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Purely Procedural Preferences
- Beyond Procedural Equity and Reciprocity -[‡]

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Abstract

We conduct experiments in which parties face a pair of two-player pie-splitting procedures. Parties submit their strategy in each, their beliefs about their opponent's choices, and are also asked whether they prefer one procedure over the other. The procedures – a yes-no game, an ultimatum game, and a dictator game – are designed such that by all existing economic preference models, whether distributive or procedural, parties should be indifferent between them. In particular, the procedures should yield the same outcomes, the same expected outcomes and carry the same information on parties' intentions. At the same time, the procedures differ in the way they distribute decision and information rights across players, and also in their complexity and efficiency. Experimentally, parties do indeed still reveal preferences over the outcome-invariant procedures at hand. To explore why this happens, we elicit individuals' simplicity and efficiency ratings of the procedures, and also the degree by which individuals invoke the equality of basic rights and liberties in their moral judgement – an ethical criterion not yet captured by any preference model. The preferences we find link to this data. We explore formalizations for such preferences.

JEL Classification: C90, C78, D02, D03, D63

Keywords: procedural preferences, equality of rights, experiment, institutional design

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1 Introduction

In some areas of life, procedures may be vitally important when they do not have even a stochastic influence on outcomes. In an election, for instance, great care is taken to grant each individual an equal opportunity to vote, to make the voting simple, and to elect a candidate in a transparent way. Yet, one may plainly refuse to acknowledge a candidate's victory, if it is learned that the election violated some of the criteria mentioned before. Notably, such a concern may be independent of any potential outcome.

This paper studies procedural properties which do not refer to the outcomes of a procedure at all: process fairness which requires that the rules of the game do not privilege any party in terms of available information or decision rights.[1] Individuals may disapprove of such privileges even if these do not assist the privileged party in the pursuit of her material ends. To test the idea, we conduct an experiment in which subjects choose between two pie-splitting procedures which all social preference models predict to induce the same material and social payoffs. In one treatment, subjects choose between a binary offer ultimatum, and a binary offer yes-no game, in another treatment between a binary offer ultimatum, and a binary offer dictator game. In all procedures, there are two efficient ways to share a pie of 6 Euros, that is, there are two proposals. The party who picks the proposal always earns weakly less than her opponent (one proposal splits the pie equally and is fair, the other favors the opponent and is generous). The opponent can express her consent or dissent differently in each procedure. In the dictator game, consent does not influence the outcome. In the yes-no game, consent implements the proposal without knowing which proposal was made; dissent implies zero payoff for both parties. In the ultimatum game, consent implements the proposal knowing which proposal was made; dissent implies again zero payoff for both parties. Subjects first make decisions in all player roles; they choose an allocation and choose to consent or dissent. Afterwards, they choose which procedure they would implement for their actual role. We also ask subjects for their beliefs in each procedure to verify empirically that subjects always choose the same action, and always believe their opponent to choose the same action for sure such that they expect identical distributions of outcomes in all procedures. Even when subjects' actual actions and beliefs therefore imply that they should be indifferent, they are still willing to pay for having the allocation determined by one procedure rather than the other. Most often, subjects prefer either a yes-no or a dictator game to a fair coin flip between either of these games, and the ultimatum game. This is our first main finding.[2]

We also study the rationale behind *the observed choices between procedures* and find that they are ethically motivated. Relying upon Jean Piaget's (1948) and Lawrence Kohlberg's (1969, 1984) work, we elicit in a non-incentivized standardized moral judgement test (Georg Lind 1978, 2000, 2008) how an individual arrives at the conclusion that some portrayed action is either right or wrong. More specifically, we elicit by which degree individuals refer to expectations about punishment or reward,

[1] See also Eliaz and Rubinstein (2014) and Arad and Rubinstein (2017) for related work.

[2] The type of procedural preference we study corresponds to Class I of procedural utility proposed by Benz and Stutzer (2003): preference from institutions per se. Yet, we do not elicit what kind of institutions/procedures subjects view as ideally fair. We merely elicit pairwise preference comparisons between two alternative procedures.

social norms, others' expectations or intentions to judge whether a course of action is right or wrong. This way, we quantify individuals' preferences over the set of ethical criteria around which economics has built preference models to date. Kohlberg's field work lists yet two other ethical criteria whose consequences have not yet been modelled in economics: the ideal that each member of society enjoy the same rights – justified either in terms of the social contract, e.g. (Rawls 1971; Binmore 1994), or by the existence of some inalienable human right. The more likely subjects invoke these two last ethical criteria in their moral judgement, the more likely they prefer the yes-no game (which distributes decision rights equally) or the ultimatum game (which proceeds transparently, granting both parties perfect information about the history of the game when they take action) over a fair coin flip between both procedures. This is our second main finding. The second result supports the conclusion that the procedural choices we observe do not reflect mistakes in decision making, or outcome-related differences between the procedures which we cannot measure.[3] The fact that we observe procedural choices which have a systematic motivation, suggests a new type of procedural preference which has not been formalized in economics as of yet. We call these preferences *purely procedural* since they are not defined in terms of procedural outcomes.

Since Thibaut and Walker's (1975) seminal contribution, an impressive body of research in psychology and – more recently, also in economics – has studied the topic of procedural fairness. From a conceptual point of view, procedural justice is best understood if contrasted with *distributive justice*. While distributive justice (Adams 1965) is concerned with unjust allocations and human reactions to these, *procedural justice* explores the fairness of the principles and measures taken to reach such allocations and how individuals react to the application of these principles.

Procedural justice is a necessary building block for economic prosperity and a stable society. A third party resolving a property rights dispute, for instance, needs legitimacy for its authority. This legitimacy springs ultimately from a shared perception between the dispute parties and outsiders about the fairness of the procedures employed (Lind 2001; Tyler 2004). Perceived procedural justice also promotes compliance by the dispute parties to the verdicts of the authority (Lind 2001). Since the seminal work of Thibaut and Walker (1975), research in psychology (Lind 2001; Tyler 2004) and experimental and behavioral economics (Falk et al. 2003; Bolton et al. 2005; Brandts et al. 2006) have come to establish, and to support these views.

Psychological and economic research into procedural justice employ different methods to strive for overlapping but different goals. Both disciplines have sought to disentangle process fairness from distributive fairness. Cropanzano and Ambrose (2001, pp. 125) state that in psychology, distributive justice is operationalized as "individuals' reactions to economic or quasi-economic allocations", and procedural justice as "individuals' reactions to the allocation of socioemotional benefits".

Economists resort to game theoretic models to clarify the difference between distributive (outcome-related) and procedural fairness. So far, the overarching principle in the procedural fairness literature has been to compare the outcomes of a procedure to the outcomes other procedures would have

[3]We opt for a simple yet conservative belief elicitation method (Schlag and Tremewan 2012, Schlag et al. 2014), conservative in that it biases beliefs which express certainty (indifference) downward to uncertain beliefs. We countercheck the accuracy of the indifference condition by controlling that also a new ethical criterion underlies subjects' choices.

generated. When the fairness value of an outcome depends on counterfactual paths of the process (or the game), then the process itself matters, not only the outcome. By exploiting this principle, a first strand of research studies whether and how individuals discriminate between fair and unfair explicit randomizations over outcomes (Karni and Safra 2002; Bolton et al. 2005; Karni et al. 2008; Trautmann 2009; Krawczyk 2011; Krawczyk and LeLec 2010; Kircher et al. 2009)[4]. The classical dilemma here is how to divide an indivisible object in a fair manner. The procedural fairness literature formulates and shows that people prefer fair coin flips over lotteries which grant parties unequal chances of winning. While these preferences are clearly not only about outcomes but also about the process, changes in the chances of winning also imply changes in expected payoffs. Thus, in comparing two procedures, the preference compares the payoff distributions which both procedures generate, after all. A second strand of research explores how kind (economically generous) an individual deems an opponent's choice of a specific process[5] compared to what she believes would have happened had the opponent chosen a different process (Rabin 1993; Blount 1995; Dufwenberg and Kirchsteiger 2004; Falk and Fischbacher 2006; Brandts et al. 2006; Sebald 2010).[6] Aldashev et al. (2010) show that psychological game theory in general can be interpreted from this perspective, although it is not customary to do so. Since kindness is measured in economic terms, also the preferences in this second strand of literature assess distributions of outcomes when judging the fairness of two procedures. Both strands have made important contributions to understanding differences in individual reactions to procedures and to advancing the optimal design of institutions and organizations. Yet, from a bird's-eye perspective and independent of their interpretation, it is evident that in both strands, individuals evaluate the fairness of a given process by their subjective expectations of the social and economic benefits which alternative processes would have generated. Therefore, both strands of research ultimately refer to the distribution of outcomes and thus stress that the rules of the game matter *because* they impact the distribution of outcomes. Similar connections between distributional and process fairness have also been admitted in psychology. Two leading figures in the field – Cropanzano and Ambrose – summarize the decades of psychological research into procedural and organizational justice (2001, pp. 119-120) concluding that:

"the procedural justice and distributive justice are more similar than is generally believed... both procedural justice perceptions and distributive justice perceptions are, in some sense, derived from individuals' expectations about outcomes."

[4]Güth and Tietz (1986) or Grimalda (2012) study equal and unequal randomizations over the roles of an ultimatum game. Formally, this translates into comparing fair and unfair lotteries over unequal outcomes (the proposer usually has a higher payoff than the responder in the ultimatum game). Proposers make higher offers when the lottery is unfair than when it is fair; responders reject higher offers when the lottery is unfair than when it is fair. These behavioural compensations are analogous to those found in (Bolton et al. 2005). Mertins and Albert (2015) find that responders who can directly affect proposers' take rate in a power-to-take game destroy the pie less often than responders who cannot affect the take rate. Formally, the power-to-take games with and without responder influence on the take-rate translate into lotteries with different expected behaviour – and hence, different expected outcomes.

[5]By 'process' we mean a 'path' in the extensive form of a game.

[6]The experimental findings of (Brandts et al. 2006) and (Albrecht and Mertins 2015) can be understood from this perspective. In (Sebald 2010) and Aldashev et al. (2010) players may explicitly randomize at their own decision nodes of the game when choosing between actions, and opponents can hold beliefs that actions were so chosen.

Thus, whether looking into economics or psychology, procedural fairness tends to be evaluated applying yardsticks for distributive fairness.

Already the early literature on democracy and its federal organization points out that procedures which grant all parties equal decision rights and equal information can become undesirably complex and hard to handle (de Tocqueville 1868, p. 276). Hence, the decision maker may need to trade off potentially conflicting properties when choosing between alternative procedures. To illustrate such trade-offs, take the following example. Individuals may prefer to grant all agents an option to (dis)agree on some proposal rather than denying one or several agents their say. Individuals may also prefer that all agents are properly informed about the proposal before they opt to agree or to disagree.[7] Incorporating these aspects into a procedure will increase agents' freedom of choice and their information rights. At the same time, the potential number of instances where an agreement cannot be found increases – as does the need for their expedient regulation. In the real world, choices of institutions tend to involve such trade-offs. Therefore, we let subjects decide between alternative procedures which are predicted to induce identical expectations and outcomes. Subjects may choose to increase the responder's freedom of choice by opting for an ultimatum rather than a yes-no game but not without foregoing the simpler (the yes-no game), or the more efficient procedure (the dictator game). To flesh out these trade-offs, decision rights (freedom of choice), information rights, procedural simplicity, and efficiency must be formally discussed and hence, measured. We explore such measures without referring to outcomes in any way, while a myriad of these measures may exist. Guided by this formal discussion, we elicit additional data on subjects' motives and show that responder choices of the yes-no and choices of the dictator game in general link to subjects' simplicity rankings and efficiency perceptions of both procedures.

Purely procedural preferences are economically and politically relevant. Survey studies suggest that fair procedures catalyze the smooth functioning of organizations and institutions. The more an institution or an organization is deemed to employ fair procedures, the higher are organizational engagement, performance, and cooperation (Tyler 2000; Sondak and Tyler 2007; De Cremer et al. 2005). Frey and Stutzer (2005) find that inhabitants of Swiss Cantons with greater democratic participatory rights are more satisfied with their lives. Thereby, life satisfaction does not only increase because participation is seen to improve the outcomes of political decision making – self-reported life satisfaction also increases in the right of proper participation itself. These surveys suggest that better insight into procedural fairness might also benefit institutional design. Economists have indeed called for more economic and behavioural research into the relatively new field of procedural fairness (Rabin

[7]How procedures allocate decision and information rights are just two examples for procedural properties individuals may care about when they do not affect procedural outcomes. Procedural fairness research in organizational psychology, for instance, enlists even more properties a procedure must comply with in order to be fair: (i) consistency (with equal opportunities as an integral subproperty), (ii) freeness from bias, (iii) accuracy in that all relevant information is available when decisions are taken, (iv) correctability, (v) representativeness (of parties' interests which is often coined as "voice"), and (vi) compliance with prevailing ethical standards (Leventhal 1976; Cropanzano and Ambrose 2001). Decision and information rights refer to (i), and (iii) but have, as mentioned before, been ultimately been defined in terms of outcomes. Sociologist Max Weber uses decision and information rights to define how much *power* a party holds. In (Weber 1921 I §16), power is about the number of opportunities to implement one's will, also against opposition. Moreover, it arises from the fact that information is kept asymmetrically to a small circle of people close to the decision maker (Weber 1921, X §3). A procedure which distributes decision and information rights equally, therefore distributes *power* equally.

1993; Rabin 2002; Konow 2003; Engelmann and Strobel 2004). Even experimental economics which has long taken intrinsic fairness concerns seriously, has only recently turned to analyze the effects of procedural aspects. To date, however, experiments on procedural preferences invariably compare procedures which induce outcome distributions with different statistical moment(s) – the preferences studied can thus be about those differences. Exceptions are Fehr et al. (2013) or Bartling et al. (2014) who show in studies on control rights and delegation that principals have intrinsic value for maintaining the power to decide and control and that reducing control or delegating decision rights to an agent has a positive welfare effect beyond what reciprocation can explain (Charness et al. 2012). We, instead, report evidence for *ethical* concerns about the *distribution* of rights across players, and a concern for procedural efficiency – parties remove their veto if they expect that it cannot change payoffs and if they can still voice their opinion without veto.

The following section describes the two-player pie-division procedures we use. Section 3 verifies that all relevant preference models and theories predict procedurally invariant outcomes within each pair of procedures – in, but also out of equilibrium. Section 4 introduces our experimental design and the experimental test used to describe individuals' moral judgement. Section 5 presents our main results, Section 6 cross-checks some aspects of cleanliness of our design. Section 7 concludes and argues that the purely procedural preferences we report may resolve controversies about other preference types.

2 Allocation procedures

We design three simple procedures which generate the same outcomes, the same expected payoffs, and the same psychological payoffs according to a variety of social preference theories. This section describes the procedures we use, the next section discusses their outcome-invariance. Let 200 units be shared among two parties. One party, the proposer (P), has more allocation power than the other, the responder (R). Two divisions of the pie are possible; a fair one, where both the proposer and the responder obtain 100 units and an unfair one where the proposer obtains 20 units and the responder 180 units. Thus, the unfair allocation favors the less powerful responder. We introduce three procedures for sharing the 200 units in either way: a mini dictator game, a mini yes-no game (Gehrig et al. 2007), and a mini ultimatum game (Güth et al. 1982).

The first procedure, a dictator game (DG), leaves the responder R no option to choose in a payoff-relevant way. Whatever proposer P chooses is implemented. In our specific setting, the responder can agree or disagree with the proposal but her choice does not affect the outcome[8]. The DG is thus a one person decision problem in a two-person environment. A second procedure, the yes-no game (YNG), grants the responder an *unconditional* opportunity to choose. P proposes either (100,100) or (20,180) and R decides whether to accept without knowing the proposal made by P. Hence, R cannot condition her decision on P's proposal. If R agrees, the proposal is implemented. If she rejects, both parties earn zero payoffs. Therefore, the yes-no game is a two-player game with each player having two options

[8]We introduce this feature to reduce the number of differences across procedures. Since all three procedures give responders a 'voice', she can always express her opinion, and her preference for a specific procedure cannot be motivated by a desire to express this opinion. In our setup, the responder's voice is not communicated to the proposer, though.

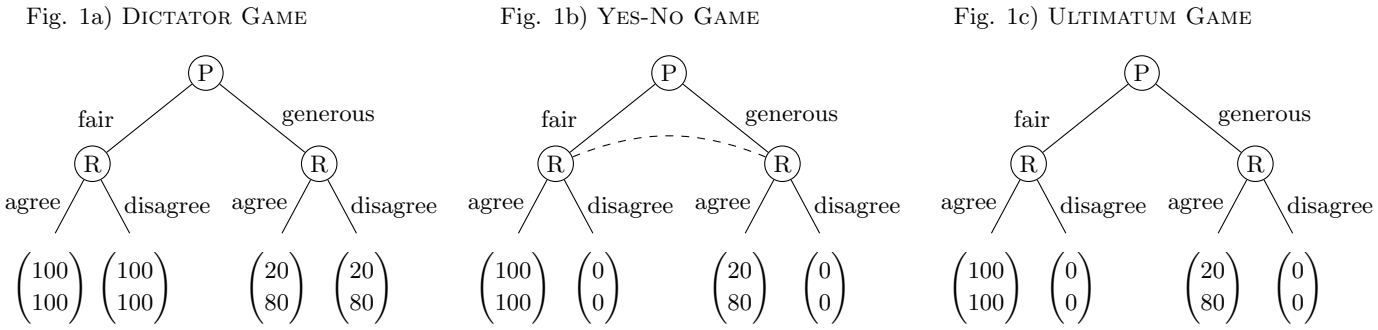

Figure 1: Illustrations of the three allocation procedures.

only. A third procedure, the ultimatum game (UG), grants the responder a *conditional* opportunity to take action. As in the yes-no game, P proposes one of the two allocations. R decides for each potential proposal whether to accept or to reject it. Again, a rejection leads to zero payoffs whereas acceptance implements the proposed sharing. Fig. 1 illustrates the three allocation procedures in extensive game form (we do not use extensive game form illustrations in the experiment, though).

We confront each subject with one pair of alternative procedures to choose from. Each subject chooses either between the yes-no game and the ultimatum game, or between the ultimatum game and the dictator game. The details of the design are explained in Section 5.

3 Predictions within procedures

In this section we verify that the games and monetary payoffs in section 2 were designed such that central preference theories predict the same equilibrium outcome, the same equilibrium behaviour, and the same equilibrium beliefs[9] in each allocation procedure – once the proposer's actions are identically labelled across games, as are the responder's. Readers who are convinced that outcomes are predicted to be identical across all procedures may skip this section at first reading and turn back later to also check the off-equilibrium cases. We cover self-interest, inequity-aversion, altruism, various models of reciprocity, guilt-aversion, and various procedural fairness models. Some reciprocity models only predict identical equilibrium behaviour if the fair and generous offers in the ultimatum game are accepted with equal likelihood.[10] In order to ensure that this additional assumption holds, we elicit subjects' beliefs, and begin our analysis by looking only at participants who satisfy these assumptions. Table 1 summarizes the predictions and illustrates that existing theories have a hard time providing differential predictions across our allocation procedures. If behaviour is identical across procedures, then also the payoff distributions across procedures must be identical. Therefore, participants should be indifferent across the two procedures in each pair.

