments with more than two players. To our knowledge, this section contains a complete survey as of

2006.[18]

Charness and Rabin (2002) base their analysis primarily on two-player games, but they also included three 3-player dictator games. The results are in favor of quasi-maximin preferences with a higher weight on the maximin component than the efficiency component.[19]

In Engelmann and Strobel (2004, henceforth E&S), we initially aimed at discriminating between B&O and F&S, which is impossible in two-player games (except for some rather artificial examples). Discriminating between the models was achieved by a dictator choice that resembles the choice between different tax systems. The dictator had a fixed, intermediate income and could choose among three different money distributions between a high-income and a low-income person (see Table 1, columns Fx and Ex; person 2 is the dictator in all treatments). The crucial aspect of the design is that redistribution in favor of the low-income person 3 (which would be predicted by F&S as it reduced advantageous and disadvantageous inequality) increases the difference of the dictator's share and the "fair share" 1/3, so that B&O would predict instead redistribution in favor of the high-income person 1.

[18] An early three-player dictator game was conducted by Kahnemann, Knetsch, and Thaler (1986), but dictators knew the choices of the two recipients in preceeding two-player dictator games, so this game is clearly influenced by indirect reciprocity. Frey and Bohnet (1997) studied three-player dictator games where the dictator could freely share a fixed sum of money with two recipients. On average, dictators gave 14% to each of the recipients, consistent with inequality aversion and various versions of altruism. The focus of their study is the effect of communication. If the dictators can talk to one recipient before making their decision, the share allocated to this recipient increases to 37% while that of the other recipient stays almost constant at 17%. Hence, as the authors conclude, communication can strenghthen other-regarding preferences in dictator games as has previously been shown for other games like the prisoner's dilemma, but at the same time it can lead to an increase in inequality. Since communication also eliminated anonymity, it cannot, however, be excluded that the effect is rather due to fear of punishment outside the experiment.

[19] One of the games presents clear evidence against B&O as a majority of subjects (54%) prefers an allocation (575,575,575) over (900,300,600) where the last person is the dictator. In both games the dictator receives exactly 1/3, so all subjects in the B&O model would strictly prefer the second allocation since the dictator's payoff is higher.

In order to balance a possible confound of efficiency concerns, in one treatment (Fx) redistributing to the low-income subject increased the total payoff (hence F&S and efficiency concerns coincide), whereas in the other treatment (Ex) it decreases the total payoff (thus B&O and efficiency coincide). In treatment Fx the vast majority choose in line with F&S and efficiency, in Ex they split roughly equally between the F&S allocation and the one in line with B&O and efficiency, with a relatively high share of choices for the intermediate allocation. While this appeared to favor F&S over B&O, F&S coincides in these games with maximin preferences and F&S does not capture the difference in choices between the treatments, which clearly point to efficiency concerns.[20]

The linear C&R model is consistent with a large share of choices, a non-linear extension like C&S can even capture the choice for the intermediate allocation in treatment Ex and hence can rationalize all choices except the 13 % for the intermediate and B&O allocations in treatment Fx.

A further treatment where the F&S allocation was Pareto-dominated by the B&O allocation which in turn was Pareto-dominated by the efficient allocation again found large support for quasi-maximin preferences (70% of choices, see Table 1, column N). Providing small incentives (1 or 2 Deutsche Marks) to the dictator in either direction did not substantially affect the distribution of choices (for details see E&S).

In treatment R where the dictator was the high-income person and efficiency concerns and inequality aversion coincide, while maximin preferences predict the efficiency minimizing allocation, the latter outperform the former (see Table 1, column R). Finally, in treatment P where the dictator is the low income individual and hence maximin preferences play no role, the majority

[20] Our experiments were run in three sessions as class-room experiments with first-year undergraduate students in economics and business administration in the second or third week of classes. We ran the games with role uncertainty, i.e. each participant made a choice as if they were the dictator before roles were assigned, knowing that their choice would only become relevant if the random role assignment would put them in the role of the dictator. We will address robustness with respect to the subject pool and the procedure below.