Experimentally, however, individuals may yet not always comply with (a) the predicted *equilibrium behaviour*, and (b) the predicted *equilibrium beliefs*. For these cases, we show that subjects are still indifferent between procedures *if* they choose the same pure strategy action, and expect their opponent

[9]Throughout, the solution concepts applied in table 1 postulate sequential rationality.

[10]This is required such that the ultimatum and the yes-no game generate the same outcome distribution, for instance.

to choose the same pure strategy actions in each of the two procedures per pair.[11] Table 2 reviews the conditions which – given this assumption – ensure that on and off equilibrium, all procedures generate distributions of outcomes with identical statistical moments under existing preference models. The summary predictions in tables 1 and 2 nicely illustrate that economic approaches to other regarding preferences and procedural fairness – just as their non-mathematical counterparts in psychology (Cropanzano and Ambrose 2001) – are based on *distributive* fairness: as soon as procedures produce identical distributions of outcomes, players must be indifferent between them.

Thus, if we still observe preferences for one allocation procedure over another, this would suggest a new type of procedural preference. In order to observe such novel preferences, (i) the procedures must vary in aspects which are meaningful to the subject, and (ii) behaviour and beliefs must be invariant in each of the two procedures per pair. This is why (a) we focus on mini-games with only a fair and a generous offer: they are simple enough to theoretically produce the same distribution of outcomes but still differ in purely procedural criteria, see section 4. This is why (b) we elicit behaviour and beliefs in each procedure: to control for *actually* identical pure strategy actions and beliefs, the condition for which all preference models predict identical distributions of outcomes for all procedures. This is why (c) we let each player make choices in both roles such that she exerts maximal cognitive effort to put herself into the shoes of her opponent: to ensure she understands fair proposals are likely, both offers are acceptable, and to ensure she submits informed first order beliefs.

To begin with, section 6.2 studies purely procedural preferences of subjects who *actually* fulfill *all* assumptions which theory requires to predict identical distributions of outcomes across procedures. Section 6.3 shows that these subjects seem to apply an ethical criterion (Kohlberg 1984; Lind 2002) to identify their preferred procedure, and that this criterion is quite distinct from those upon which existing preference models build. Section 7.2 exploits this characteristic ethical criterion to statistically instrument *purely procedural preferences* on the entire set of subjects who do not fulfill the restrictive indifference conditions derived here. Section 7.4 discusses the validity of the instrument. Now, let us provide intuitive arguments why existing models predict that subjects are indifferent between procedures, given the two assumptions outlined above, before section 4 introduces a model of *purely procedural preferences*.

3.1 The explanatory power of models

3.1.1 Distributive theories

Self-interested opportunism. If R is opportunistic, she only cares about her share of the 200 units of

[11] To see why, note that the only difference between the three procedures is that, *off equilibrium*, the responder might update her beliefs about the proposer's kindness in the ultimatum game whereas this is not possible in the yes-no game (and irrelevant in the dictator game). This difference vanishes for pure strategy beliefs: a pure strategy belief implies that responders do not expect to update their beliefs in any procedure because they expect the fair (or generous) offer *for sure*. *Off-equilibrium*, we must for all psychological game theory models additionally assume that a player's second order beliefs coincide with her actions. The remaining part of the indifference condition, i.e. that players must choose pure strategy actions, accessorily implies that across *all* games – in particular the ultimatum game – the responder accepts both offers *with equal likelihood* under which condition all reciprocal models predict a unique equilibrium.

[12] See appendix E.

			BEHAVIOURAL PREDICTIONS						
			make fair proposal DG	make fair proposal YNG	make fair proposal UG	accept in YNG	accept (100,100) UG	accept (20,180) UG	**same outcomes across procedures**
SOCIAL PREFERENCE MODELS	Outcome based	Self Interest	+	+	+	+	+	+ off eq.path	+
		Inequity Aversion	+	+	+	+	+	+ off eq.path	+
		Altruism	depends on degree of altruism	depends on degree of altruism	depends on degree of altruism	+	+	+	+
	Reciprocity based (PGT)	Falk & Fischbacher (2006)	+	+	+	+	+	+ off eq.path	+
		Dufwenberg& Kirchsteiger (2004)[12]	+	+	+	+	+	+ off eq.path	+
	Guilt based	Battigalli & Dufwenberg (2007)	depends on sensitivity to guilt	depends on sensitivity to guilt	depends on sensitivity to guilt	+	+	+	+
PROCEDURAL FAIRNESS MODELS	Inequity based	e.g. Bolton et al. (2005)	+	+	+	+	+	+	+
	Reciprocity based	Sebald (2010)	+	+	+	+	+	+	+

Table 1: Predictions of central social preference theories, if all offers are accepted with equal likelihood in all games (as implied by pure strategy actions and beliefs).

pie and never rejects any proposal. Anticipating R's opportunism, P selects the allocation (100,100) in all three games and R accepts whenever she has the opportunity.[13] The expected payoff in each procedure is 100 for each player. Self-interested players are therefore indifferent between all three allocation procedures. *Self-interested parties who violate these predictions are still procedurally indifferent if their actual behaviour, and actual beliefs are the same in all procedures.*

Inequity aversion. Models of allocative fairness (Bolton 1991; Bolton and Ockenfels 2000; Fehr and Schmidt 1999) assume that a player's utility does not only increase in a player's private payoff, but also in the equality of payoffs. Fehr and Schmidt (1999) assume that each player's own payoff and her payoff from (in)equality are additively separable. That is, if a player earns x units and her opponent earns y units, then the player's utility is $x - a \times max\{(y-x), 0\} - b \times max\{(x-y), 0\}$ where a and b denote non-negative individual parameters. Further, the model assumes that players suffer more from disadvantageous than from advantageous inequality, that is, $a \geq b$. A player strictly prefers the allocation $(0,0)$ to (x,y) with favourable inequality $x > y$ iff $b > \frac{x}{(x-y)}$. A player strictly

[13] These strategies are sequentially rational (Selten 1967).

prefers $(0,0)$ to the allocation (x,y) with unfavourable inequality $x < y$ iff $a > \frac{x}{(y-x)}$. For our two allocations ($x = 100$, $y = 100$) and ($x = 180$, $y = 20$), inequity averse responder with $b < 1$ would accept all proposals. If so, inequity-averse proposers maximize their utility by proposing (100,100). The expected payoff is 100 for each player in each procedure. Thus, neither player should prefer one procedure over another. *Inequity-averse parties who for some reason, violate these predictions are still procedurally indifferent if their actual behaviour, and their actual beliefs are the same in all procedures.* An inequity averse individual invokes a social reference point about the distribution of material payoffs (Fehr and Schmidt, pp. 820-821, Bolton and Ockenfels, p. 172), or put differently, a social norm about the equality of outcomes (Bolton et al. 2005, p. 1068) to derive the right course of action.

3.1.2 Psychological game theory

As mentioned before, theory predicts identical distributions of outcomes and indifference across procedures, *only if* players choose identical pure strategies, and expect their opponent to do so. *Given identical pure strategy actions and pure strategy beliefs*, (Dufwenberg and Kirchsteiger 2004) and (Falk and Fischbacher 2006) yield a unique equilibrium prediction that the fair proposal is made and accepted. Let us first focus on Dufwenberg and Kirchsteiger (2004). To see why this is an equilibrium, notice that the only efficient responder strategy is to accept all proposals. Accepting is therefore neutral (Dufwenberg and Kirchsteiger, p. 276), the proposer should hence not be generous, but rather choose the fair proposal. This is clearly unkind, and we have an equilibrium only if the responder's (unobservable) intrinsic reciprocity type is not too large. To see why this equilibrium is unique if we assume *identical pure strategies* and *identical pure strategy beliefs* across procedures, imagine the responder were to adopt the opposite strategy in equilibrium, and were to *reject* both offers with probability one (for the other cases, see appendix E.2). In this case, both proposals would lead to the same zero payoff, and would therefore be neutral (neither kind nor unkind). Thus only monetary payoff would matter for the responder. Since it is not optimal to leave money on the table, the responder would have to *accept* both proposals which contradicts our point of departure. We therefore see that accepting all offers with certainty and proposing the equal split are the only equilibrium strategies under our additional assumptions which ensure indifference between procedures. In (Falk and Fischbacher 2006), kindness is judged with reference to inequity aversion: any intention to generate an outcome which makes the opponent weakly better off than the player is considered weakly kind, any intention to make the opponent worse off, unkind. In our setup, there is no payoff allocation in which the responder earns strictly less than the proposer; since the proposer cannot be unkind, the responder must accept all offers, and the proposer makes the fair offer. *Reciprocal parties who for some reason, violate these predictions, are still procedurally indifferent, if their actual pure strategies and their actual pure strategy beliefs are the same in all procedures*, see footnote 11. In terms of ethical criteria, reciprocal models assume that individuals refer to others' *intentions* when judging whether an action is right or wrong.

Guilt aversion (Battigalli and Dufwenberg 2007; Charness and Dufwenberg 2006) is yet another other-regarding concern in psychological game theory. Therein, guilt matters only if a player harms

				PLAYERS ARE PROCEDURALLY INDIFFERENT...	
				...in perfect equilibrium ...if both offers are equally likely to be accepted.	...off equilibrium... ...if they choose analogous pure strategies AND hold pure strategy first order beliefs in all games.[14]
SOCIAL PREFERENCE MODELS	OUTCOMES		Self interest	+	+
			Inequity Aversion	+	+
			Altruism	+	+
	INTENTIONS	Reciprocity	Falk & Fischbacher (2006)	+	+
			Dufwenberg & Kirchsteiger (2004)	+	+
		Other	Guilt	+	+
PROCEDURAL PREFERENCE MODELS		Inequity-based	Bolton et al. (2005) Trautmann (2009) Krawczyk (2011)	+	+
		Reciprocity-based	Sebald (2010)	+	+

Table 2: When are players procedurally indifferent in, and off equilibrium?

the other and lets her down. Suppose a responder expects a proposer to expect rejection: if so, the responder does not harm the proposer by accepting instead, and her guilt payoff is always zero. In this case, rational self-interest requires that she always accepts. Suppose a responder expects a proposer to expect acceptance with some probability: if so, rejecting would harm the proposer, the responder would feel guilt, and her guilt payoff would strengten the incentive to accept. In summary, responders always accept and their guilt payoff is zero. A very guilt averse proposer who very much expects the responder to expect a generous offer might indeed offer (20,180). However, as long as *actual* actions and *actual* beliefs are the same for two procedures, guilt averse parties are indifferent between them. In terms of ethical criteria, guilt averse individuals invoke others' expectations (Battigalli and Dufwenberg 2007, p. 170) or social norms (Bicchieri 2006, López-Pérez 2008) to derive the right course of action.

3.1.3 Economic models of procedural fairness

Recently, *economic approaches to procedural fairness* have been developed, some building upon in-

[14] As mentioned earlier, we must in addition assume that second order beliefs coincide with a player's own actions.

equity aversion (Bolton et al. 2005; Krawczyk 2011; Trautmann 2009), others upon reciprocity (Sebald 2010)[15]. Even these approaches predict indifference between the two pie-sharing games in each of the two pairs of games. Bolton and Ockenfels (2005) formulate that individuals are inequity-averse over expected payoffs and prefer lotteries with similar expected payoffs for both players to lotteries with dissimilar expected payoffs. Applying this – or the other two inequity based models of procedural preferences (Trautmann 2009; Krawczyk 2011) – to our setting, we find that participants who hold the same beliefs in two procedures will also expect the same payoffs in each procedure and therefore, be indifferent between the procedures.

Sebald (2010) allows the preference to be influenced by the kindness of a procedure, that is, the kindness the opponent would have shown had she chosen that procedure. In Sebald's model – contrary to Dufwenberg and Kirchsteiger (2004) – the responder does not update her beliefs about the proposer's choice probabilities in the ultimatum game when she learns the proposal that has been made (if both proposals have a positive probability ex ante). Thus, if a player has procedurally invariant actions and beliefs, she is predicted to be indifferent between the mini yes-no game and the mini ultimatum game. Similarly, if each proposal is accepted for sure in the ultimatum game, the responder is neither kind nor unkind towards the proposer (recall that accepting is the only efficient strategy) and the psychological payoffs are always zero in the dictator, and the ultimatum game. Thus, if each proposal is proposed with equal probability in these games, players are indifferent.

4 Purely Procedural Preferences

Suppose now that a player believes that all games do indeed lead with certainty to the same allocation and that hence, all preference models above predict indifference – both in, and off equilibrium. Suppose that moreover, none of the ethical criteria upon which existing preference models build are at play. Which type of preferences could a player still hold? In this paper, we set out to provide evidence that people care about procedural properties which do not refer to payoffs or outcomes at all. To make the argument concrete, this section sketches ideas how such models could look like and matter in the context of our paper. It is important to keep in mind that our experiment does not intend to formally test these potential dimensions of purely procedural preferences.

First, we pursue the idea that people might care how *rights* are distributed across parties. One could for instance, express a player's *decision rights* in a procedure by the cardinality of her strategy set – or analogously, the cardinality of her action sets summed over all instances where she is called upon to play.[16] Giving a player decision rights amounts to giving her options between which she may choose. At the same time, a new option can only add to the player's decision rights if it is *diverse* (Pattanaik and Xu 1990; Sen 1991; Foster 2011) from all options the player already has. One way of going about this is to say that an option adds to diversity if, by some preference of the player,

[15]Sebald's model is based upon the reciprocity model of Dufwenberg and Kirchsteiger (2004).

[16]We use the notion of an extensive form game strategy just for formal simplicity. An individual may rather think in terms of the options laid out before her at a given decision node (her action sets). For this case, one can use the sum cardinality over a player's action sets across all information sets of this player which leads to the exact same conclusions.

it can be preferred over all previously available options. Adding more than one inefficient allocation to a player's choice set when every inefficient allocation yields her zero utility, would potentially not expand that player's freedom of choice, for instance. Adding, however, only options which do, one obtains a player's set of effective opportunities (Sugden 1998). Since we do not know players' complete set of preferences, and can therefore not know whether an additional option expands her freedom of choice, we discuss the distribution of decision rights for the simplest case: selfish players. For example, one can recursively construct a selfish proposer's set of effective opportunities as in (Sugden 1998), starting from a reduced set of options which only includes her least preferred option, the generous split (20,180). Adding option (100,100) expands her effective set of opportunities since it yields more payoff for the self and can therefore be preferred over the generous split. We see that, for a self-interested individual, the cardinality of the effective opportunity set equals the number of options which we count in the form of strategies. The cardinality of the strategy set equals two for the proposer in all three allocation procedures from section 2. For the responder, this cardinality equals one (or zero) in the dictator game, two in the yes-no, and four in the ultimatum game.

We can now use this notion to compare the distribution of decision rights across individuals much the same way as we compare material payoffs in the inequity aversion models: there is inequality in decision rights in the dictator and the ultimatum game, yet decision rights are equally distributed in the yes-no game. It is easy to imagine that this inequality is felt more strongly if a player has lesser rights than her opponent (disadvantageous inequality), than if it is the opponent who has lesser rights (advantageous inequality for the player). We pursue here the idea that the aversion against inequity of rights is driven by a democratic ideal that all individuals enjoy *the same* civic rights: the same freedom of choice, the same freedom to look after their own self-interest and that therefore, they dislike both advantageous and disadvantageous inequality. More formally, for players $i = 1, 2$, let S_i be the opportunity set of player i in the two-player extensive form game Γ and let α_i and β_i with $\alpha_i \geq \beta_i$ be the degree to which player i dislikes disadvantageous, and advantageous inequality, respectively. Then, if player i cares about the equality of decision rights and utility is linear in cardinality differences, her preferences might be characterized by:

$$u_i(s_i, s_j; b_i, b_j) - \beta_i max\{\#S_i - \#S_j, 0\} - \alpha_i max\{\#S_j - \#S_i, 0\}$$

where $u_i(s_i, s_j; b_i, b_j)$ captures that part of the social utility function which refers to selfish and other-regarding material payoffs s_i, s_j (as in Fehr and Schmidt 1999; Bolton and Ockenfels, 2000, for instance) and possibly on players' belief systems b_i, b_j (as in psychological games (Battigalli and Dufwenberg, 2009).[17] If instead, people only dislike advantageous, but hold no aversion against disadvantageous

[17]To see that the Fehr-Schmidt (1999) (FS) model, for instance is a special case, note that $u_i(s_i, s_j) = \pi_i(s_i, s_j) - \beta_i^{FS} max\{\pi_i(s_i, s_j) - \pi_j(s_j, s_i), 0\} - \alpha_i^{FS} max\{\pi_j(s_j, s_j) - \pi_i(s_i, s_j), 0\}$ where $\pi_i(s_i, s_j)$ is the material payoff to player i and payoffs do not depend explicitly on beliefs. Since $u_i(s_i, s_j; b_i, b_j)$ depends on beliefs, one can also derive the payoff functions of psychological game theory – see section E.1 – as a special case. Note, however, that adding purely procedural terms need not necessarily increase the complexity of the utility function: if a player compensates an opponent for lesser decision rights by giving that opponent more payoff, the player will behave *as if* she cared for the opponent's payout whereas she actually cares for the opponent's position of rights. Hence, only one of the two terms is needed to capture her behaviour. Yet, the distributive fairness terms would not correctly predict this player's behaviour for another game

purely procedural criterion	Yes-No game	Ultimatum game	Dictator game (with voice)	ethical motivation
equality of decision rights	+	-	-[18]	yes
equality of information rights	+	-	+	yes
transparency	-	+	+	yes
simplicity	+	-	-	no
efficiency	-	-	+	no

Table 3: Purely procedural properties of the three allocation procedures at hand.

inequality in decision rights since they prefer to give greater opportunities to others (in affirmative action, for instance), the parameter restrictions would rather reflect those in (Charness and Rabin 2002). Next to decision rights, parties may also care for equal rights of information, an idea which we formalize in appendix D.1.

Yet, making the distribution of any right more equal will typically cause changes to other purely procedural criteria: removing a player's advantage by taking away some of her decision rights will also result in a simpler procedure; removing a player's advantage in information rights can result in a procedure with imperfect information. We formalize these properties to facilitate a rigorous discussion of our procedures in purely procedural terms: granting equal information rights (app. D.1) in the yes-no game comes at the cost of procedural intransparency (app. D.2). Opting for transparency in the ultimatum game comes at the cost of unequal information rights, but also at the cost of additional procedural complexity (app. D.3). Granting equal information rights and efficiency (app. D.4) in the dictator game comes at the cost of denying the responder any decision right at all since the decision maker must forego the ultimatum game. Granting the responder any decision rights by opting for the ultimatum game instead, comes at the cost of unequal information and decision rights, and procedural inefficiency. Table 3 reviews the three procedures from section 2 in terms of these criteria, for more details see table A3. From this discussion, we retain that subjects' goals in choosing the same procedure may be mixed. To explore where purely procedural *fairness* concerns are at play, we must, in addition to choices between outcome invariant procedures, collect information i) which choices are motivated ethically by an ideal which does not underly any of the outcome based preference theories in section 3, collect information about ii) subjects perceptions how simple the procedures are relative to each other, and iii) how efficient.

5 Experimental setup

The computerized experiment was conducted in the laboratory of the Max Planck Institute of Economics in Jena. Participants were 352 undergraduates from the University of Jena, randomly drawn

with a different distribution of rights while the purely procedural terms would.

[18] If players define process fairness not in terms of equal decision rights overall, but in terms of equal *unkind* decision rights – that is, equal options to punish the opponent –, note that the dictator game grants all parties an equal number of options to be unkind.

from all fields of study. 186 of them participated in sessions which introduced the mini yes-no and the mini ultimatum game from section 2, another 166 participants in sessions which introduced the mini dictator and the mini ultimatum game. Participants were recruited using the ORSEE software (Greiner 2004). The experiment was programmed in z-Tree (Fischbacher 2007). At the beginning of each session, participants were randomly seated at visually isolated computer terminals where they received a hardcopy of the German instructions which can be found in section A.1. Subsequently, participants answered a control questionnaire to ensure their understanding, see section A.2. The experiment started after all participants had successfully completed the questionnaire.

Each session introduced only one pair of procedures, either the ultimatum and the yes-no game, or the dictator and the ultimatum game from section 2. In each game, a pie of 200 ECU (experimental currency units with 200 ECU = 6 Euros) was to be shared. We elicited subjects' choices in all games by means of the vector strategy method (Selten 1967), that is, by asking subjects to decide in every decision node of either procedure, and for either role. We explicitly wished to exploit potential behavioural effects of the strategy vector method which familiarizes subjects with both roles and both procedures thus increasing the share of subjects who would deem the procedures outcome-invariant.[19] Subsequently, each subject in a randomly formed pair of subjects, was randomly assigned the role of a proposer or a responder.

Informed about their actual role, subjects received on-screen instructions which announced and explained an option to influence the draw of the procedures, see appendix A.3 and answered a further control question, see appendix A.4. Subjects were reminded that both procedures had been initialized to occur with 50% probability. Subjects were told they could now choose to pay 15 (Euro) Cents to make their preferred procedure more likely to occur. In particular, subjects were informed that at the end of the experiment, a lottery would select one player in each proposer/responder pair with equal probability. If this player had paid for her preferred procedure, her preferred procedure would occur for sure. If she had not paid, procedures would continue to occur as initialized with 50% probability. Next, subjects stated on a decision screen reproduced in Fig. 2 whether they preferred any procedure at all, and if so, which one.

Subsequently, first-order beliefs were elicited. For every decision node of the opponent in either procedure, each player submitted how she believed her opponent would decide. Subjects were asked how many out of four randomly drawn players of the other role they believed had made a specific choice[20]. Beliefs were incentivized such that subjects earned 100 additional ECUs (3 Euros) for a correct answer and no additional ECUs otherwise. This simple belief measure has recently been suggested in (Schlag and Tremewan 2012). Unlike the seemingly precise quadratic scoring rule, for instance, this simple belief measure is unbiased even for risk-averse subjects (Schlag and Tremewan 2012) and can easily, and controllably be understood (Price 1998). Just as the quadratic scoring rule,

[19]Our results do, however, not seem to be too sensitive to the strategy vector method. In (Chlaß and Riener 2015), subjects can influence the draw of two procedures: one with a fair, and another with an unfair distributions of rights. Throughout, subjects decide only for their own role. Similarly as in section 6.3, choices of the fair distribution of rights link to Kohlberg class five; departures from rational self-interest as in section 7.2 also link to Kohlberg class five.

[20]We did not elicit subjects' beliefs about whether, and for which procedure, the other player in her pair would pay.

REMINDER

With equal probability, lots are cast between A and B to determine which participant can actually influence the draw of the situations. This participant can pay an amount of 5 ECU such that a specific situation occurs. If she does not pay 5 ECU, both situations continue to occur with 50 % probability as they have been initialized. The decisions made earlier for the situation which is drawn are validated. If lots determine that you can influence the draw of the situations, 5 ECU will be subtracted from your payoff for changing the probabilities.

Assume that lots will be cast such that you can influence the draw of the procedure. You proceed as follows: 1. Please state whether you prefer any situation. If you do, please state which one. 2. Tick whether you want to pay 5 ECU such that your preferred situation occurs.

1. I prefer
   - ○ no situation
   - ○ situation 1
   - ○ situation 2

2. I want to pay 5 ECU such that my preferred situation occurs ○ no ○ yes

Figure 2: Elicitation of subjects' stated and revealed procedural preferences: decision screen (translated from German).

our simple belief measure may be imprecise. These imprecisions could bring out about challenges in our context. We address those challenges in sections 6.3 and 7.1.[21]

Finally, the procedures were drawn. If the randomly selected player had stated a preference for a procedure and paid for it, then her preferred procedure was used. If she had not paid, each procedure was drawn with equal probability. The cost of influencing the procedure was subtracted. If a subject wanted to pay but was not drawn, she would not incur any cost. Only the choices that had been made in the procedure which was drawn became payoff-relevant. To assess the correctness of a player's beliefs, four subjects of the other role were randomly drawn to see whether their behaviour coincided with the player's beliefs.

At the end of each session, we handed out a standardized moral judgement test (M-J-T) by Georg Lind (1978, 2008) which is freely available for research purposes from georg.lind@uni-konstanz.de. The test elicits to which ethical criteria individuals actually resort in order to derive the right course of action, or put differently, how they make moral judgements. If subjects' procedural choices are motivated by *none* of the ethical criteria upon which existing preference types – see section 2 – build, we can reaffirm that we report evidence for new preferences. The specific ethical criteria which subjects can employ in the test are taken from Lawrence Kohlberg's (1969, 1984) field work. Kohlberg studied extensively which criteria individuals in the field use to make moral judgements and classified them into six classes, see appendix C. Coincidentally, this classification arguably covers all ethical criteria which economics has used to formalize preferences to date. The test presents two stories and asks subjects whether they deem the respective protagonist's behaviour right or wrong. Subsequently, the

[21] See (Schlag and Tremewan 2012) for a comprehensive account of belief-elicitation methods.

test lists an inventory of 24 arguments (12 after each story, see the excerpt in app. A.6; two arguments per story refer to the same Kohlberg class from app. C) and asks subjects to agree or disagree with the use of each argument on a nine-point scale[22]. Eight arguments refer to whether the outcomes of the respective action were favourable for the self (e.g. "the action was good/right because it made me a lot of money"), another eight to the protagonist's intention, others' expectations and social norms (e.g. "the action was good/right because I intended only good outcomes for others/ was expected of me/ everybody would have done it"), and another eight refer *solely* to the way how the action came about (e.g. "the action was good, because when it was executed, others' equal rights of participation and information were respected"). Specifically the last type of argument does not refer in any way to actual, expected, or intended outcomes of this action, see section 6.3. The test does not refer in any way to the experiment and is designed such that even in a sample of subjects who do not necessarily give their real opinion in the test (who do, for instance, try to answer in what they deem a socially appropriate and acceptable way), the true underlying distribution of the score in this sample is not biased (Wasel 1994; Lind 2002).[23]

Finally, additional questionnaires designed by us were distributed in eleven out of thirteen sessions which asked subjects for their gender, which asked them to rank the procedures in terms of 'simplicity', and which gave subjects space to explain their procedural choice – if any – in written open form. We use this questionnaire data to investigate the possible existence of purely procedural simplicity and efficiency concerns, see appendices D.3 and D.4 since the yes-no game does not only distribute rights more equally but is at the same time simpler than the ultimatum game whereas the dictator game does not only distribute subjects' freedom of choice to be unkind equally but is also more efficient than the ultimatum game. Simplicity and efficiency concerns could be active only in cases where procedural choices cannot be statistically explained by any ethical (fairness) criteria: neither by the fairness criteria underlying existing preference models in section 3, nor by a concern about the equality of rights in section 4. To avoid making any inference about a possible existence of simplicity and efficiency concerns from a mere non-rejected Null hypothesis (of there being no statistical support for an underlying ethical motivation), we try to additionally explain subjects' procedural choices in these cases by simplicity rankings and efficiency statements.

In our analysis, we first focus on a class of subjects who – according to *all* preference models discussed in section 3 as judged by our simple unbiased belief measure – deem their pair of procedures outcome-invariant (henceforth 'EQ'-subjects). These are responders who i) accept each proposal in each procedure and who ii) expect that the fair proposal is *always* proposed in both procedures.

[22]This is a rating approach and therefore, subjects can rate all arguments equally should they so wish. We do not cluster subjects into 'types'. Instead, we use each subject's complete set of six scores (one preference over using each of the six Kohlberg classes) to explain her procedural choice in 6.3 and 7.2.

[23]The test achieves these desirable psychometric properties by listing arguments of the six Kohlberg classes in a different order every time (out of four times), and by varying the frames in which the four arguments pertaining to the same class are presented (two arguments out of four may be used to argue *for*, and two *against* an action) – see appendix A.6 for an excerpt. It is hence hard if not impossible for an experimental subject to see how she can fill out the test such that her score (whose calculation – see footnote 27 – she does not know anyway) shifts into a specific direction. For this reason, a subject who answers specific test questions in a way to justify some or all of the many choices made during the experiment, changes her score but not into the direction she intends. Rather, she adds noise to her true score.

Proposers in turn need to i) *always* make the fair proposal and ii) think that responders *always* accept both proposals in both procedures (in the dictator game, this is satisfied by construction since responders cannot influence payoffs). We test whether these 'EQ'-subjects still prefer one procedure over the other. If this is the case, we say that subjects qualify for a *purely* procedural concern. In section 6.3, we show that these choices also identify purely procedural concerns: i) choices of the yes-no game can indeed be explained by the degree to which subjects resort to the equality of basic rights and liberties (Kohlbergian classes 5 or 6) in the moral judgement test and by subjects' simplicity rankings; choices of the ultimatum game can be explained by subjects' invoking the equality of basic rights and liberties, and lastly, iii) choices of the dictator game can be explained by subjects' efficiency statements, always controlling for all other Kohlbergian classes they might have used. Section 7.4 tries to seek out confounds for our result that purely procedural fairness concerns exist. We do not, however, find likely candidates for a third variable which correlates with subjects' moral judgement and could hence cause its link to 'EQ'-subjects' procedural choices.

If Kohlberg classes 5 or 6 are indeed at play, we can, first of all, rule out that 'EQ'-subjects' procedural choices are mistakes. Second, we have double checked that the existing preference models from section 3 *do not* explain the procedural choices at hand and that, consequently, the simple unbiased belief measure we use was precise enough to control for these preferences from section 3 (we discuss the precision of our belief measure explicitly in section 7.1). Third, we have provided *positive evidence* that new preferences are at play, and that, moreover, we did not induce an experimenter demand effect in which case subjects' choices would have been explained by their desire to comply with others' (our own) expectations about their choices (Kohlberg class 3).

Fourth, we can extend our analysis to non-'EQ'-participants by instrumenting purely procedural preferences with Kohlberg classes 5 or 6 to estimate how prevalent purely procedural preferences are overall, and which types of behaviour they induce when procedures are perceived to generate different outcomes. This is done in section 7.2.1 by building groups of non-'EQ'-subjects whose beliefs and actions differ *similarly* across procedures. All subjects *within* the same group are therefore likely to perceive a highly similar material, kindness-based, or fairness-based difference between the procedures and should therefore, make largely similar procedural choices. If instead, the procedural choices within such a highly similar group are very heterogeneous, and if this heterogeneity can be explained by Kohlberg classes 5 or 6, we have instrumental evidence for non-'EQ'-subjects who are motivated by purely procedural preferences. Fifth, we can test whether 'EQ'-subjects differ persistently from other subjects in those characteristics which explain 'EQ'-subjects' purely procedural choices in 6.3. If this were true, then limiting our analysis to 'EQ'-subjects would have led to a selection effect in section 6.2.[24] We do, however, not find evidence for such an effect, see section 7.3. In the next section, we start with the analysis of 'EQ'-subjects and the motivations underlying their procedural choices.

[24] A selection would exist if 'EQ'-subjects differed from non-'EQ'-subjects – that is, subjects with procedurally *variant* actions and beliefs – in a latent characteristic which is *critical* for a purely procedural choice.

6 Results

6.1 Behaviour and beliefs across protocols

First, we briefly describe individuals' actions (see also appendix B) and beliefs in all games. Offers do not necessarily increase (as acceptance rates do not necessarily *decrease*) with the responder's increasing veto power across dictator, yes-no and ultimatum games as is usually found (Gehrig et al. 2007) because in our setup, selfish offers are *not* available.

Yes-no vs. ultimatum game. Proposers are more generous in the yes-no game (87 fair and six generous splits) than they are in the ultimatum game (90 fair and three generous splits). Responders accept the proposal in the yes-no game *more often* (91 times) than they accept either proposal in the ultimatum game (fair split: 88 times, generous split: 80 times). Responder beliefs are identical across yes-no and ultimatum games. Proposers' belief that *all* four responders accept is less widespread in the yes-no game (64 times) than in the ultimatum game (fair split: 66 times, generous split: 69 times). Figs. 3 and 4 provide the complete distributions of beliefs. Altogether, 67 of 186 subjects state to prefer the yes-no game, 33 of which pay; 45 state to prefer the ultimatum game, 13 of which pay, see also Figs. A-V and A-VI in appendix B for more detail.

Dictator vs. ultimatum game. Proposers are less generous in the dictator (76 equal and seven generous splits) than in the ultimatum game (70 equal and 13 generous splits). Responders accept the fair proposal more often in the ultimatum game (79 times) than the generous proposal (69 times). According to their voice in the dictator game, both types of proposals are *less* acceptable in the dictator game (fair split: 72 'accept' voices, generous split: 58) than in the ultimatum game (fair split: 79 times accepted, generous split: 69 times). Responders' belief, that *all* four proposers offer the fair proposal, is *less* widespread in the dictator (45 times) than in the ultimatum game (46 times). Figs. 5 and 6 illustrate the distributions of beliefs for both parties. Altogether 113 of 166 subjects state to prefer the dictator game, 47 of which pay. 24 proposers and 18 responders who prefer the dictator game state an efficiency reason (see section 6.3). 21 state to prefer the ultimatum game, 9 of which pay, see also Figs. A-VII and A-VIII in appendix B for more detail.

6.2 How often do 'EQ'-subjects state a purely procedural concern?

We first concentrate on the 140 so-called 'EQ'-subjects who choose identical pure strategies and hold identical pure strategy beliefs such that they fulfill even the most restrictive conditions for procedural indifference from section 3. These two conditions ensure indifference in equilibrium (and would hold within such an equilibrium), and importantly, also off-equilibrium.

59% of all 'EQ'-subjects *state* a purely procedural preference, i.e. state a preference for some procedure. 21% of all 'EQ'-subjects would also pay for their preferred procedure and thereby *reveal* a purely procedural preference.

RESULT 1. A significant share of 'EQ'-subjects (binomial 99% confidence intervals, results by treatment in table 4) states and is willing to pay for a *purely* procedural preference.

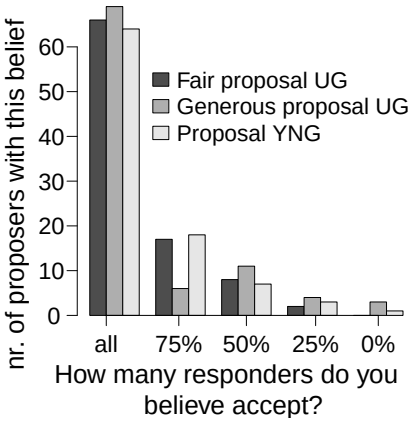

Figure 3: Proposer beliefs (n=93) yes-no vs. ultimatum game

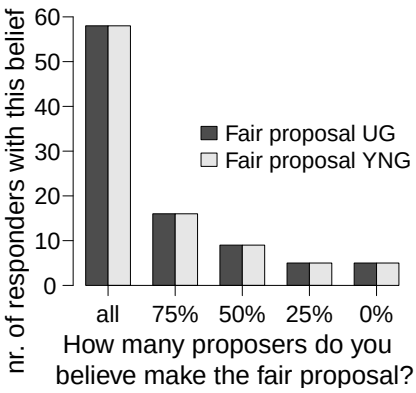

Figure 4: Responder beliefs (n=93) yes-no vs. ultimatum game

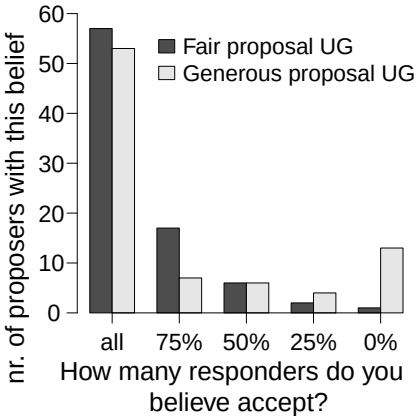

Figure 5: Proposer beliefs (n=83) dictator vs. ultimatum game

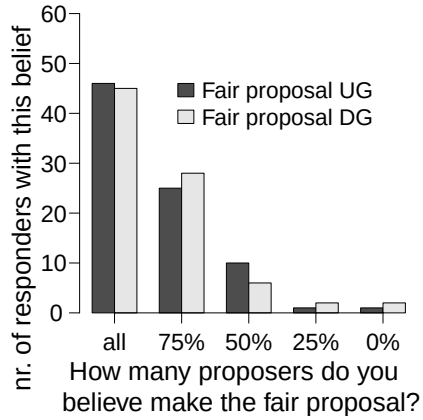

Figure 6: Responder beliefs (n=83) dictator vs. ultimatum game

Table 4 reviews the absolute frequencies of 'EQ'-proposers and 'EQ'-responders amongst those subjects who choose between a mini dictator, and a mini yes-no game, and amongst those subjects who choose between a yes-no and an ultimatum game, along with their choices and 99% confidence intervals for the frequency of these choices.

Looking at 'EQ'-subjects who choose between a mini dictator and a mini ultimatum game, 65% state a preference for one procedure over another. 58% state a preference for the dictator game, 25% would pay and thereby *reveal* this preference. Additional 7% state to prefer the ultimatum game over the dictator game and essentially nobody, i.e. 3%, reveals this preference.