Treatment	Fx			Ex			N			R			P		
Allocation	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Person 1	17	18	19	21	17	13	16	13	10	11	8	5	14	11	8
Person 2	10	10	10	12	12	12	8	8	8	12	12	12	4	4	4
Person 3	9	5	1	3	4	5	5	3	1	2	3	4	5	6	7
Total	36	33	30	36	33	30	29	24	19	25	23	21	23	21	19
Average 1, 3	13	11.5	10	12	10.5	9	10.5	8	5.5	6.5	5.5	4.5	9.5	8.5	7.5
Relative 2	.278	.303	.333	.333	.364	.4	.276	.333	.421	.48	.522	.571	.273	.3	.333
Efficient	A			A			A			A			A		
ERC pred.			C	A				B		A					C
F&S pred.	A					C			C	A					C
Maximin	A					C	A					C	A	B	C
Choices (abs.)	26	2	2	12	5	13	21	8	1	8	6	16	18	2	10
Choices (%)	86.7	6.7	6.7	40	16.7	43.3	70	26.7	3.3	26.7	20	53.3	60	6.7	33.3

Table 1: Allocations (in DM), predictions by B&O and F&S, maximin and efficient allocations, and decisions for 5 of the 10 games in E&S. Person 2 is the dictator in all treatments. Our initial two treatments were very similar to Ex and Fx, but with less pronounced differences in payoffs and yielded virtually identical results.

of subjects (60%) maximize efficiency and only 33.3% choose in line with inequality aversion (see Table 1, column P). The choices in P are consistent with C&S as disadvantageous inequality is reduced by lowering the payoff of the high-income subject substantially while increasing the payoff of the intermediate-income person. Alternatively, this behavior can also be captured by a generalized quasi-maximin model where the ranking of payoffs has direct influence by putting a higher weight on other subjects' payoffs the lower they rank in the distribution.[21] We discuss such a model in Engelmann and Strobel (2007).

Overall, according to a conditional logit analysis, being in line with maximin preferences or efficiency concerns significantly increases the probability of an allocation to be chosen while inequality aversion does not add significant explanatory power. The quasi-maximin model does relatively well and the choices that it cannot capture can be captured by generalizing it to a non-linear version or to putting higher weights on relatively poorer subjects in general, not only on the poorest.[22]

While in E&S the quasi-maximin model needed to be generalized only in order to rationalize relatively small shares of the data, it becomes more apparent in two 4-player dictator games by Cox and Sadiraj (2006) that the exclusive role of the minimal payoff is too crude a simplification. In these experiments either the minimal payoff or the total payoff is held constant across allocations and satisfying quasi-maximin preferences comes at high costs for the second poorest person. Only a small minority chooses in line with quasi-maximin preferences. Bolton and Ockenfels (2006) find similar results in a 6-person dictator game.

[21] The weight the dictator would have to assign to the intermediate-payoff person would have to be at least three times the weight assigned to the highest-payoff person in this game for the 33% of dictators who chose C.

[22] Note that since the dictator's payoff is constant in most of the treatments of E&S, the choices in line with efficiency concerns are also consistent with lexicographic preferences as suggested by Fisman, Kariv, and Markovits (2007). The treatments with small effects on the dictator's payoffs, however, show also only small effects on the distribution of choices, suggesting that at least strict lexicographic preferences are not a major factor.

Kamas and Preston (2006) study individual behavior across a set of ten three-player dictator games of the type in E&S. They find that about two thirds of subjects are consistent across all choices with either selfish (13.5%), inequality averse (27.1%) or quasi-maximin (24.6%) preferences. There is a caveat, however, concerning the consistency with F&S preferences: about three quarters of the subjects who are generally consistent with F&S across games require $\beta < a$ in some games and $\alpha < \beta$ in others. Thus even if we relax the $\beta < \alpha$ constraint, very few people are actually consistent with a specific F&S utility function, even in a broad sense as they are not even consistent with the whole class of either $\beta < \alpha$ or $\alpha < \beta$ F&S utility functions.[23] Similarly, the subjects consistent with quasi-maximin follow efficiency maximization in some games, but maximin preferences in other games, though given the different trade-offs between these motives, such a pattern can in principle be consistent with C&R.