RESULT 2. A significant share of 'EQ'-subjects states to prefer the dictator over the ultimatum game and is willing to pay for this preference.

Looking at subjects who choose between a mini yes-no, and a mini ultimatum game, 55% state a

procedures	role	nr. of obs.	DG $\succ$ UG		UG $\succ$ DG		UG $\asymp$ DG	
			state	reveal	state	reveal	**state**	**reveal**
dictator vs. ultimatum	proposer[25]	35	28]57%, 94%[	10]11%, 52%[	1 [0%, 20%[	0 [0%, 15%[	**29** (**83**%)]**61**%, **96**%[	**10** (**29**%)]**11**%, **52**%[
	responder	25	7]8%, 56%[	5]4%, 47%[	3]1%, 38%[	2]0%, 33%[	**10** (**40**%)]**16**%, **68**%[	**7** (**28**%)]**8**%, **56**%[
	all	**60**	**35** (**58**%)]**40**%, **75**%[	**15** (**25**%)]**12**%, **42**%[	**4** (**7**%)]**1**%, **20**%[	**2** (**3**%)]**0**%, **15**%[	**39** (**65**%)]**47**%, **80**%[	**17** (**28**%)]**14**%, **46**%[
			UG $\succ$ YNG		YNG $\succ$ UG		YNG $\asymp$ UG	
yes-no vs. ultimatum	proposer	42	4]1%, 28%[	2 [0, 21%[	18]23%, 64%[	8]6%, 39%[	**22** (**53**%)]**32**%, **73**%[	**10** (**24**%)]**9**%, **45**%[
	responder	38	13]16%, 57%[	0 [0%, 14%[	9]8%, 46%[	3]0%, 0.27%]	**22** (**58**%)]**36**%, **78**%[	**3** (**8**%) [**0**%, **26**%[
	all	**80**	**17** (**21**%)]**10**%, **36**%[	**2** (**3**%)]**0**%, **12**%[	**27** (**34**%)]**20**%, **49**%[	**11**(**14**%)]**5**%, **27**%[	**44** (**55**%)]**40**%, **70**%[	**13** (**16**%)]**7**%, **30**%[

Table 4: 39 OF 60 (65%) 'EQ'-SUBJECTS STATE; 17 OF 60 (28%) REVEAL TO PREFER THE DICTATOR OR THE ULTIMATUM GAME. 44 OF 80 (55%) STATE, 13 OF 80 (16%) REVEAL TO PREFER THE YES-NO OR THE ULTIMATUM GAME.

preference for one procedure over the other, and 16% *reveal* such a preference. In this pair of procedures, 'EQ'-subjects most frequently prefer the yes-no game over the ultimatum game. 34% state this preference, and 14% *reveal*, i.e. would pay for it. A preference for the ultimatum game over the yes-no game in turn is less frequent; only 21% state such a preference and 3% would pay for it.

RESULT 3. A significant share of 'EQ'-subjects states to prefer the yes-no over the ultimatum game and is willing to pay for the respective preference.

Note that parties differ in their procedural choices and that proposers opt far more often for the yes-no game than responders do. This asymmetry and the overall popularity of the yes-no game are hard to explain in terms of outcomes: on aggregate, there are *fewer* proposers who always offer an equal split and who also expect all four responders accept this split in the yes-no game than there are such proposers in the ultimatum game, see section 7.1 for a detailed discussion. However, preferences for the equality of decision and/or information rights across parties as formulated in section 4 and appendix D.1 would predict exactly such an asymmetry in choices. As we argued there, a player i is likely to feel a stronger dislike toward disadvantageous inequality in rights, than toward advantageous inequality, i.e. $\alpha_i \geq \beta_i$, and would thus also show a stronger preference to have her own disadvantage removed than to remove the opponent's disadvantage (which is the player's own advantage). Proposers who opt for the yes-no game remove their own disadvantageous inequality in information, and in decision

[25]Reading example: take the first line of table 4. There are 35 'EQ'-proposers for the yes-no/ultimatum pair of games. 28 of them state to prefer the yes-no game, 10 of which pay to influence the draw of the procedure. Only one states to prefer the ultimatum game but does not pay (not reveal her preference). On aggregate, 29 'EQ'-proposers state to prefer any procedure at all, and 10 altogether pay in the yes-no/ultimatum pair of games. The second line provides 99% confidence intervals for each of these frequencies. A square bracket [57%, 94%] denotes a confidence interval which includes its lower and upper bound,]57%, 94%[denotes one which does not include either end point,]57%, 94%] denotes one that does not include the lower end point, and [57%, 94%[denotes one which does not include the upper end point.

rights from the ultimatum game. Responders who opt for the yes-no game remove their opponent's (the proposer's) disadvantageous inequality in decision and in information rights from the ultimatum game. The preferences in section 4 would therefore predict that proposers opt more often for the yes-no game than responders.

The next section explores whether we can identify a systematic motivation underlying 'EQ'-subjects' purely procedural choices. Making use of our theoretical discussion in section 4, we look at whether purely procedural choices relate to individuals' conception of fairness (or instead, to subjects' simplicity and efficiency rankings of the procedure) and whether a purely procedural fairness notion hence exists in the first place. To do so, we test if any of the procedural choices in table 4 are linked to an ethical criterion. If an ethical criterion were at play, it should differ from those underlying the preference models of section 3, and notably differ from intentionality concerns, social image concerns, others' expectations, the absence of punishment or presence of a reward, status, and social norms – those would all lead to ultimately outcome-based preference models.

6.3 What motivates 'EQ'-subjects' procedural choices? Procedural choices, moral judgement, and questionnaire data.

In section 4, we saw that the motivations underlying 'EQ'-subjects' purely procedural choices of the same game could be mixed: by opting for the yes-no game, a decision maker could remove the responder's advantage in decision and information rights from the ultimatum game, but not without also making the game simpler. By opting for the dictator game, the decision maker could remove the responder's advantage in information rights from the ultimatum game, but not without depriving her of any freedom of choice at all, and not without also making the procedure more efficient. Guided by the theoretical discussion in section 4, we collected data to proxy purely procedural fairness concerns, data to proxy simplicity concerns, and data to proxy efficiency concerns. Since we set out to show that purely procedural concerns exist, subjects' procedural choices should have a corresponding purely procedural motivation. The analysis is, however, exploratory, and by no means intended as a formal test for the preference formulations we explored in section 4.

We proxy a potential simplicity concern by subjects' *simplicity rankings*: subjects submit on a 7-point Likert scale whether they deem the yes-no game simpler than the ultimatum game (from -3: do not agree to +3 do agree), and, to check for consistent answers and to avoid the ask, also submit whether they deem the ultimatum game simpler than the yes-no game (from -3: do not agree to +3: do agree). Efficiency concerns were proxied by data from the open-form post-experimental questionnaire. If an EQ-subject stated that she preferred the dictator game because neither party could get a zero payoff, we classified her as efficiency concerned.[26] In other words, a procedure is efficient if *it does not allow parties to destroy the pie – even when actual behavior is such that this destruction never takes place*. Finally, looking at concerns for an equal distribution of various rights in section 4, we proxy *purely procedural fairness* concerns by subjects' preferences over outcome-invariant ethical criteria (it is unfair/unethical to favour one person over another by granting her more rights or greater privileges

[26]Subjects who state an efficiency concern amongst several concerns are not classified to hold a concern for 'efficiency'.

argumentation	motivation for moral behaviour
postconventional	*postclass 1 (Kohlberg class 5).* Social contract orientation, in which duties are defined in terms of the social contract and the respect for others' rights as recorded in that contract. Emphasis is upon equality and mutual obligation within a democratic order. *postclass 2 (Kohlberg class 6).* The morality of individual principles of conscience such as the respect for the individual will, freedom of choice etc. Rightacts is determined by conscience in accord with comprehensive, universal and consistent ethical principles.

Table 5: Kohlberg's two classes of postconventional moral argumentation (Ishida 2006).

than her opponent). An 'EQ'-subject who has such a purely procedural *fairness* concern should put greater weight on ethical arguments which refer to individual rights when she judges about right and wrong than an 'EQ'-subject who has no purely procedural fairness concern. To test this, we first need a means to describe how individuals typically derive that some course of action is ethically either right or wrong – that is, how they make a moral judgement and which arguments they employ to do so. There has been extensive field work to collect and describe the ethical criteria which individuals endorse and apply in practice. A given individual typically feels comfortable to use only some of these criteria: individuals therefore have preferences over ways of moral argumentation (see e.g. Piaget 1948; Kohlberg 1984; Lind 2008). Kohlberg (1969, pp. 375) distinguishes three broad ways of moral argumentation: a *preconventional*, a *conventional*, and a *postconventional* way, described through altogether six 'classes of argumentation' which we review in appendix C.

An individual uses a *preconventional* argument if she argues that an action is ethically right when it does not entail a punishment, or else, when that action is rewarded (classes 1 & 2). Instead, an individual uses a *conventional* moral argument, if she argues that something is ethically right because it is in line with a social norm, a social expectation or done with a good intention (classes 3 & 4). Inequity aversion (Fehr and Schmidt 1999; Bolton and Ockenfels 2000; Bolton et al. 2005) and reciprocity (Dufwenberg and Kirchsteiger 2004; Falk and Fischbacher 2006) would therefore rely on conventional moral argumentation. An individual uses a *postconventional* argument if she argues that something is right because it is in line with the social contract. She may, for instance, argue that the rules of the game do not comply with the individual rights recorded in a constitution and violate the legislative principle that all individuals enjoy the same rights and that there be no discrimination (postclass 1). An individual also argues postconventionally if she deems something wrong because it violates a value or some general ethical principle which she considers universally valid, or because it infringes specific human rights *above* the social contract (postclass 2). Such a principle could be the consideration of another's will or her dignity, for instance. Specifically postconventional arguments do not refer to the outcome of an action or a process but rather, to the nature of the action or process itself. The same outcome may hence be judged very differently if generated by a dictator's decision, rather than by democratic consensus (Kohlberg 1969, p. 376).

Suppose now that some procedural choices in our experiment do indeed reflect ethical preferences over the *rules of a game* rather than preferences over outcomes, intentions, or norms. If so, there should

be a strong link between these choices and their sensitivity to *postconventional* moral arguments. Table 5 reviews the two classes of postconventional argumentation from which purely procedural fairness concerns should spring; a complete overview over all Kohlberg classes is found in app. C.

Table 6 reviews the results of simple binary Logit models which seek to explain subjects' procedural choices by all ways of moral argumentation outlined above, by subjects' simplicity ratings of the ultimatum and yes-no games, and an efficiency concern where the dictator game is concerned. Results are robust to the inclusion of gender, the main demographic correlate with the two moral judgement variables that significantly determine subjects' procedural choices, see section 7.4. Throughout, *pre*, *con*, and *post* denote the extent to which subjects make use of preconventional (Kohlberg 1 & 2), conventional (Kohlberg 3 & 4), and postconventional argumentation (Kohlberg 5 & 6), respectively. *postclass1* denotes the extent to which subjects make use of the first subclass of postconventional moral argumentation (Kohlberg class 5), see table 5. We report the marginal effect of each explanatory variable averaged over all individuals.[27]

Overall, 'EQ'-subjects' use of preconventional argumentation *pre* does not significantly link to their choice of games in either pair of procedures, see table 6. Hence, we do not find evidence for an *outcome-based* motivation in terms of mere material payoffs. Interaction term $con \cdot post$ captures the interdependence between subjects' use of conventional and postconventional arguments. If this interaction is large, neither conventional, nor postconventional arguments have stand-alone value for a subject. Where significant, subjects who score higher on $con \cdot post$, are *more likely* not to prefer any procedure at all. The individual elements of this term, *con* and *post*, do not show any impact other than through this interaction – adding them individually does therefore not change either significance or nature of the results in table 6, see footnote 27. Conventional (i.e. intention and norm-based) moral argumentation *con* which is at the heart of inequity-aversion and reciprocity (Kohlberg 2 & 3) does therefore not significantly determine subjects' choice of games.

A) EQ-subjects' preferences for the mini yes-no over the mini ultimatum game. Proposers' choices of the yes-no game link to *postclass 1* arguments suggesting they are purely concerned about parties' rights in each procedure. Responders' choices of the yes-no game in turn link to their simplicity ratings of the procedures. If a responder rates the yes-no game by one point (on a 7-point scale) simpler than the ultimatum game, she is an estimated 9% ($z-stat: 2.48$, $p-value < 0.02$) more likely to prefer the yes-no game. If, however, we contrast responders who prefer the yes-no game only with responders who are indifferent (and leave out responders who prefer the ultimatum game which leaves us with $n = 15$ observations), this simplicity concern vanishes, and responders are 75% more likely to prefer the yes-no game, the more they make use of *postclass 1* arguments ($z - stat: 2.82$, $p - value < 0.01$).

B) Preferences for the mini ultimatum over the mini yes-no game. 'EQ'-proposers are 31%

[27]All models begin with comprehensive specifications including all ways of moral argumentation, Lind's C-score for cognitive moral ability, and all two-way interactions between variables. These models are reduced step by step leaving out insignificant variables. Insignificant variables of theoretical interest are reported within brackets. Scores are computed as follows: *postclass 1*, as an example, is the average over all four ratings of (the four) Kohlberg class 5 arguments, divided by the difference between the largest, and the smallest rating a subject ever ticks in the test to make subjects' use of the Likert scale comparable. We subtract the sample mean from this score and divide it by the sample standard deviation.

[28]Since we did not ask subjects in all sessions to rate the procedures in terms of simplicity, we only have data for 21 rather than for all 38 (see table 4) 'EQ'-responders.

Note: Significance levels of the z-tests are indicated by $a : p < .01$, $b : p < .05$.

	yes-no game		ultimatum game		dictator game	
	proposer	responder	proposer	responder	proposer	responder
nr. of obs.	42	21[29]	24[30]	21	35	25
pre	[−0.09]	[−0.09]	[−0.03]	[0.22]	[0.10]	[0.65]
con · post	−0.22 [a]	[−0.14]	[−0.02]	−0.69 [b]	[0.06]	[0.14]
postclass 1	0.22 [a]	−0.15 [c]	0.31 [b]	0.64 [a]	[0.01]	[0.18]
simpler	[−0.01]	0.08 [a]	–	–	[−0.07]	[1.20]
more efficient	–	–	–	–	0.18 [b]	perfect
Count R^2	0.74	0.76	0.83	0.81	0.80	1.00

Table 6: Preferences for the yes-no and the ultimatum games link to Kohlberg class five ('postclass 1') and a simplicity argument, preferences for the dictator game to an efficiency argument.

more likely to choose the ultimatum game rather than state indifference, the more they make use of *postclass 1* arguments ($z - stat : 2.18, p - value < 0.03, n = 24$). 'EQ'-responders are 64% more likely to prefer the ultimatum game, the more often they use *postclass 1* arguments ($z - stat : 2.58, p - value < 0.01, n = 21$). The belief conditions derived in section 3 – see table 2 – therefore seem to be sufficient to rule out any concerns that the procedures might entail different material and pychological outcomes. At the same time, it shows that our belief measure is precise enough to control these belief conditions. Looking at payment data exclusively, we observe analogous effects: proposers are 19% more likely to reveal a purely procedural preference, the more they make use of *postclass 1* arguments ($z - stat : 2.08, p - value < 0.04, n = 30$). Preconventional or conventional arguments do not show any impact.

C) Preferences for the dictator over the mini ultimatum game. Subjects' choice of the dictator game is exclusively linked to their efficiency statements; the choice does not show a connection with *any* way of moral argumentation, or with subjects' simplicity rankings. Overall, 'EQ'-proposers who state an efficiency concern are 18% more likely to prefer the dictator game ($z - stat : 2.17, p - value < 0.03, n = 35$)[31]. Considering only proposers who are willing to pay for the dictator game, the effect becomes 0.33 ($z - stat : 1.97, p - value < 0.05, n = 16$)[32]. All 12 'EQ'-responders who state to prefer the dictator game (and hence also those amongst them who pay) state an efficiency concern. 'EQ'-responders' efficiency concern nicely illustrates the purely procedural nature of the concern. 'EQ'-

[29] Since the yes-no game does not only distribute decision rights more equally but is also simpler than the ultimatum game, subjects were also asked to rate the procedures relative to each other in terms of simplicity in some sessions. Therefore, we only have data for 21 rather than all 38 (see table 4) 'EQ'-responders.

[30] This Logit model contrasts the four proposers who prefer the ultimatum game only with proposers who are indifferent (not those who prefer the yes-no game). Else, the number of observations in both categories would differ too substantially.

[31] As mentioned before, we do not have such statements from all participants which is why the number of proposers and responders in this paragraph are not equal to the shares of 'EQ' proposers and responders in section 6.2.

[32] On the overall set of 'EQ'-Proposers, preconventional argumentation also shows a weak effect (0.12, $z - stat : 1.87, p - value = 0.07$) which vanishes (0.15, $z - stat : 1.51, p - value = 0.13$) if we consider payment data only. Hence, proposers who merely state a preference for the dictator game acknowledge that the lack of responder veto might entail a material advantage – but not for this paper's payoffs – hence, they state to be indifferent.

responders always accept and therefore, know for sure the pie will not be destroyed. Still, they choose the dictator over the ultimatum game which removes inefficient options from their own action set which they never use. In the next section, we show that also the distribution of 'EQ'-beliefs contradicts the idea that outcome-based motives drive the main part of the evidence, or risk aversion[33].

7 Discussion: Robustness & Prevalence

7.1 'EQ'-subjects' precision of beliefs

If our belief measure were infinitely precise, all preference theories to date – see section 3 – would predict 'EQ'-subjects to be indifferent between procedures. Yet, infinitely precise belief measures do not exist. The quadratic scoring rule – a likely candidate –, for instance, derives its precision from the assumption that subjects are risk-neutral, an assumption which itself can only be imperfectly controlled in practice. As soon as EUT individuals are risk averse (Schlag et al. 2014), the seemingly precise belief reports under a quadratic scoring rule are biased away from the extremes, that is, when actions are believed to be either certain, or impossible. Apart from this bias, the method is known to be unintuitive to subjects and therefore, known to be only partly absorbed (Price 1998). In view of these problems, we chose an unbiased frequentist method – the simple belief elicitation recommended in (Schlag and Tremewan 2012): subjects are asked how many out of 4 randomly drawn opponents choose a given one of the two available actions. Those subjects who report beliefs 4 out of 4 or 0 out of 4 are of particular interest to us since they contribute to the set of 'EQ'-subjects which is the starting point of our analysis. This belief elicitation method is intuitive and unbiased, and can easily and controllably be absorbed (Price 1998) since subjects need not report probability estimates. Its only disadvantage is that it does not provide point belief estimates in probabilistic terms. Therefore, measurement imprecision remains a concern.

Theoretically – see Schlag and Tremewan (2012) for details – individuals who submit a belief that 4 out of 4 opponents choose a specific action, have a probabilistic confidence of 80 % or higher that all opponents choose this action. Individuals who submit that 0 out of 4 opponents choose that action have a probabilistic confidence of 80 % or higher that no opponent chooses this action. If, in view of this imprecision, self-interest or other preference types really explain the choice of a game, the distribution of 'EQ' actions and beliefs should tell. Say, self interest were at play when 'EQ'-proposers choose the yes-no game because they believe that their offer is more likely accepted than in the ultimatum game. Then, of those proposers who always offer the equal split, there should be more who believe that four out of four responders accept in the yes-no game than proposers who hold such a belief in the ultimatum game. Yet, we observe the exact opposite. The same holds for 'EQ' responders who choose the yes-no game. Of those responders who always accept there are more who hold a belief that four out of four proposers offer an equal split in the yes-no game than responders

[33] In line with the next section, we can also dismiss here that a latent correlation between risk preferences and *postclass 1* arguments explains the significant effect of *postclass 1* arguments on choices: for data on 285 subjects collected from the same subject pool at the same time, a linear (or indeed, any nonparametric) association between risk preferences *and postclass 1* arguments remain insignificant (effect: -0.03, $p - value = 0.27$)

who hold this belief in the ultimatum game. In short, if there were measurement error, then given the actual distribution of 'EQ' beliefs, 'EQ' proposers would deem the acceptance probability in the yes-no game somewhat *smaller* than in the ultimatum game; responders would expect somewhat *less* generosity in the yes-no game than in the ultimatum game. Both parties would therefore act against their self-interest when choosing the yes-no game which was 'EQ'-subjects' main preference in 6.2. Analogously, the actual distribution of 'EQ' beliefs provides evidence against the concern that if there were measurement error, inequity averse, reciprocal preferences, or *risk aversion* could be at work, see appendix F. Finally, if other than this paper's purely procedural preferences were at work, choices should either link to no Kohlberg class at all or to Kohlberg classes one to four, but not to Kohlberg class five. The complete discussion of measurement error is found in appendix F where we address yet other preference types, and assemble similar arguments for the case where subjects choose between a dictator, and an ultimatum game.

7.2 Do 'EQ'-subjects' motives carry over to other sets of subjects?

'EQ'-subjects' procedural choices do indeed link to ethical criteria about the equality of rights (and a procedural efficiency concern) which we elicit in a psychological test separately from the incentivized experiment. Hence, the outcome-based preferences from section 3 do indeed not seem to matter. The latter was also confirmed by the distribution of 'EQ'-beliefs across games in section 7.1. Reasoning in terms of equal rights (Kohlberg class five) clearly differs from reasoning in terms of expectations or intentions, as postulated by inequity aversion, guilt aversion, reciprocity models, or still, existing procedural preference models. In our setup, we therefore identify a new ethical criterion which does not underlie any existing preference type. How about other subjects? Might even subjects with procedurally varying beliefs choose a specific procedure because they are concerned with individual rights or efficiency rather than with the (subjective) outcomes of that procedure?

To test this, we cluster (group)[34] all non 'EQ'- subjects according to their actions and beliefs and analyze whether their behaviour links to the same ethical criterion as the procedural choices of 'EQ'-subjects did. Within each cluster, all subjects – those who report a procedural preference, and those who report to be indifferent – have similar material, intention-, or norm-based incentives to choose one procedure over another. Put differently, each cluster 'balances' subjects on the degree ('balancing score') to which inference about purely procedural motives from subjects' experimental choices could theoretically be confounded (Rosenbaum and Rubin 1983) by any of the outcome-based preferences discussed in section 3. Keeping this potential confound constant across subjects, we remove the strategic confound from the comparison of subjects who state to be indifferent between procedures with subjects who do state a preference. This method is more precise than directly estimating and controlling for the confound (Heckman 1979) since balancing reduces specification uncertainty: we need not specify, and therefore, not be correct about how a subject's perceived strategic incentive

[34]Clusters were obtained using Ward's method; cluster similarity was measured by Eucledian distance in five dimensions: i) proposers' offer in the yes-no game, and ii) in the ultimatum game, iii) proposers' belief about how many responders accept in the yes-no game, and iv) how many responders accept the equal split and v) the generous split in the ultimatum game, respectively. Initially, each procedure produced three clusters.

changes along with changes in that subject's beliefs about the opponent's actions. If the clustering achieves to make the strategic confound similar enough between all groups, then choosing any game over being indifferent should link to the same motives as for 'EQ'-subjects in section 6.3. If after clustering, the strategic confound still differs between subjects who prefer a given game and subjects who report indifference, we can identify subjects who choose *against* their incentive and see whether the motives from section 6.3 explain subjects' willingness to forego payoff. We only compare one group to the reference group at a time since the balancing score might not be precise enough to make all groups differ from the reference group by the same strategic confound.

Appendix G shows the respective results. In essence, the new ethical criterion *postclass 1* is at play in all sets of procedurally variant beliefs and behaviour, and hence, for all types of non-'EQ'-subjects who choose between a yes-no and an ultimatum game. On the one hand, the new ethical criterion underneath this paper's purely procedural preferences statistically explains why many non-'EQ'-subjects choose against their incentives. These are proposers (responders) who opt for the yes-no game while expecting a strategic advantage of on average 1 ECU (responders: 98.33 ECU) in the ultimatum game; proposers who report indifference while expecting a strategic advantage of on average 40 ECU in the ultimatum game, and responders who report to be indifferent while expecting a strategic advantage of 32.08 ECU in the yes-no game. On the other hand, there are responders who still choose the ultimatum game because of *postclass 1*, even if they also expect a small strategic incentive in that procedure. Altogether, Logit models predict that 48% of all non-'EQ'-subjects who choose between the yes-no and the ultimatum game are motivated by ethical criteria of *postclass 1* at the 1% or 2% significance level. Interestingly, the interaction effect *con* · *post* which *reduced* the likelihood of a purely procedural concern on the set of 'EQ'-subjects is never significant for non 'EQ'-subjects. Purely procedural concerns might hence be *more* frequent among non 'EQ'- than among 'EQ'-subjects. The simplicity concern does not seem to carry over to non EQ-subjects.

Efficiency concerns are also met amongst non-EQ subjects. We observe that proposers *and* responders who state efficiency concerns opt for the dictator game while expecting an advantage in the ultimatum game, or avoid the dictator game when they expect that greater efficiency comes at a material disadvantage to the opponent. Altogether, Logit estimates predict that 'efficiency' statements explain the dictator game choices of altogether 23% of all non 'EQ'-subjects.

7.3 Is there a selection effect?

Section 6 first concentrated on 'EQ'-subjects who should – even according to the most restrictive conditions from section 3 – be indifferent between procedures. These subjects should have no outcome-based, intention-based, or expectation-based motive to prefer one procedure over another. To understand the nature of 'EQ'-subjects' procedural choices, we studied whether and how these choices related to the ethical criteria which subjects employed to determine whether a course of action is ethically right or wrong. 'EQ'-subjects more likely preferred one procedure over another, the more often they argued in terms of Kohlberg (1969, 1984) class five (*postclass 1*), that is, in terms of individual rights as stipulated by the social contract when making such a moral judgement. There did, therefore, seem to

be an ethical criterion at play which was outcome-independent as we require. We also observed purely procedural choices of 'EQ'-subjects which linked to subjects' simplicity rankings of the procedures, or to self-reported concerns for purely procedural efficiency.

It is possible, however, that the procedural choices which we reported for 'EQ'-subjects in section 6 result from a selection effect. A selection effect would imply that 'EQ'-subjects differ from all other subjects in some characteristic which is *critical* for a purely procedural choice, and that therefore, the new type of preference which we report is either significantly more, or less prevalent in non 'EQ'- than in 'EQ'-subjects. To test for such an effect, we use the motivations behind 'EQ'-subjects' purely procedural choices – the characteristics which were *critical* for their purely procedural choices – and test whether these motivations are per se more relevant to 'EQ'-, than to non 'EQ'-subjects.[35]

Appendix H shows that 'EQ'-subjects do not care more for ethical criteria of *postclass 1*, and do not care more for simplicity or efficiency than their non 'EQ' counterparts. These variables were positively linked to the purely procedural choices in section 6.3. Similarly, 'EQ'-subjects cannot be confirmed to score *lower* on variables which were *negatively* linked to the purely procedural choices in section 6.3. For each motive we also derive the critical 'strength' – the critical value – for which the binary logit models in section 6.3 start to predict a purely procedural choice and perform Fisher's exact test to see whether there are significantly more 'EQ'-, than non-'EQ'-subjects who score above this critical threshold. We did not find any significant difference for any explanatory variable in any type of procedural choice, or any role around these thresholds. Therefore, we do not find evidence for a selection effect.

7.4 Do demographics determine 'EQ'-subjects' procedural choices?

The connection between 'EQ'-subjects' procedural choices and their moral judgement scores may ultimately be due to a third, an omitted, variable. Subjects' responses to the moral judgement test, could, for instance, vary along with demographic information. While this study exclusively controls for gender, www.chlass.de/research.html provides results from four subsequent laboratory experiments (Chlaß 2010; Chlaß and Moffatt 2012; Chlaß et al. 2015; Chlaß and Riener 2015) on moral judgement which also control for students' age, personality, risk preferences, religion, religiosity, nationality, socio-economic status, and so forth. Only two of these potential controls are found significant at least once: i) students' gender and ii) their field of study: Law. For this paper's sample, however, neither *postclass 1*, nor $con \cdot post$ – the two moral judgement variables which link to students' procedural choices in section 6.3 – depend on gender (*postclass 1*: 0.01, *p-value*= 0.94; $con \cdot post$: 0.20, *p-value*= 0.39). ORSEE registrations reveal that 20 Law students participated in the yes-no/ultimatum game treatment in which moral judgement mattered. Since Law students score significantly lower than other students on both *postclass 1* (-0.47, *p-value*:< 0.05) and $con \cdot post$ (-0.57, *p-value*< 0.02), it is unlikely that they should more, or less often state a procedural choice than students of other subjects. It is hence also unlikely that they should produce the link between moral judgement and subjects' procedural choices

[35]The selection effect could also operate such that a link between these motivations and a purely procedural preference exists exclusively in 'EQ'-subjects. However, we have shown in the previous section that this is not the case.

in section 6.3. We could, therefore, not identify a potential confound for the connection between moral judgement and 'EQ'-subjects' procedural choices – the subject pool might have been too homogeneous for such a confound to emerge.

8 Conclusion

We present evidence that agents care about procedures in a way which no existing economic preference model explains: agents prefer certain procedures over others even when they do not expect these preferred procedures to generate more advantageous, more equal, or kinder outcomes. Moving away from these conditions which allow us to infer the existence of the preferences we suspect, we show that such preferences produce a wide range of behavioural anomalies amongst our participants.

Procedural preferences are not new, *purely procedural preferences* are[36]. So far, economists interested in procedural concerns have focused on preferences for fair randomizations over unequal outcomes, e.g. (Bolton et al. 2005), or preferences for procedures which generate *kind* distributions of outcomes (Sebald 2010). In both approaches, procedural preferences are conceived as preferences over the outcomes which different procedures generate. Even in psychology – a field with a long-standing empirical interest in procedural justice – procedural preferences have an inevitable distributive foundation, see (Cropanzano and Ambrose 2001) for an extensive review and a discussion of the psychological literature on 'purely' procedural preferences.

In this paper, however, we find evidence for preferences that a procedure itself should meet certain criteria which do not refer to the distribution of outcomes generated by this procedure at all: that it should distribute decision and information rights equally across parties, that it should be simple, and efficient. We also report instances where these ethical criteria explain individuals' decision to forego strategic advantages in a given allocation procedure.

In two-player pie-sharing procedures which yield the same expected material and psychological/other-regarding *equilibrium* payoffs, we find that subjects who – according to all social preference theories known to date – should be indifferent *in and off equilibrium*, still show preferences over the procedures at hand. Subjects therefore seem to care for *purely procedural criteria* – or put differently, they seem to care for *the rules of the game* without any reference to outcomes.

We provide supporting evidence that there are outcome-invariant ethical criteria behind these purely procedural concerns. Scores from a standardized moral judgement test (Lind 1978; Lind 2000; Lind 2008) measuring individuals' preferred ways of moral argumentation (Kohlberg 1969; Kohlberg 1984) consistently predict subjects' preferences for a procedure.[37] The more subjects use arguments

[36]The idea that the rules of the game by themselves may affect utility, is not new, see e.g. (Benz and Stutzer 2003). In a survey study, Frey and Stutzer (2005) report that self-reported happiness increases in citizens' democratic rights. Yet, this self-reported happiness can be the result of those procedural preferences ultimately based on outcomes which we discussed in section 3, of an improvement in citizens' life circumstances (the outcomes of the political process), as well as the right of participation (in the political process) itself. We study the existence of purely procedural preferences in a controlled setting and also find a concern for efficiency which may moderate concerns for increased participation.

[37]Sociologist Jean Piaget and psychologist Lawrence Kohlberg studied the types of moral argumentation which individuals in the field use when making a moral judgement. In Lind's (1978,2008) test, subjects are asked to moral judgements using precisely these types of argumentation reported by Piaget and Kohlberg. Subjects' preferences over pie-sharing

which refer to the respect for individual rights stipulated by the social contract – Kohlberg's (1969, 1984) class five of moral argumentation – when making a moral judgement, the higher is their estimated likelihood to prefer one pie-sharing procedure over the other (when behavioural theories unanimously claim subjects should be indifferent *in and off equilibrium*). We use this result to extend our analysis to the entire set of subjects. Many procedural choices by subjects who ignore or actively forego expected payoff advantages can be modelled by exactly the same ethical criterion as on the set of indifferent subjects. This holds for 48% (51 out of 106) of those participants who should not be indifferent between the yes-no and the ultimatum game, and for 23% of those participants who should not be indifferent between the dictator and the ultimatum game (24 out of 106). Some subjects seemingly try to 'compensate' the rules of the game behaviourally.

Why care about purely procedural preferences? One might argue that the core interest of the economic discipline lies in observed choices and outcomes, and neither in the personal nor in the institutional decision making procedures behind these (Gul and Pesendorfer 2005). Yet, take the election example from the introduction again. More individuals may vote in a procedurally fair than in an unfair election, even if the same candidate is expected to win equally likely in both cases. High abstention rates may undermine a democratic process by reducing the legitimacy of the winning candidate and trigger institutional change in the long run. Moreover, voters who find that electoral rules violate their ethical ideals – e.g. by giving some minority less rights to participate, or less information – may change their votes in the interest of that minority to compensate the infringement of the minority's rights. This would be one example how individuals who respect individual rights and the social contract may compensate the rules of the game by *altruistic* behaviour.

Consistent with this idea, Chlaß and Moffatt (2012) find that dictators' propensity to give in standard anonymous dictator games strongly increases in dictators' value of universal individual rights.[38] Notice that a dictator game is a procedure which denies the recipient any right to state her own will. There is also evidence that individuals show a distaste for discriminatory taxes, even when they are socially as efficient as non-discriminatory taxes and produce the same expected outcomes (Tyran and Sausgruber 2014). Purely procedural preferences might therefore affect tax morale and tax evasion. Arad and Rubinstein (2017) show that purely procedural preferences reduce the effectiveness of soft government interventions designed to 'nudge' (Sunstein 2014) individuals into more desirable behaviours because nudges impede individuals' freedom to choose and autonomy rights. Chlaß and Riener (2015) use this paper's preferences to explain when individuals are averse against cheating an opponent through sabotage, fabrication, or spying, and prefer to compete fairly.

procedures in our experiment link to the extent to which they invoke individual rights and the social contract in their moral judgement – exactly the ethical criterion underlying the preferences we formulate.

[38] This finding is robust under different frames, and under real-effort conditions.

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A Online Appendices[39]–NOT For PUBLICATION.

A.1 Instructions[40]

Instructions

Welcome and thank you for participating in this experiment. For showing up on time you receive €2.50. Please read the following instructions carefully. Instructions are identical for all participants. Communication with other participants must cease from now on. Please switch off your mobile phone.

If you have any questions, raise your hand – we will answer them individually at your seat.
During the experiment all amounts will be stated in ECU (Experimental Currency Units). The sum of your payoffs from all rounds will be disbursed to you in cash at the end of the experiment (exchange rate: 1 ECU=0.03 €). Your initial endowment is 20 ECU.

Information regarding the experiment

Participants take on different roles **A** and **B**. You do not know your role in the beginning and will at first make decisions for role **A** as well as for role **B**. You will then be randomly assigned one role and will be informed accordingly. From then on, roles remain the same throughout the experiment.

You will be randomly matched with **other anonymous participants**. Your decisions affect your own payoff and often also the payoffs of those participants with whom you interact.

In the experiment, you encounter two situations. These situations are characterized as follows:

Situation 1. There are **200 ECU**. Participant **A** chooses between two options **X** and **Y** to allocate these 200 ECU to herself and participant **B**.

X: She allocates **100 ECU** to herself and **100 ECU** to participant **B**.
Y: She allocates **20 ECU** to herself and **180 ECU** to participant **B**.

Participant **B does not learn** which allocation **A** has chosen. **B** chooses between **U** and **V**:

U: **B agrees** with the allocation **unknown to her**. The allocation then corresponds to participants' payoffs in ECU.

V: **B disagrees** with the allocation **unknown to her**. Both participants obtain a payoff of **0 ECU**.

[39] available from http://www.chlass.de/research.html.

[40] Instructions of the experiment were written in German. The following chapter reproduces a translation into English for experimental sessions which introduced the Ultimatum and the Yes-no game. Emphases in bold or italic font are taken from the original text, **TEXT IN CAPITAL LETTERS WAS NOT PART OF THE ORIGINAL INSTRUCTIONS**. Instructions for other treatments are available from the authors.

Situation 2. There are **200 ECU**. Participant **A** chooses between options **X** and **Y** to allocate these 200 ECU to herself and participant **B**.

X: She allocates **100 ECU** to herself and **100 ECU** to participant **B**.
Y: She allocates **20 ECU** to herself and **180 ECU** to participant **B**.

Participant **B learns** which allocation **A** has chosen. **B** chooses between **U** and **V**.

U: **B agrees** with the allocation **known to her**. The allocation then corresponds to participants' payoffs in ECU.

V: **B disagrees** with the allocation **known to her**. Both participants obtain a payoff of **0 ECU**.

All participants now make their decisions for each situation and each role. You state for role **A** which option (**X** or **Y**) you choose in situation 1 and situation 2. For role **B**, you choose between **U** and **V** for both situations. Both situations are initialized to occur with probability 0.50 (50%). The decisions made for the situation which is drawn become payoff relevant. Payoffs are calculated as described above.