Consistent with, e.g., Fehr, Naef, and Schmidt (2006), Kamas and Preston find that women are more inequality averse and less efficiency minded than men.[24] Furthermore, they show that the majority of subjects among those who can be classified (58.5%) choose at least once consistent with compassion, i.e. concern for the worse-off even if this increases inequality and decreases their own payoff as well as the total payoff.[25] They also find an effect of the field of study similar to the one identified by Fehr, Naef, and Schmidt (2006).[26] Finally, subjects react

[23] In effect, they hence behave consistently as if they are inequality averse, but their degree of aversion to advantageous relative to disadvantageous inequality is not stable across decisions. Depending on the degree of inequality or the costs, they behave in one type of situations as if they are more concerned with advantageous inequality and in others as if they are more concerned with disadvantageous inequality.

[24] The difference is quite dramatic: among the women, 16.5% are consistent with quasi-maximin, but 37.8% with inequality aversion (allowing for the β/α ratio to vary across games) and 11% with selfishness, for men the numbers are 37.5% quasi-maximin, 10% inequality averse, and 17.5% selfish.

[25] A compassionate choice in their framework is effectively one where the β component of F&S dominates the α component or where maximin preferences dominate efficiency concerns.

[26] Business majors are more frequently selfish (16.9%) than economics (12%) or other majors (11.7%). Both business (16.9%) and economics majors (20%) are less frequently classified as inequality averse than others (35.1%)

in the expected way to changes in the price of affecting others.

In Engelmann and Strobel (2005), we study games similar to E&S, conducted via the Internet. Most subjects play either ten three-player games or eight five-player games. The three-player games are designed to isolate individual motives. We find extremely little support for competitiveness or B&O, some support for aversion towards disadvantageous inequality and efficiency concerns and strong support for maximin preferences.[27] The five-player games suggest as the four-player games of Cox and Sadiraj (2006) that quasi-maximin preferences are a too crude simplification because choices are less frequently in line with quasi-maximin preferences if this comes at relatively high costs to the second poorest person. Finally, we find a high degree of heterogeneity and less consistency than Karmas and Preston (2006). For a more detailed discussion, see also Engelmann and Strobel (2007).

Fisman, Kariv, and Markovits (2007) also extend the approach in Andreoni and Miller (2002) to three-player games (with linear budget sets). Each player is confronted with a large number of games, where the costs of giving to the other players are varied. As in the two-player games, most subjects behave (at least almost) as if they are maximizing a well-behaved utility function and there is a lot of heterogeneity. Interestingly, dictators give only marginally more to two recipients in total than to one recipient in the two-player games, while both giving almost nothing and giving more than half in total occur more frequently in the three-player games than the two-player games. More players are classified as perfectly selfish than in the two player case (36.9% vs. 26.3%). While among 65 subjects only 3 are pure efficiency maximizers (giving

but business (28.2%) and in particular economics majors (36%) are more frequently consistent with quasi-maximin than others (19.8%). According to probit analyses, however, only the decrease in the probability for being inequality averse for the business major is (weakly) significant. The above differences according to the major are are apparently primarily driven by gender effects, since the economics majors were predominantly male.

[27] In three-player games, one cannot isolate aversion towards advantageous inequality, since it always coincides with maximin preferences or with efficiency concerns. Comparisons across games do not suggest a major role of this motive, however.

the same weight to own and others' payoffs) and only one expresses pure maximin preferences, estimating utility functions indicates that a clear majority of subjects prefers increasing the total payoff over reducing inequality (both between self and others or between others). Interestingly, even though most subjects show at least some bias in their favor, there is a strong correlation between the trade-offs that subjects make between efficiency and equality when considering allocations between themselves and others on the one hand and among others on the other hand. Thus, dictators are, for example, not substantially more concerned with inequality to their own disadvantage than with inequality between others.

Stahl and Haruvy (2006) provide a systematic study of the effect of the number of recipients n and the factor with which the part of the pie allocated to the recipients are multiplied, m, before this pie is split between recipients (i.e. each recipient receives (m/n) times the amount not kept by the dictator). n varies between 1 and 23 and $m = 1, 2$, or n, with corresponding total pie size of $M = \$80, \$40$ or $\$20$. In the first treatment, the dictator is chosen randomly after making the choice (as in E&S). For constant $m = 1$ or 2, the median share of the pie kept decreases in n, while for $m = n$, the median share kept is constant at 1/2. This is not inconsistent with B&O, F&S and C&R, but requires that preferences are strongly non-selfish. Achieving an egalitarian (and hence also a maximin) distribution requires this pattern, but at the same time, it is becoming more expensive. Thus with increasing n more dictators should revert to the selfish choice. This happens only to a minor degree (the median is generally close to the egalitarian distribution, but for higher n is somewhat higher). This suggests overall that players are either strongly inequality averse or that they have strong maximin preferences (which dominate efficiency concerns). The decreasing share kept for constant m is, however, consistent with C&S, without requiring extremely non-selfish preferences (distributing the same amount to more but poorer people increases the utility more),[28] but the share kept should also