Have a little patience until the experiment starts. Please be quiet. If you have any questions, raise your hand. Before the experiment starts, please answer the following comprehension questions.

A.2 Control Questions

Comprehension Questions[41]

1. Assume that participants choose as follows:

participant A:

situation 1	situation 2
X	X

participant B:

situation 1	situation 2	
	if X	if Y
agrees	agrees	disagrees

This means that in situation 1 and in situation 2, participant A chooses X. Participant B agrees in situation 1. In situation 2, she agrees if A chooses X, and disagrees if A chooses Y.
If situation 1 realizes, what is (in ECU)

(a) participant A's payoff?

(b) participant B's payoff?

If situation 2 realizes, what is (in ECU)

[41] COMPREHENSION QUESTIONS ABOUT THE ACTIONS AND SITUATIONS IN PHASE 1.

(a) participant A's payoff?

(b) participant B's payoff?

2. Assume that A and B still choose as described in 1., except that in situation 2, A now chooses Y.

   (a) What is participant B's payoff in situation 2?

Please press 'OK'.

3. What is the difference between situation 1 and 2? Please choose 'right' or 'wrong'.

   (a) In situation 2, B has two courses of action whereas in situation 1, she has only one.

   (b) Both in situation 1 and in situation 2, B knows which allocation A has chosen.

   (c) In situation 2, B can actually react to A's action whereas in situation 1, she can merely make a decision.

Please press 'OK'.

A.3 Instructions – Bidding Phase

Now, one of the two participants can influence which situation is drawn. With equal probability, lots are cast between A and B to determine which participant can actually influence the draw of the situations. This participant can pay an amount of 5 ECU such that a specific situation occurs. If she does not pay 5 ECU, both situations continue to occur with 50 % probability as they have been initialized. The decisions made earlier for the situation which is drawn are validated.

Payoffs are calculated as described in the instructions. The cost for changing the probabilities is subtracted from these payoffs, if, after casting lots, you can influence the draw of the situations.

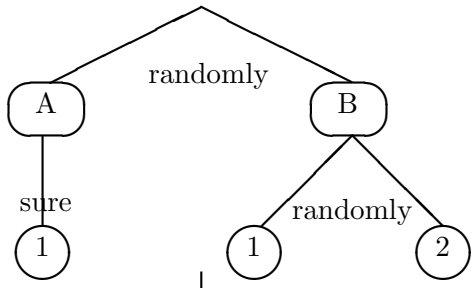
A.4 Control Questions – Bidding Phase

Comprehension Questions[42]

Assume that A preferred situation 1 and paid 5 ECU for this situation. B preferred situation 2 but did not pay for this situation. Lots have not yet been cast which participant can actually influence the draw of the situations. How likely is it that situation 1 occurs?

[42] ABOUT THE INSTRUCTIONS FOR PHASE 2, I.E. THE BIDDING MECHANISM.

Some graphical help:



A has paid for situation 1. Situation 1 is certain.

B has not paid for situation 2. Both situations continue to occur with 50 % chance.

Please tick 'true' or 'false':

1. Situation 1 is certain. true/false.
2. Situation 1 is more likely than situation 2 (but not certain). true/false.
3. Situation 1 is as likely as situation 2. true/false.
4. Situation 1 is less likely than situation 2 (but not impossible). true/false.
5. Situation 1 is impossible. true/false.

Please press 'OK'. *(SUBJECTS ALSO HAD THE POSSIBILITY TO GO BACK TO THE PREVIOUS SCREEN WHICH SHOWED THE INSTRUCTIONS FOR THE BIDDING PHASE – SEE ABOVE.)*

A.5 Elicitation of preferences over procedures

REMINDER

With equal probability, lots are cast between A and B to determine which participant can actually influence the draw of the situations. This participant can pay an amount of 5 ECU such that a specific situation occurs. If she does not pay 5 ECU, both situations continue to occur with 50 % probability as they have been initialized. The decisions made earlier for the situation which is drawn are validated. If lots determine that you can influence the draw of the situations, 5 ECU will be subtracted from your payoff for changing the probabilities.

Assume that lots will be cast such that you can influence the draw of the procedure. You proceed as follows: 1. Please state whether you prefer any situation. If you do, please state which one. 2. Tick whether you want to pay 5 ECU such that your preferred situation occurs.

1. I prefer
   - ○ no situation
   - ○ situation 1
   - ○ situation 2

2. I want to pay 5 ECU such that my preferred situation occurs
   - ○ no
   - ○ yes

A.6 An Excerpt of the Moral Judgement Test by Georg Lind (1976, 2008). The test is freely available from georg.lind@uni-konstanz.de. For the analysis, see footnote 27.

Doctor

A woman had cancer and she had no hope of being saved. She was in terrible pain and so weak that a large dose of a pain killer such as morphine would have caused her death. During a temporary period of improvement, she begged the doctor to give her enough morphine to kill her. She said she could no longer stand the pain and would be dead in a few weeks anyway. The doctor decided to give her an overdose of morphine.

28. Would you agree or disagree with the doctor's action ...

I strongly *dis*agree						I strongly agree
-3	-2	-1	0	1	2	3

How acceptable do you find the following arguments *in favor* of the doctor?
Suppose someone argued he acted *rightly*...

. . .

30. because the doctor was the only one who could fulfill the woman's will. Respect for her will made him act as he did.

I strongly reject								I strongly accept
-4	-3	-2	-1	0	1	2	3	4

. . .

34. because most of his fellow doctors would presumably have done the same in a similar situation.

I strongly reject								I strongly accept
-4	-3	-2	-1	0	1	2	3	4

How acceptable do you find the following arguments *against* the doctor?
Suppose someone said that he acted *wrongly*...

35. because he acted contrary to his colleagues' convictions. If they are against mercy-killing, the doctor shouldn't do it.

I strongly reject								I strongly accept
-4	-3	-2	-1	0	1	2	3	4

36. because one must be able to have complete faith in a doctor's devotion to preserving life even if someone in great pain would rather die.

I strongly reject								I strongly accept
-4	-3	-2	-1	0	1	2	3	4

. . .

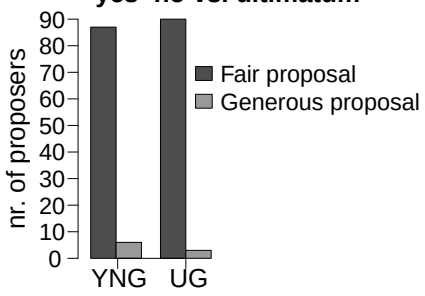
Thank you!

NOTE: This excerpt of the test is given with kind permission by Georg Lind. The excerpt reproduces one (of two) dilemmas, and four (out of 24) arguments. The first argument (nr. 30) is one of altogether four which represent *Kohlberg class five*; the second (nr. 34) and third (nr. 35) are two of altogether four arguments which represent *Kohlberg class three*, the fourth argument (nr. 36) represents again *Kohlberg class five*. Three dots represent places where, due to copyright protection of the original publication, the excerpt leaves out one or several items.

B Overall behavior across protocols

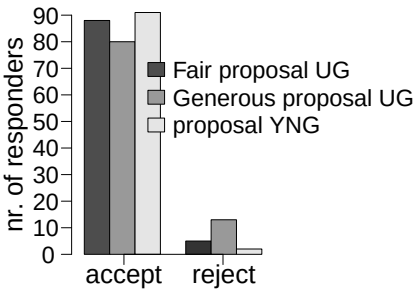
B.1 Allocations and acceptance decisions within protocols

Fig. A−I) Proposer actions (n=93) yes−no vs. ultimatum



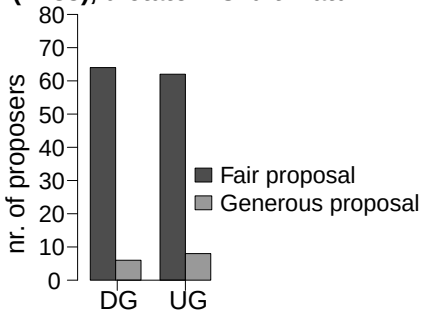
How many proposers make a given proposal?

Fig. A−II) Responder actions (n=93), yes−no vs. ultimatum



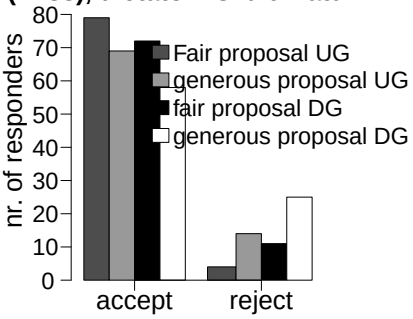
How many responders accept/ reject in YNG and UG

Fig. A−III) Proposer actions (n=83), dictator vs. ultimatum



How many proposers make a given proposal?

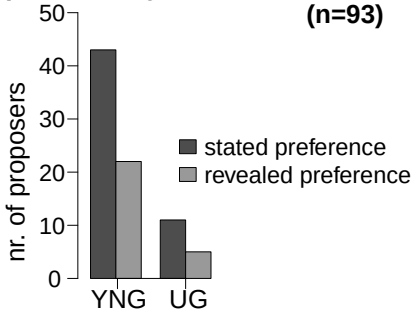
Fig. A−IV) Responder actions (n=83), dictator vs. ultimatum



How many responders accept/agree reject/disagree in UG and DG

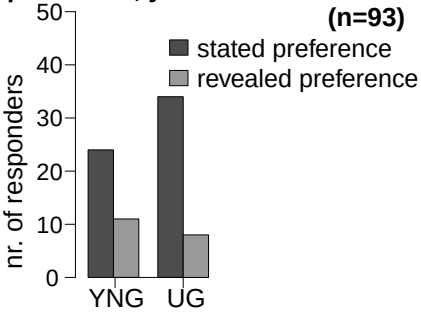
B.2 Procedural choices

Fig. A−V) Proposers' choice of procedure, yes−no vs. ultimatum (n=93)



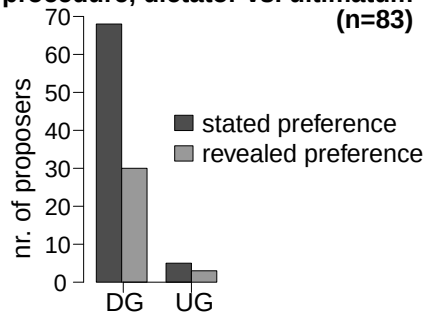
How many proposers state, how many reveal to prefer a procedure?

Fig. A−VI) Responders' choice of procedure, yes−no vs. ultimatum (n=93)



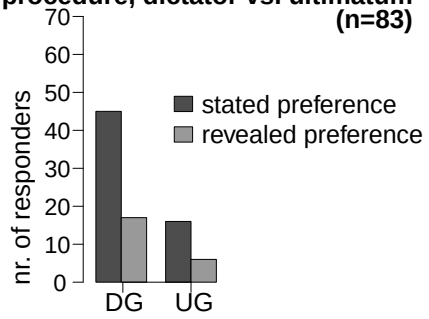
How many responders state, how many reveal to prefer a procedure?

Fig. A−VII) Proposers' choice of procedure, dictator vs. ultimatum (n=83)



How many proposers state, how many reveal to prefer a procedure?

Fig. A−VIII) Responders' choice of procedure, dictator vs. ultimatum (n=83)



How many responders state, how many reveal to prefer a procedure?

C Lawrence Kohlberg's six 'classes' or 'ways' of argumentation.

Table A1: Six ways of moral argumentation (summary by Ishida 2006, examples from the authors).

argumentation	Classes of motivation for moral behavior	I prefer...
preconventional way	***Kohlberg 1.*** Orientation to punishment and obedience, physical and material power. Rules are obeyed to avoid punishment. ***Kohlberg 2.*** Naïve hedonistic orientation. The individual conforms to obtain rewards.	...the yes-no game because therein, I will not be punished for not being generous./ ...the ultimatum game: because the responder can and will reward me for being generous by accepting the proposal.
conventional way	***Kohlberg 3.*** "Good boy/girl" orientation to win approval and maintain expectations of one's immediate group. The individual conforms to avoid disapproval. One earns approval by being "nice".	...the ultimatum game because therein, I can signal my generous intentions to the responder who will reciprocate by accepting/
	Kohlberg 4. Orientation to authority, law, and duty, to maintain a fixed order. Right behavior consists of doing one's duty and abiding by the social order.	...because the responder expects me to be generous, and in the ultimatum game, I can show the responder I do not want to disappoint her expectations and let her down...
postconventional way	***Kohlberg 5, 'postclass 1'.*** Social contract orientation. Duties are defined in terms of the social contract and the respect of others' rights. Emphasis is upon equality and mutual obligation within a democratic order.	...the yes-no game: it is more democratic since it grants both parties equality in decision and information rights/...the ultimatum game: it proceeds more transparently and the social contract can only be backed by transparent institutions/
	Kohlberg 6, 'postclass 2'. The morality of individual principles of conscience, such as the respect for the individual will, freedom of choice etc. Rightness of acts is determined by conscience in accord with comprehensive, universal and consistent ethical principles.	...the ultimatum game: as proposer, I respect the responder's will and she has more opportunity to express this will in the ultimatum game

D Purely procedural concerns

D.1 Inequality in information: Formalization

As before, we use the terminology of Osbourne and Rubinstein (1994) if not otherwise stated. Let Γ be a two-player extensive form game where each player moves at most once. Let $s_i \in S_i$ be a strategy of player i in her strategy set in that game. A terminal history of the game in the set of terminal histories is denoted by $z \in Z$.

If we wish to model players who care about the interpersonal dimension in the distribution (or put differently, the precision) of information, we first need a means to express the amount of information each player has. There are two sources of information for a player: first, information about events exogenous to the game (e.g. information about nature's move) that each player has. Second, the information which each player learns about her opponent's actions. We assume here that each player can perfectly control and learn her own actions, and also assume perfect recall. Information from both sources determines how well a player can predict which terminal node or history of a game will be reached. If both players can transparently observe all actions and gain all relevant information about exogenous events and all actions at each stage of a procedure, then each player knows the terminal history for sure and coincidentally, there is also equity of information (there is also equity of information if players ignore the terminal history of the game to the same extent). If one of the players knows all relevant aspects and controls all decisions determining the allocation of material benefits in the game and this takes place without any transparency or possibilities for the opponent to monitor those actions, then there is severe asymmetry of information about the terminal histories of the game. Hence, we express the amount of information for each player by the fragmentation of her information partition about the terminal histories of the game. These information partitions have, to date, not directly entered the utility function, and thus not been modelled as directly relevant for indvidual preferences.

Let us denote player $j's$ partition of information over the terminal nodes with $\mathcal{I}_j^z$. This is what j knows about terminal nodes given j's own information, what j learns about $i's$ actions, and the control j has over her own actions when she is active. These partitions for players 1 and 2, respectively, will in a natural way be perfectly determined by the player nodes, information partitions, and action sets for each player.

As examples, consider the ultimatum game and the yes-no game. In both games, both players fully control their own actions: the proposer fully controls her proposal, the responder fully controls her acceptance/rejection decision. Yet, the two games differ regarding how much the responder knows about the proposal. In the ultimatum game, the responder learns the proposal made by the proposer. Since in addition, the responder also controls her own decision, she knows which terminal node will be reached. Therefore, the four terminal nodes of the ultimatum game are partitioned into singleton sets for the responder. The proposer in turn fully controls her own action – the proposal she makes/made. She does, however, not know how the responder reacts to each of her two potential proposals. Thus, the proposer's information partition over the terminal nodes consists of two non-singleton sets each containing two terminal nodes: the first set contains the responder's acceptance and rejection of the fair proposal; the second set containing the acceptance and rejection of the generous proposal. In

summary, the cardinality of the information partitions over the terminal nodes of the ultimatum game are 2 for the proposer, and 4 for the reponder, respectively. In the yes-no game, the responder does not learn the proposal. She fully controls her acceptance/rejection. Thus, her partition over the terminal histories of the game contains two sets, i.e. has *cardinality two*: one set with the two possible terminal histories where the responder has accepted, another set with the two terminal histories where she has rejected. The proposer's information partition is identical in the yes-no and the ultimatum games, since she controls the proposal, but does not know how the responder will react. The information partition has therefore *cardinality two* as well.

Using these measures for how much information each player has, we can now express a player's aversion to information asymmetries. If player i cares about purely procedural fairness and the equality of access to information in particular, her preferences could be characterized by the utility function

$$u_i(s_i, s_j; b_i, b_j) - \beta_i max\{\#\mathcal{I}_i^z - \#\mathcal{I}_j^z, 0\} - \alpha_i max\{\#\mathcal{I}_j^z - \#\mathcal{I}_i^z, 0\}$$

where $u_i(s_i, s_j; b_i, b_j)$ captures the social welfare function dependent on the outcome s_i, s_j (as in inequity aversion models; Fehr-Schmidt, 1999; Bolton and Ockenfels, 2000, for instance) and possibly on players' belief systems b_i, b_j (as in psychological games; Battigalli and Dufwenberg, 2009). The procedural fairness notion of inequity aversion in access to information is modelled as $-\beta_i max\{\#\mathcal{I}_i^z - \#\mathcal{I}_j^z, 0\} - \alpha_i max\{\#\mathcal{I}_j^z - \#\mathcal{I}_i^z, 0\}$ where the first term captures the aversion for advantageous inequality in access to information and the latter term the aversion for disadvantageous inequality in access to information. Notice that the cardinality of a set B, $\#B$, denotes the number of elements in that set. This is the simplest specification with piecewise linear utility in information asymmetries. As an analogy with Fehr-Schmidt (1999), it is natural to assume that $\alpha_i \geq \beta_i$ so that players are assumed to be more aversive to disadvantageous inequality than to advantageous inequality. Thus a proposer and a responder with identical procedural preferences facing a choice between the same two procedures may each prefer a different procedure just, because of their role, the inequality in access to information in a given procedure is advantageous for one of the players and disadvantageous for the other (see tables 3 and 4 in section 6). Such a proposer would have a payoff $u_1^{UG}(s_1, s_2; b_1, b_2) - \alpha_1 max\{\#\mathcal{I}_2^{z,UG} - \#\mathcal{I}_1^{z,UG}, 0\} = u_1^{UG}(s_1, s_2; b_1, b_2) - \alpha_1 max\{4-2, 0\}$ in the ultimatum game, and a payoff $u_1^{YNG}(s_1, s_2; b_1, b_2) - \alpha_1 max\{\#\mathcal{I}_2^{z,YNG} - \#\mathcal{I}_1^{z,YNG}, 0\} = u_1^{YNG}(s_1, s_2; b_1, b_2) - \alpha_1 max\{2-2, 0\}$ in the yes-no game. Thus the proposer with purely procedural concerns of equality of information would strongly prefer the yes-no game if the terms $u_1^{UG}(s_1, s_2; b_1, b_2)$ and $u_1^{YNG}(s_1, s_2; b_1, b_2)$ are equal (which requires analogous actions and beliefs in the two procedures, see table 2, section 3). The responder with purely procedural concerns of equality of information would also prefer the yes-no game but her preference would be weaker since $\alpha \geq \beta$. This is in line with the observed revealed preference patterns over the two procedures (see table 4, section 6).