[28] While the other models predict here that fewer dictators will give, but those who give will give more, C&S would suggest that all dictators give weakly more. In the notation of Stahl and Haruvy, $\beta(n)$ is increasing in

be decreasing in n for $m = n$.

The surprisingly small average share kept appears to be driven by the fact that a player's own choice was relevant only with relatively small probability (because only one player was chosen as dictator ex-post and players made choices for 15 games, but only one game was chosen ex-post for payoffs.) Thus as Stahl and Haruvy argue, obtaining the "warm glow" of choosing the egalitarian distribution has low expected cost. Alternatively, the ex-post selection of the dictator increases the empathy with the recipients, since the dictator could end up being a recipient himself.[29] These explanations are supported by a control experiment with $n = 5, m = 1, M = \$20$ and a pre-assigned dictator, where 83% of dictators keep at least 3/4 of the pie. In a further control experiment with $n = 2, m = 1, M = \$10$ dictators keep less (in particular, about a quarter of dictators choose nearly the equal split, keeping only about a third of the pie). The difference between these two treatments is consistent with F&S, B&O and C&R, since obtaining equality or increasing the minimal payoff is cheaper with $n = 2$ than with $n = 5$. For the given parameters, C&S, by contrast would predict (weakly) more money to be given away for $n = 5$ and the same share to choose the equal split, which is not supported. None of the models, however, predict the substantially lower rate of giving in these treatments compared to the first treatment since the random ex-post choice of the payoff-relevant game and the dictator do not enter the utility

n in C&S, consistent with their observation for constant m. The underlying reason is that because the utility function in C&S is concave in all recipients' as well as the dictator's payoff, the marginal utility from increasing l recipients' payoffs by $\frac{\Delta Y}{l}$ when their payoff is $\frac{Y}{l}$ is higher than that of increasing $k < l$ recipients' payoff by $\frac{\Delta Y}{k}$ when they have $\frac{Y}{k}$. In both these cases, the dictator would have $M - Y$. Hence if giving away Y is optimal for $n = k$, the optimal amount given away would be higher for $n = l$.

[29] Such a warm glow effect is unlikely to matter in E&S. In E&S the (ex-post) dictator has a constant payoff, hence the costs of any choice are zero. Furthermore, there is no clear fair distribution that would give a warm glow. The point of E&S is just to find out which allocation the players consider "fair" and hence able to generate a warm glow by making this warm glow available for free. The ex-post allocation of dictators does not make this any cheaper. Increased empathy could, however, bias the results in favour of C&R, but control treatments with pre-assigned roles found only a weak effect in this direction.

function.

A final treatment in Stahl and Haruvy uses only one game with $n = 5, m = 1, M = \$75$ and ex-post selection of the dictator. This leads to substantially higher giving than in the first control treatment (which suggests that empathy rather than warm glow matters, since the warm glow has high expected costs in this treatment). The amount kept is, however, substantially higher than in the first treatment, suggesting that the increased empathy due to the ex-post choice of dictators does not fully explain the high share of egalitarian choices in the first treatment and that warm-glow effects matter here as well. The difference between the last treatment and the first control treatment can in principle be captured by B&O, but only if we assume that the marginal utility of own payoff is sharply decreasing.[30] It is also consistent with C&S if marginal utility from own payoff is decreasing relatively sharply.

In contrast to the relatively high degree of dictator giving in large groups in the experiments by Stahl and Haruvy (2006), Rutström and Williams (2000) find almost perfectly selfish behavior in games of 12 players with production and a random dictator. According to their performance, players are assigned to four groups of three. Players choose (with one randomly chosen player's choice being implemented) between four distributions of the total payoff where in the most unequal available distribution the groups obtain 40%, 30%, 20%, and 10% of the total earnings, respectively, whereas payoffs are equal in the other extreme. All except one participant make the perfectly selfish choice. This suggests, in contrast to Stahl and Haruvy (2006) that dictator giving reduces substantially in large groups. Note that redistribution is particularly cheap for players in the second income group, because at a cost of only one sixth of their total payoff they completely eliminate both substantial advantageous and disadvantageous inequality and increase the minimum payoff by 150%. Nevertheless, only one player chooses to redistribute.

[30] In the last treatment, the payoff is higher by a factor of about 3.75. Hence the cost of bringing the dictator's own share of the total pie by δ closer to the equal share is also 3.75 times higher. The dictator will hence only give away a higher share if his marginal utility of own payoff decreases by a factor of 3.75 if his own payoff increases by a factor of 3.75, which implies that the degree of concavity has to be larger than that of $\ln x$.

These results are thus in stark contrast to any high relevance of distributional preferences as suggested by any of the models.[31]

Cason and Mui (1997) compare behavior in standard two-player dictator games with that of the same subjects in a game where two dictators split a pie of double the size between themselves and two recipients, with equal shares for both dictators and for both recipients. They find that teams give more, which they find best to be explained by social comparison. This behavior is, however, also consistent with C&S since a dictator, by demanding less now also re-distributes between the second dictator and the second recipient, which he prefers due to the concavity of his utility function. In contrast, C&R and B&O predict that the decision should be the same since the efficiency is not affected and the trade-off between the dictator's and the minimal payoff or the dictator's payoff and his share of the total payoff are not affected. F&S would even predict that teams give less since now there are three other players but only two recipients and hence giving \$1 reduces the utility loss due to the advantageous inequality by $\$\frac{4}{3}\beta$ instead of $\$2\beta$. The treatment effects are, however, rather weak and hence do not provide strong evidence in favor of C&S. In particular, if two dictators give the same in the standard dictator game, they always give the same as a team.

Johnson, Rutström, and George (2006) study behavior in six-player games with a random dictator. They elicit players' willingness to pay for a perfectly equal distribution compared to a distribution that is derived from a previous common resource game. The dictator's as well as the total payoff are held constant across the two allocations and hence the data does not allow inferences concerning the relative performance of the various models (as under this condition they would all say that dictators should prefer the equal distribution and pay more the

[31] Rutström and Williams (2000) also run a treatment without production and a single group of 38 subjects where half have an initial endowment of \$40 and the other half \$0. A random dictator can choose between four levels of redistribution. In this treatment, 33 subjects make the most selfish choice. The slightly lower share of selfish choices is consistent with the result of Cherry, Frykblom, and Shogren (2002) that earned incomes increase selfishness in dictator games.

more unequal the alternative distribution), but only on the relative importance of distributional preferences and reciprocity.

Brañas-Garza (2006) studies dictator games with three recipients. The recipients are from poor countries and Brañas-Garza compares three treatments. In the first, no information is given concerning the recipients, in the second, dictators know that recipients are poor, while in the third in addition they are informed that the donation will be made in the form of medicine instead of money.[32] Average donations increase from less than 9.5% of the total share of 15 Euros in the first treatment to 61.6% in the second treatment and 82.3% (and 86.2% with real payoffs) in the third. The difference between the first and second treatments is consistent with dictators having maximin preferences with respect to total income (or C&S). The further increase of donations in the third treatment is hard to reconcile with any of the models. Plausibly, dictators assume that a larger share of the donation will reach the recipients in the medicine treatment and hence the result of higher giving would then be in line with maximin preferences or inequality aversion applied to the total income.

Within the relatively small set of multi-player dictator games, there has not yet been much room for robustness tests, but those that have been conducted point again at a relatively high sensitivity to procedural details, subject pools and specifics of the games in question.