D.2 Procedural transparency

Hegel (1821, §215) argues that people should have an equal claim to jurisprudence which can only be the case if the law is transparent, and in particular, if all decisions pertaining to judicial processes are common knowledge to all parties at all points in time. In game theoretic terms, a transparent

procedure is therefore one of perfect information: each player is informed about all decisions that have been made before she is called upon to play. Transparency implies that the game grants each party equal (all available) information about the history of the game, and therefore also involves an equality (a fairness) argument. Rawls (1958) argues that transparency – along with simplicity, and equal freedom of choice – define fairness which in turn promotes justice. Transparency of institutions, does, therefore, also have ethical content. Moreover, as a necessary feature of those institutions backing the social contract, it could be motivated by the same ethical criterion from which preferences about the equality of rights should spring, that is, Kohlberg class 5, see table 5. There are two games which proceed transparently in our setting: the dictator, and the ultimatum game. Whenever a party is called upon to choose, she knows all decisions which have previously been made. Note that subjects who choose between the yes-no and the ultimatum game can only opt for transparency (i.e. the ultimatum game) at the cost of introducing unequal information and unequal decision rights.

D.3 Procedural simplicity

We express the simplicity of a procedure by the number of eventualities a player needs to reason about, see already (de Tocqueville 1868) for some aspects, and the desirability of this property[43]. This number of eventualities depends on two elements: the number of the opponent's choices, and the number of the player's own choices. For each opponent choice, the player must determine what her own preferred reaction to this choice is, and whether given this reaction, the opponent choice was in the opponent's interest given some preference the opponent might hold. The higher this number of eventualities, the more cognitive effort is required, and the more cognitive resources are bound. Players could prefer procedures where the number of strategic eventualities she needs to consider, is small(er). In the yes-no game, each player has to think about the two moves of her own, and the two moves of the other player. Therefore, each player in a yes-no game has to think about altogether only four possible combinations of moves (which coincides with the cardinality of a player's set of 'pure strategies')[44]. In the ultimatum game, each player has to think about the proposer's two moves, and the responder's two moves given each proposal. Altogether, each player needs to think about six possible combinations of moves. In terms of procedural simplicity, the yes-no game is therefore *simpler* than the ultimatum game. Since the yes-no game also distributed rights equally while the ultimatum game did not, a natural way to disentangle these motivations is to look whether a player's preference for the yes-no game correlates with her moral judgement (motive: distribution of rights), or not (motive: simplicity). Looking at this paper's specific dictator game, proposer and responder also have to think about six eventualities each: the proposer needs to understand that whatever she proposes, whether the responder agrees or disagrees with each proposal, does not change the final allocation. The responder needs to understand the same.

[43]The complexity of strategies has also been described game-theoretically by e.g. Rubinstein (1986) or Kalai and Stanford (1988)

[44]We do not explicitly consider mixed strategies. But note that the pure strategies are the limiting case for each mixing strategy, and therefore, two different sets of distinct pure strategies – whatever they are – always spawn the exact same number of mixed strategies on a continuous scale.

D.4 Procedural efficiency

In our setting, the proposer can only make a fair, and a generous proposal. Hence, she cannot bias distributive fairness in a self-serving way. The veto right in our mini-ultimatum game thus does not protect the responder from a proposer's self-serving distributive unfairness: the veto is merely an inefficiency-inducing option. Responders and proposers could intrinsically value procedures which preclude conflict, even if they know for sure they agree, and that conflict is a purely hypothetical scenario. In our setting, the only game which meets the criterion of purely procedural efficiency, is the dictator game.

Table A2: Yes-No Game vs Ultimatum Game: Distribution Of Rights across proposer and responder, Simplicity, Transparency, and Efficiency of each game.

	role	yes-no game	ultimatum game
decision rights (nr. of effective pure strategies)	proposer	2	2
	responder	2	4
	distribution of rights	$\{2,2\}$	$\{2,4\}$
information rights (cardinality of information partition over terminal nodes)	proposer	2	2
	responder	2	4
	distribution of rights	$\{2,2\}$	$\{2,4\}$
simplicity (sum of own and opponent's moves a party has to reason about)	proposer responder	4	6
transparency: game has perfect information	proposer responder	no	yes
efficient regulation of conflicts?		no	no

Table A3: Dictator Game vs Ultimatum Game: Distribution Of Rights across proposer and responder, Simplicity, Transparency, and Efficiency of each game.

	role	dictator game	ultimatum game
decision rights (nr. of effective pure strategies)	proposer	2	2
	responder	1	4
	distribution of rights	$\{2,1\}$	$\{2,4\}$
information rights (cardinality of information partition over terminal nodes)	proposer	4	2
	responder	4	4
	distribution of rights	$\{4,4\}$	$\{2,4\}$
simplicity (sum of own and opponent's move a party has to reason about)	proposer responder	6	6
transparency: game has perfect information	proposer responder	yes	yes
efficient regulation of conflicts?		yes	no

E Predictions of existing theories

Let us now show in detail (intuitions have been given in the main text) that existing and ultimately outcome-based preference models have a hard time explaining procedural preferences in this paper's setting. Purely distributive theories are discussed in the main text. Here, we focus on models that build upon psychological game theory and for which proofs are a little more intricate.

E.1 Psychological game theory

Reciprocity. If responders care for the kindness of the intention behind a proposal, they compare the actual proposal with other proposals that could have been made. The kindness of a proposal therefore depends on the set of possible proposals. The unrestricted set of proposals is a set where the pie can be split into any numerically possible way. On this set, the equal division is fair. If only two options are available, the equal split may be considered even fairer. Indeed, Falk et al (2003) hardly ever find responders who reject meager offers in mini-ultimatum games when only two proposals are possible – suggesting that even meager offers are more acceptable for the smaller set. Apart from restricting the set of proposals, our experimental design also has no proposal where the proposer earns more than the responder. Hence, both allocations: $(100, 100)$, and $(20, 180)$ should appear kind and be accepted. We next discuss reciprocal concerns in the frameworks of Falk and Fischbacher (2006), and Dufwenberg and Kirchsteiger (2004).[45] Throughout, reciprocal preference models assume that individuals invoke others' intentions to derive the right course of action.

Reciprocity – Falk and Fischbacher (2006). The kindness of player j towards i at node n is defined as $\varphi_j(n, s_i'', s_i') := \vartheta_j(n, s_i'', s_i')\Delta_j(n, s_i'', s_i')$ where s_i' represents i's first-order belief about the strategy of j and s_i'' is i's second-order belief (the belief about the first-order belief of j). In equilibrium, this second-order belief coincides with a player's actual behaviour. The term $\Delta_j(n, s_i'', s_i') = x_i(n, s_i'', s_i') - y_j(n, s_i'', s_i')$ expresses the perceived payoff difference, $\vartheta_j(n, s_i'', s_i') \in [0, 1]$ measures the degree of intentionality in j 's choices. For negative Δ_j, player j is unkind to i whereas for positive Δ_j, player j is kind. For binary choices, a player is intentionally unkind if she gives her opponent a smaller share of the pie than she keeps herself when she might have offered the opponent the larger share. A player is unintentionally unkind to her opponent if she gives her opponent a smaller share of the pie than she keeps for herself but had no opportunity to give the same or the larger share. For all our procedures and all their outcomes, the difference between what the proposer gave and what she kept, i.e. Δ_j, remains non-negative. Therefore, the *proposer* cannot be unkind.

The *responder* ensures equal payoffs both if she accepts the fair offer, and if she rejects it. The fair proposal $(100, 100)$ is not unkind and is therefore always accepted. The generous proposal $(20, 180)$ is even kinder. If a responder accepts this generous offer, she is unkind – because this gives her opponent less than herself. However, this unkindness is not deemed intentional, since rejecting the generous offer would give the proposer even less than the generous proposal does. Thus, the generous offer is accepted

[45] Cox et al. (2007, 2008) formulate an alternative to the psychological game theory models of reciprocity discussed in the main text of this appendix. In their model, a player's lost or gained payoff opportunities at earlier nodes of an extensive form game influence the subsequent marginal rate of substitution (MRS) between the player's own earnings and those of her opponent. The MRS remains constant across two games where the fair proposal is always proposed and each proposal is always accepted. Thus, also according to Cox et al. (2007, 2008) players are indifferent between this paper's protocols.

provided that purely distributional motives do not matter. If, however, an individual holds a high concern for equal outcomes *and* sufficiently strong reciprocal motives, Falk and Fischbacher (2006) can predict rejections of the generous offer in equilibrium. This reaction to the generous offer does, however, not matter, since the proposer in equilibrium prefers to propose the fair offer anyway. The fair proposal is accepted with certainty in every perfect equilibrium of both the mini ultimatum and the mini yes-no game. In the dictator game, the responder cannot be intentionally kind or unkind since she has no influence on any payoff. The proposer thus chooses the fair proposal. In summary, Falk and Fischbacher (2006) predict that the fair offer is always proposed and accepted with certainty in all procedures, and that each player earns 100. Since there are no payoff differences, the psychological payoffs are zero and the equilibrium payoffs identical in all procedures. No player should prefer one procedure over another.

Reciprocity – Dufwenberg and Kirchsteiger (2004). This model of reciprocity first identifies efficient strategies. The difference between the payoff a player gives her opponent with a specific strategy and the average payoff a player gives her opponent over all efficient strategies which are still available at a given node measures the kindness of a specific strategy (see Dufwenberg and Kirchsteiger, pp. 276). In every protocol of our setting, there is a single efficient responder strategy: the pure strategy which accepts every proposal. Thus, all responder strategies that put a positive probability on rejection are unkind, and the responder can only be neutral or unkind towards the proposer. This implies that the proposer always prefers the fair offer if the probabilities of acceptance of each offer are equal: there is no kindness she would need to reciprocate. Knowing that the fair offer will be proposed for sure, the kindness of the responder who rejects with probability q equals $q \cdot 100$ for the yes-no game, and the ultimatum game. If the proposer believes that each offer is accepted with probability q, her kindness in proposing the fair offer is[46] $(q \cdot 100 - q \cdot (100 + 180)/2)$ in both games. Each player's equilibrium payoff is thus identical in the mini-ultimatum and the mini- yes-no game given her sensitivity to reciprocity. In equilibrium therefore, players are indifferent between these two procedures.

In the dictator game, each proposal is accepted with certainty. The responder has no influence on payoffs and for this reason, is always neutral towards the proposer. Therefore, psychological payoffs are zero, preferences coincide with rational self-interest, and the proposer chooses the fair proposal. As we saw above for the ultimatum and yes-no game, accepting both offers with certainty is efficient and expresses zero kindness towards the proposer. The psychological payoffs are zero as in the dictator game. Players who believe that every proposal is accepted with certainty in all games and who expect the fair proposal to be always proposed are indifferent between the dictator, ultimatum, and yes-no game. At the bottom of this appendix, we characterize all equilibria of the games at hand under the constraint of equal acceptance probabilities across nodes and games (which is a necessary condition for procedural indifference and a feature imposed by the empirical analysis).

General remark on psychological games. In psychological games, payoffs depend explicitly on beliefs and thus, expected payoffs do not have to be linear in probabilities (contrary to standard expected utility theory). Specifically, the psychological payoffs of the two theories of reciprocity are quadratic

[46] The difference between the expected responder payoff in the fair offer, i.e. $q \cdot 100$, and the expected average responder payoff over all efficient available strategies, i.e. $q \cdot (100 + 180)/2$.

in beliefs. For instance, the responder's evaluation of the proposer's kindness depends explicitly and quadratically on how likely she deems the generous offer. We denote this probability by $1-p$. Since in the ultimatum game, the responder reacts to updated information about this probability, the expected payoff of the responder differs from his expected payoff in the yes-no game (where the responder does not receive an information update) whenever the ex-ante belief about the probability of the fair offer is $0 < p < 1$, even if ex ante beliefs are identical in the two games (by Jensen's inequality). The expected payoffs are yet equal in the two games if ex ante, the fair offer is either certain, i.e. $p = 1$, (as predicted by sequential reciprocity equilibrium if acceptance rates are equal, see appendix E) or impossible, i.e. $p = 0$.

Guilt aversion (Battigalli and Dufwenberg 2007; Charness and Dufwenberg 2006) is yet another other-regarding concern which can also be modelled via psychological game theory. In these theories, guilt matters only if a player harms the other and lets the other down (Bicchieri, 2006, pp. 52; Battigalli and Dufwenberg, 2007, pp. 171; Miettinen, 2013, pp. 71). If the responder expects the proposer to expect rejection, the responder does not harm the proposer by accepting instead and the responder's guilt payoff is zero. Thus, the responder's preferences coincide with rational self-interest and she always accepts. If the responder expected the proposer to put some weight on acceptance in her beliefs, rejecting would harm the proposer. The responder's guilt payoff will then only increase her incentive to accept. Therefore, the responder always accepts, and her guilt payoff is zero. A very guilt averse proposer who very much expects the responder to expect a generous offer might indeed offer $(20, 180)$. However, as long as actual actions and actual beliefs are the same for two procedures, guilt averse parties are indifferent between them. This differs from reciprocity, because in guilt aversion, psychological payoffs are linear in beliefs (Battigalli and Dufwenberg 2007), and not quadratic. In terms of ethical criteria, a guilt averse individual invokes others' expectations (Battigalli and Dufwenberg 2007, p. 170) or social norms (Bicchieri 2006, López-Pérez 2008) to derive the right course of action.

E.2 Predictions of the sequential reciprocity equilibrium (Dufwenberg and Kirchsteiger (2004)).

Proposition (YNG). *Since, by construction of the yes-no game, the fair and the generous proposal are accepted with equal likelihood, there is a unique equilibrium. The proposer (all types) proposes F. A responder with sensitivity to reciprocity $Y_R \leq 1/40$ accepts with probability one, a responder with $Y_P > 1/40$ accepts with probability $q = \frac{1}{40Y_R}$.*

Proof. The responder has a single efficient strategy (see Dufwenberg and Kirchsteiger, 2004, pp. 276): to accept with probability one. Therefore, the responder R is commonly known to be unkind towards the proposer P. The responder's kindness towards the proposer is captured by variable κ_{RP} where kindness is associated with a positive value and unkindness associated with negative value. By the above argument, $\kappa_{RP} \leq 0$.

Given acceptance rate q, the proposer's pecuniary payoff for proposing F is $100q$ and that for proposing G is $20q$. The responder's respective payoffs are $100q$ and $180q$. The proposer proposes F if the payoff for doing so (on the left-hand side of the following inequality) is greater than the payoff of proposing G (on the right-hand side)

$$100q + Y_P\kappa_{RP}(100q - \frac{100q+180q}{2}) > 20q + Y_P\kappa_{RP}(180q - \frac{100q+180q}{2})$$

where the parameter Y_P is the proposer's sensitivity to reciprocity, $(100q - \frac{100q+180q}{2})$ and $(180q - \frac{100q+180q}{2})$ measure the proposer's kindness κ_{PR} of proposing F and G, respectively. Since κ_{RP} is non-positive, the responder maximizes her payoff by proposing F.

The responder accepts if the payoff of accepting (the left-hand side of the following inequality) is greater than that of rejecting (on the right hand side)

$$100 + Y_R \times 0 \times \kappa_{PR} > 0 + Y_R \times (-100) \times \kappa_{PR}$$

where $\kappa_{PR} = \frac{100q-180q}{2} < 0$. The inequality simplifies to$Y_R < \frac{1}{40q}$. If to the contrary $Y_R > \frac{1}{40q}$, then the responder rejects the fair proposal. Notice that in equilibrium, the proposer must have correct beliefs about the rejection rate. Thus, in equilibrium the responder never rejects with probability one. The responder with sensitivity to reciprocity $Y_R \leq 1/40$ accepts with certainty and a responder of specific sensitivity $Y_R = \frac{1}{40q}$ is indifferent and accepts with probability $q = \frac{1}{40Y_R}$. *QED.*

Proposition (UG). *Under the assumption that the fair, and the generous offer are accepted with equal likelihood (under the restriction $q_F = q_G$), there is a unique equilibrium where $q_F = q_G = 1$. The proposer (all types) proposes F. A responder with sensitivity to reciprocity $Y_R \leq 1/40$ accepts with probability one. The proposer must expect $Y_R \leq 1/40$ with probability one.*

Proof. As in the yes-no game, the responder can only be neutral or unkind, $\kappa_{RP} \leq 0$. Given the acceptance rates q_F and q_G of the fair and the generous proposal respectively, the proposer's pecuniary payoff for proposing F is $100q_F$ and that for proposing G $20q_G$. The responder respective

payoffs are $100q_F$ and $180q_G$. The proposer proposes F if $100q_F + Y_P\kappa_{RP}(100q_F - \frac{100q_F+180q_G}{2}) > 20q_G + Y_P\kappa_{RP}(180q_G - \frac{100q_F+180q_G}{2})$, i.e. if

$$100q_F - 20q_G > Y_P\kappa_{RP}[180q_G - 100q_F].$$

There are three cases: (1) $q_G < 5/9q_F$. In this case, the proposer prefers F if

$$Y_P < \frac{100q_F - 20q_G}{\kappa_{RP}(180q_G - 100q_F)}.$$

(2) $5q_F \geq q_G \geq 5/9q_F$ (this includes the case $q_F = q_G$). In this case, proposers of all sensitivities Y_P prefer F. (3) $5q_F < q_G$. In this case the proposer prefers F if $Y_P > \frac{100q_F-20q_G}{\kappa_{RP}(180q_G-100q_F)}$.

We are interested in predictions under the restriction that the responder is expected to accept both proposals with equal probability, $q_F = q_G$ (this is something we control for by eliciting beliefs). In this case the proposer always proposes F. The responder who expects that the fair proposal is proposed accepts if $Y_R < \frac{1}{40q_F}$. By the same argument as above, the responder accepts with certainty if $Y_R < \frac{1}{40q_F}$, i.e. in equilibrium where beliefs are correct $Y_R < \frac{1}{40}$. There is no pure strategy equilibrium where the responder rejects with certainty. Yet, given a commonly known sensitivity type Y_R, there is a mixed strategy equilibrium where the type $Y_R = \frac{1}{40q_F}$ is indifferent and accepts with probability $q_F = \frac{1}{40Y_R}$.