Fehr, Naef, and Schmidt (2006) present results of replications of two of the games in E&S. They find strong subject pool effects. While economics students in their sample decide in favor of

[32] More precisely, only the third treatment was conducted with real money, and independently all three treatments were conducted with hypothetical payoffs and within subjects. While there were no significant differences between the third treatment in the real payoffs and hypothetical payoffs conditions (dictators even give slightly more with real payoffs), the treatment comparisons hence rest on the hypothetical payoffs sessions. The results for the first treatment without information are in line with previous results. This is, however, true only after some creative treatment of the data. The author excludes subjects who donate 10 or 15 Euros in total in the first treatment from the analysis since donations are cheap talk in the hypothetical treatments. Including these 28% of subjects still leaves substantial and significant differences among treatments, however.

the efficiency maximizing allocation even more frequently than in E&S,[33] other subjects choose the inequality minimizing allocation significantly more often. Hence for non-economists, the importance of efficiency concerns might be lower than the results in E&S have suggested. On the other hand, in Charness and Rabin (2002) the sessions that were run at Berkeley did not employ economics students and strongly support the quasi-maximin model. So it appears that there are subject pool effects, but they are not consistent and strong enough to conclude that efficiency concerns are of minor importance for non-economists. This is further discussed in Engelmann and Strobel (2006, 2007).

Fehr and Schmidt (2004) present results of an experiment where the distribution games are preceded by an ultimatum game in order to trigger strategic considerations. They report a significant reduction in the share of efficiency maximizing choices and conclude that efficiency concerns might play less of a role in strategic games. Since an ultimatum game might equally well prime subjects for equality concerns rather than putting them into a strategic context, von der Twer (2005) tried to replicate their results by letting a similar distribution game be preceded by the ultimatum game as well as other strategic games. In particular he investigated the influence of a preceding auction (possibly priming subjects for competitiveness) and an asymmetric prisoners dilemma (possibly priming subjects for efficiency). He could not replicate the results of Fehr and Schmidt (2004). Letting the distribution game be preceded by any of the games even slightly, but insignificantly, increases the share of efficiency maximizing choices, with no differences between the games.[34] Thus it appears that attempts to prime subjects in

[33] This might be because our students were first-year students in the second or third week of classes and hence only self-selection can have led to higher concerns for efficiency, whereas the subjects in Fehr, Naef, and Schmidt (2006) have been more advanced and hence been exposed to additional efficiency indoctrination.

[34] Interestingly, the difference is exclusively due to the male participants. Restricting the analysis to these, the hypothesis that the preceding prisoner's dilemma leads to more choices in line with efficiency finds support ($p = 0.04$, Fischer's exact test). Von der Twer also confirms the gender differences that Fehr and Schmidt (2004) report. Across treatments, 49% of women chose the efficient allocation and 74% of men.

the distribution games for different motives or create a strategic context by letting them play another game first yields no robust results. It might have an effect in some instances but does not in others and we do not know enough to understand the differences.[35]

To collect more data, some dicatator experiments are run with role uncertainty. Each participant in the experiment has to decide in the role of the dictator. Only later subjects get to know whether their decision is relevant (i.e. they are chosen as dictators). In E&S we have also tested our results for robustness with respect to the role uncertainty method we employed. For two treatments, we ran additional experiments where the roles were pre-assigned. In both treatments, choices for the efficient allocation decreased by 1/6 (from 60 to 50% and 40 to 33%, respectively). While these differences are insignificant, they point at the possibility that the role uncertainty might increase the concerns for other participants and hence the desire to maximize the total payoff.[36]

A fundamental limitation of all pure distributional models is uncovered in a three-player dictator game by Karni, Salmon, and Sopher (2001). Dictators do not choose an allocation, but the distribution of probabilities among three players to win a fixed pie ($15). Although each resulting allocation is necessarily unequal (and similarly efficiency and minimal payoff cannot be affected), they find that many subjects prefer a more equal distribution of probabilities.[37] This indicates that fair procedures can play similar roles as fair allocations, as Bolton, Brandts, and Ockenfels (2005) argue.

In games where subjects vote upon an allocation, beliefs about other subjects' choices mat-

[35] The robustness of such an effect is questionable since it is unclear how long the effect of the preceding strategic game should last. If there is an effect of an immediately preceding game, there might still be one after 10 minutes, an hour or a day and any cut-off time appears to be arbitrary.

[36] Charness and Rabin (2005), however, find no evidence for an effect of the similar role-reversal method they used in Charness and Rabin (2002).

[37] Note that the expected inequality is constant, but choosing more equal winning probabilities implies less inequality in terms of expected payoffs.

ter, but at least in sufficiently simple voting games, reciprocity should not be an issue and strategic voting might be of minor importance. Hence simple voting games can also shed light on distributional preferences, as they can point to roles of procedures. Bolton and Ockenfels (2006) have studied three-person games with majority voting about the allocation. They find that subjects vote more frequently for the efficiency maximizing allocation if they vote before roles are assigned (although they vote conditional on the role they are in), indicating that they are more willing to accept an unequal distribution if the game is embedded in a fair random procedure that gives all subjects equal opportunity to end up as the high-income individual.[38] Ackert et al. (2007) study voting upon allocations in five-person groups and find evidence for maximin preferences and inequality aversion, but little evidence for efficiency concerns.

In further related experiments by Cruz-Doña and Martina (2000) subjects have to agree, under a veil of ignorance, unanimously on one of a given set of systems of distributional justice (otherwise an unknown system will be imposed). They find that all 62 groups (and in addition all five groups who were deciding according to a majority rule) agree on maximizing the average income subject to a constraint that the minimal income exceeds some floor. This is closely related to quasi-maximin preferences, while the alternatives would have been pure efficiency concerns, pure maximin preferences and the above rule with the additional constraint that the maximum income should not exceed a certain ceiling, which corresponds most closely to inequality aversion.[39] Since voting here is under a veil of ignorance, results are influenced by

[38] Bolton and Ockenfels interpret the results from their voting games that subjects are willing to pay more to satisfy inequality aversion than to maximize efficiency. They neglect, however, that the attainable gains in terms of efficiency were much lower than those in terms of equality or maximin preferences. In particular, perfect equality was always an available option, whereas only decreasing equality was possible in E&S. A perfectly equal distribution appears to have a special appeal to subjects. While there is no systematic investigation of this question in pure distribution experiments, evidence from ultimatum games (Güth, Huck, and Müller, 2001) suggests that the availability of perfect equality increases concerns for fair distributions. See Engelmann and Strobel (2006) for a further discussion of the results in Bolton and Ockenfels (2006).

[39] Participants were university students and government employees in the Philippines. The authors report that

risk concerns and hence distributional concerns do not matter exclusively. For a subsample that can reassess their preferences after the veil is lifted, the authors do find, however, a high degree of stability of choices.

Dana, Weber, and Kuang (2003) present a game where there is no dictator but in a three-player game two players have veto power. They can unilaterally enforce an equal distribution of \$5 for each player, while the third player is passive. If none of the active players chooses the equal distribution, they both get \$6, while the passive person gets \$1. Only 35% of active players choose the fair allocation, compared to 74% in a two-person dictator game where the dictator could choose between (\$5,\$5) and (\$6,\$1). This suggests that distributional preferences are also sensitive to whether the decision maker has to take all the responsibility.[40] Hence voting upon an allocation can yield substantially more selfish decisions than dictatorial choices.

An interesting design by Herreiner and Puppe (2007) permits to discriminate between inequality aversion and envy because subjects decide upon (or bargain over) the allocation of several fictitious objects that have different value for different subjects such that it is possible that a person is envious (i.e. would rather have another person's bundle of fictitious goods than his or her own) even though the distribution of payoffs is equal. While they find that envy freeness is generally dominated by payoff-comparisons, it does help to discriminate between allocations if other fairness criteria do not yield a unique prediction.

3 Concluding Remarks

As this survey of the literature on (particularly multi-player) dictator games hopefully makes clear, experimental subjects differ widely in their preferences over income distributions. Most models fail in critical tests of their predictions, some dramatically, some less so. Absent any

in similar experiments with other subject pools only 70 to 80% of groups choose the above rule.

[40] This is similar to the "complicity effect" identified by Charness and Rabin (2002). On responsibility see also Camerer (2003).

reason for reciprocity, there is some, but relatively little evidence for malevolent preferences, even towards those that are richer. Furthermore, evidence in favor of altruism suggest that for many subjects, though not all, concerns for others are stronger the less well off the others are. Finally, the relative prevalence of various behavioral motives frequently depends on the subject pool and (partly subtle) details of the experiment. Compared to other experiments, this dependence appears to be stronger rather than weaker.[41]

[41] See Engelmann and Strobel (2007) for a more detailed discussion of the evidence.

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