Let us finally verify that it is optimal to accept G with probability $q_G = q_F$. Acceptance is preferred if

$$180 + Y_R \times 0 \times \kappa_{PR} > 0 + Y_R \times (-20) \times \kappa_{PR}$$

where $\kappa_{PR} = \frac{180q-100q}{2} > 0$ and thus acceptance is always preferred. The unique equilibrium under our restriction $q_F = q_G = 1$ where responder is of type $Y_R \leq 1/40$. *QED.*

Proposition (Procedural indifference). *If $q_F = q_G = 1$, each player is indifferent between whether UG or YNG is used/played.*

Proof. If $q_F = q_G = 1$, the proposer proposes F and the responder accepts with certainty. Thus. the responder's equilibrium payoff equals $100 + Y_R \times \kappa_{RP} \times \kappa_{PR}$ where both in the YNG and in the UG, $\kappa_{RP} = 0$ (the responder is neither kind or unkind). Thus the expected payoffs are equal in both games. It is easy to verify that the same argument implies that also the proposer payoffs are equal in the two games.

In the dictator game, the responder cannot influence the payoffs, so he can only be neutral $\kappa_{RP} = 0$. Thus the proposer receives the same payoff in the UG and in the DG, so does the responder. Therefore, there is procedural indifference between the two procedures if $q_F = q_G = 1$. *QED.*

F Appendix section 7.1 – precision of beliefs.

How imprecise is the unbiased belief elicitation method we apply? Theoretically – see Schlag and Tremewan (2012) for details – a subject who submits a belief that 4 out of 4 opponents choose a specific action, has a probabilistic confidence of 80 % or higher that all opponents choose this action. A subject in turn who submits that 0 out of 4 opponents choose that action has a probabilistic confidence of 80 % or higher that no opponent chooses this action.

$\geq$ 80 % confidence is not equal to 100% confidence, and yet our identification method for *purely procedural preferences* requires that we identify subjects who are 100% confident that each procedure generates the same outcomes, and who still pay for a(ny) game. An argument against our claim that we find evidence for new, purely procedural preferences goes as follows: *"The majority of 'EQ'-subjects prefers the yes-no game. An 'EQ' proposer who chooses between the mini-ultimatum game and the mini-yes-no-game could report a belief that 4 out of 4 responders accept the equal split in both games, and that four out of four responders also accept the generous split (20 ECUs for the proposer and 180 ECUs for the responder) in both games. Yet, this proposer might actually believe that the proposal in the yes-no-game will be accepted with probability 99 % and the fair fifty-fifty proposal in the ultimatum game with 81 % probability. If this proposer offers the equal split in both games, she would be* 0.18×100 *ECUs better off in the yes-no-game. Since the proposer can only influence the draw of the procedures with* 50% *probability in her pair and only if she pays* 5 *ECU, she would gain* $0.5 \times (18 - 5) = 6.5$ *ECU by paying for the yes-no game. Therefore, this proposer's so called purely procedural preference exhibits nothing but self-interest after all."*

Let us look at the relevant set of proposers who always offer the equal split. If the counter-argument above were true, then we must – firstly – observe that there are *more* such equal split proposers who report a *4/4* acceptance belief for the yes-no game than who report such a *4/4* belief for the ultimatum game.[47] This is, however, not true: there are *less* (64) proposers who always offer the equal split who report a *4/4* belief in the yes-no game than in the ultimatum game (66).[48] Summing up, we find that – if anything – proposers and responders would each expect to hold a small material *dis*advantage in the yes-no game. Self-interest can therefore, not explain the aggregate preference for the yes-no game which was also 'EQ'-subjects' main preference in 6.2[49]. Outcome-based equity theories do not explain the preference for the yes-no game either given the belief patterns mentioned: players can achieve an invisibly higher degree of expected equity by opting for the ultimatum game. Reciprocity

[47] If in the yes-no game, the acceptance likelihood were 99% and in the ultimatum game only 81%, then on a set of 84 proposers who always offer the equal split, we should observe $(0.99 - 0.81) \cdot 84 = 15$ *more* proposers with *4/4* beliefs in the yes-no game than we observe *4/4* beliefs in the ultimatum game.

[48] For 'EQ' responders, we can also reject the argument that they might in general expect an immeasurable material advantage in the yes-no game. Of 74 responders who accept all proposals in all games, 52 believe all four proposers offer the equal split in the yes-no game whereas only 47 think this is true in the ultimatum game. There are hence *more* responders who always accept and who expect all four proposers offer the generous split in the ultimatum game than there are such responders in the yes-no game. These belief results carry over to the complete set of participants: looking at *all* proposers, expected acceptance rates of *both* splits are *higher* in the ultimatum game than the expected acceptance rate in the yes-no game; looking at *all* responders, the generous split is expected more often in the ultimatum game than in the yes-no game. These results differ from the literature because we do not allow for a self-serving proposal.

[49] Coincidentally, the yes-no game is also the preferred according to a purely procedural preference for the equality of decision rights, see 4, the equality of information D.1, and purely procedural simplicity D.3.

explanations work into the same direction: if anything, the overall belief patterns suggest that both responders and proposers (with identical actions) would expect a higher psychological payoff in the ultimatum game. Hence, if parties had reciprocal preferences, they should unanimously prefer the kinder, the ultimatum game. Nevertheless, most prefer the yes-no game.

If the counter-argument were true, we should – secondly – observe that proposer choices for the yes-no-game correlate with moral argumentation from Kohlberg classes one to four, see appendix C – where material benefits, costs, social comparisons and norms, expectations and status determine what a subject deems to be the *right* course of action. This is, however, not what we observe. The evidence for purely procedural preferences in 6.2 correlated with Kohlberg class five in 6.3, a new ethical criterion upon which none of the existing preferences in section 3 builds, and an ethical criterion which explicitly refers to the equality of rights. It is also noteworthy that given the actual distribution of 'EQ' beliefs, risk-aversion would – if anything – predict that 'EQ'-subjects hold an aggregate preference for the ultimatum game where they would expect a weakly higher payoff at a lower risk.

Summing up, our evidence is indeed in line with purely procedural fairness, and at odds with outcome-based explanations building upon immeasurable differences in beliefs across games, or risk preferences. In particular, we need not make an equilibrium assumption at any point to show this. Finally, if the counter-argument were true, we should certainly not observe proposers who – motivated by the same new ethical criterion about the equality of rights – avoid the yes-no game when they expect a measurable material advantage (and hence, a disadvantage for the responder) for this game, but opt into this game when it does not hurt the responder and hence, is to their own disadvantage. Yet, sections 7.1-7.3 assemble these pieces of evidence which allow us to brush off concerns for hidden differences in beliefs and explore the robustness of our findings.

dictator vs. ultimatum game. On the relevant set of proposers – those who state an efficiency concern and who always offer the equal split – 95% report a *4/4* acceptance belief for the equal split in the ultimatum game but only 63% also report such a belief for the generous proposal (which they do not offer). In the dictator game, the expected acceptance probability is by construction 100%. Given these belief patterns, the main difference between both games would therefore lie in the greater *unkindness* of the ultimatum game, if immeasurable belief differences mattered at all. Yet, we do not observe that dictator game choices link to moral argumentation underlying reciprocal preferences according to which intentions, social norms, punishment avoidance, or a material cost-benefit analysis (Kohlberg classes one to three) determine the right course of action. On the responder side, the 65 who always accept report altogether more *4/4* equal split beliefs for the dictator than for the ultimatum game which implies a payoff advantage in the ultimatum game. Hence, self-interest or risk aversion could not explain why 'EQ' responders prefer the dictator game. Fairness and equity norms might be at play but in this case, responder choices of the dictator game would need to correlate with Kohlberg class three. Since i) choices of the dictator game do not correlate with any Kohlberg class, since ii) they do correlate with an efficiency concern, and since iii) self-interest cannot be at play given these beliefs, our evidence is again more in line with a purely procedural concern for efficiency.

G Appendix section 7.2 – other sets of beliefs.

G.1 Yes-No vs. Ultimatum Game

Within each cluster of beliefs and actions, we analyze whether individuals who choose a procedure *and* have a strategic incentive to do so, respond to this strategic incentive, or whether – just as their 'EQ'-counterparts – they are concerned about individual rights (or efficiency) and just coincidentally happen to believe that the procedures also generate different (subjective) outcomes. Similarly, we can test more generally whether individuals who prefer not to pursue their strategic gain (who for instance, state indifference when one game clearly yields them more payoff) do so out of a concern about the distribution of rights, or a concern about procedural efficiency, respectively.

A) Proposers with procedurally variant actions and beliefs, yes-no vs. ultimatum game. The WARD-clustering procedure on non-EQ proposers generated one cluster with #22, one with #9, and one with #20 proposers. The second cluster being too small to be analyzed, we manually merged it with cluster 1 thus keeping cluster 3 at maximal homogeneity[50]. In this merged cluster with #31 observations, proposers believe to have a material advantage in the ultimatum game, see table A4 for details on all clusters. Those who opt for the yes-no game and decide *against* their incentive make more use of *postclass 1* arguments than those who are indifferent (effect: 0.24, $z-stat: 3.94$, $p-value = 0.00$) with $n = 25$. Interestingly, also those proposers who act in line with their incentive and opt for the ultimatum game make more use of *postclass 1* arguments than those who are indifferent (effect: 0.29, $z-stat: 3.33$, $p-value < 0.01$) on $n = 16$. Altogether, 15/31 (48%) of all proposers in the merged cluster prefer the yes-no game, and 6/31 (19%) prefer the ultimatum game. In cluster 3 with $n = 20$, 10 proposers prefer the yes-no game, and 9 state to be indifferent. Most proposers who prefer the yes-no game expect a material advantage in this game. Instead, most proposers who state to be indifferent expect a material advantage in the ultimatum game but decide *not to pursue* this advantage. These proposers make more use of *postclass 1* arguments than those who prefer the yes-no game. If we exclude the only three proposers who state to be indifferent and have yet another incentive structure, the effect turns from weak (-0.25, $z-stat: -1.98$, $p-value < 0.047$) on $n = 20$ to intermediate significance (-0.29, $z-stat: -2.38$, $p-value < 0.017$) on $n = 17$. These proposers who state indifference and at the same time expect an advantage of an average 40 ECU in the ultimatum game might not wish to materially profit from amending the transparency of the procedure by choosing the ultimatum game – see appendix D.2 for a formulation of this property.

B) Responders with procedurally variant actions and beliefs, yes-no vs. ultimatum game. The initial clusters contained #22, #21, and #12 observations, respectively. In cluster 1, responders expect a payoff advantage in the ultimatum game. Those who nevertheless prefer the yes-no game make more use of *postclass 1* arguments than responders who prefer the ultimatum game (effect: 0.46, $z-stat: 2.96$, $p-value < 0.01$) with $n = 15$. Responders who opt for the yes-no game expect to forego an average strategic advantage of 98.33 ECU. Even responders who state to be indifferent and thus do not actively pursue their average advantage of 9.28 ECU in the ultimatum

[50]Since the results on cluster 1 before and after merging it with cluster 2 are the same, the additional heterogeneity introduced into cluster 1 is not critical. Note that only manually merging both clusters at this stage allow us to keep cluster 3 at maximal homogeneity and therefore, at maximal similarity in the strategic confound. Generating two clusters from the outset would have introduced more heterogeneity into *all* clusters and should therefore be avoided.

game care weakly more for *postclass 1* arguments than other responders who – in line with their material incentive – opt for the ultimatum game (effect: $+0.27$, $z-stat:+1.75$, $p-value=0.08$) with $n=16$. Moving to cluster 2 and 3, responders believe they have a payoff advantage in the yes-no game. Responders who state to be indifferent – and hence, prefer not to actively pursue an expected average strategic advantage of 32.08 ECU – make more use of *postclass 1* arguments than those who exploit their advantage and opt for the yes-no game. We merge both clusters to obtain a reliable sample size, and find a marginal effect of *postclass 1* arguments on the likelihood of being indifferent of 0.31 ($z-stat:4.12$, $p-value<0.01$) with $n=21$. Responders who prefer stating indifference over opting for the ultimatum game, make more use of *postclass 1* arguments, too (effect: $+0.22$, $z-stat:+2.15$, $p-value=0.04$) with $n=24$.

Table A4: Yes-No vs Ultimatum game: Strategic incentives, and actual procedural choices for both roles and all clusters in section 7.2

role	cluster nr. (# nr of observations in brackets)	game preference (#nr of observations in brackets)	material advantage *where?*	material advantage *size*	payment[51]
proposer	1 & 2 (#31)	indifference (#10)	ultimatum	11.50	cannot pay
		yes-no (#15)	ultimatum	1.00	9/15
		ultimatum (#6)	ultimatum	14.17	2/6
	3 (#17)	indifference (#6)	ultimatum	40	cannot pay
		yes-no (#10)	yes-no	9	5/10
		ultimatum (#1)	ultimatum	50	1/1
responder	1 (#22)	indifference (#7)	ultimatum	9.29	cannot pay
		yes-no (#6)	ultimatum	98.33	3/6
		ultimatum (#9)	ultimatum	26.67	1/9
	2&3 (#33)	indifference (#12)	yes-no	32.08	cannot pay
		yes-no (#9)	yes-no	22.78	6/9
		ultimatum (#12)	yes-no	33.75	4/12

G.2 Dictator vs. Ultimatum game

A) Proposers with procedurally variant beliefs, dictator vs. ultimatum game. Stated efficiency concerns perfectly predict proposers' choices of the dictator game in all clusters. #6 of #24 proposers choose the dictator game and state an efficiency concern in cluster 1, see also table A5 which summarizes all clusters. These efficiency-minded proposers expect a greater advantage (on average, 44.17 ECU) in the dictator game than their non-efficiency minded counterparts (24.67 ECU). Yet, only

[51] Reading example: Take the first line of table A4. The first cluster we analyzed in section 7.2 was a merger between cluster 1 with n=22 and cluster 2 with n=9. In the merged cluster, 10 subjects state they are indifferent. These 10 subjects believe they have a material advantage in the ultimatum game (see column 4.1) of an average 11.50 ECU (see column 4.2). Since only subjects who state a positive preference for one game can pay, these 10 subjects cannot pay (see column 5) to influence the draw of the procedures. Take the second line. 15 subjects state to prefer the yes-no game. On average, they believe to have a slight average advantage in the ultimatum game of 1 ECU. 9 out of them actually pay for the yes-no game. Hence, for this group, neither the stated preference, nor the payment decision are in line with their material incentive. Note also that for these subjects, those who pay and those who do not pay *reveal* whatever they state to prefer: both forego payoff but those who pay forego more than those who do not.

1 efficiency-minded proposer pays for this game while 8 (of 15) non-efficiency minded proposers do so. Again, proposers who value procedural efficiency might not wish to amend this property at the material expense of the recipient. In clusters 2 and 3, we observe an analogous effect. In cluster 2, #7 of #24 proposers who opt for the dictator game and state an efficiency reason expect a material advantage in the *ultimatum game* of an average 9.29 ECU. Amending the efficiency of the game does therefore not cause any material disadvantage to the recipient. Now, nearly all (#6 out of #7) efficiency-minded proposers pay for the dictator game. Non-efficiency minded proposers expect an advantage in the dictator game of an average 11.67 ECU but only #5 out of #12 of them pay for it. Altogether, 'efficiency' statements explain the dictator game choices for 27% of all non 'EQ'-proposers within a 99% confidence interval of $[12\%, 47\%]$.

Table A5: Dictator vs Ultimatum game: Strategic incentives, and actual procedural choices for efficiency-minded, and non-efficiency minded individuals opting for the dictator game; for both roles and all clusters in section 7.2

role	cluster nr. (# nr of observations in brackets)	game preference (#nr of observations in brackets)	motive[52]	material advantage *where?*	material advantage *size*	payment
proposer	1, $n = \#24$	indifference (#1)	(-)	dictator	80	cannot pay
		dictator (#21)	efficiency (#6)	dictator	44.17	1/6
			other (#15)	dictator	24.67	8/15
		ultimatum (#2)	(-)	dictator	55	1/2
	2, $n = \#24$	indifference (#1)	(-)	dictator	80	cannot pay
		dictator (#19)	efficiency (#7)	ultimatum	9.29	6/7
			other (#12)	dictator	11.67	5/12
		ultimatum (#2)	(-)	dictator	95	2/2
responder	1, #33	indifference (#7)	(-)	dictator	21.43	cannot pay
		dictator (#22)	efficiency (#6)	dictator	10	5/6
			other (#16)	dictator	30.94	9/16
		ultimatum (#4)	(-)	dictator	40	3/4
	2, #13	indifference (#4)	(-)	dictator	10	cannot pay
		dictator (#7)	efficiency (#3)	ultimatum	20	2/3
			other (#4)	ultimatum	20	2/4
		ultimatum (#2)	(-)	dictator	17.50	0/2
	3, #12	indifference (#3)	(-)	dictator	20	cannot pay
		dictator (#4)	efficiency (#2)	ultimatum	5	1/2
			other (#2)	dictator	25	2/2
		ultimatum (#5)	(-)	ultimatum	18	3/5

B) Responders with procedurally variant beliefs, dictator vs. ultimatum game. Turning to responders, stated efficiency concerns perfectly predict responder choices of the dictator game in all clusters. In cluster 1, #6 out of #33 responders (18%) choose the dictator game and state an efficiency concern. #5 of #6 efficiency-minded responders pay while expecting, on average, a material advantage of only 10 ECU. Non-efficiency minded responders expect three times this advantage (30.94

[52]We only classified whether a subject who had opted for the dictator game, had stated an efficiency reason in the open form section of the post-experimental questionnaire, or not. Subjects who chose the ultimatum game or stated indifference do therefore have no entries in the 'motive' table.

ECU) in the dictator game but only #9 of #16 pay for it. In cluster 2, #3 of #13 responders (23%) state an efficiency concern and choose the dictator game while expecting a material *dis*advantage of 20 ECU. #2 of #12 (17%)responders do so in cluster 3 expecting a material disadvantage of 5 ECU while non-efficiency minded counterparts expect an average advantage of 20 ECU. Altogether, responders who choose the dictator game for its 'efficiency' account for 19% of all non 'EQ'-responders with a 99% confidence interval of $[8\%, 36\%]$).

Table A6 shows postestimation results for each of the clusters in appendix G. We identify the critical threshold of *postclass 1* arguments for which the predicted outcome in a given Logit model changes and report the number of participants who score above this critical threshold. For choices between the dictator and ultimatum game, this amounts to counting who states an efficiency concern and opts for the dictator game since these correlate perfectly. Altogether, we obtain the estimated shares of non 'EQ' participants who act out of the same purely procedural motivation as 'EQ'-subjects did in section 6.3 which extends the analysis from sections 6.2 and 6.3 to the full set of participants.

Table A6: Logit models predict that 48% of non 'EQ'-subjects change their behaviour for *postclass 1* arguments (left table), 23% for efficiency arguments (right table).

role	cluster (#nr. of obs.)	UG vs. YNG	
proposer	cluster 1 (#31)	21 (68%)	[43%, 87%]
	cluster 2&3 (# 17+#3)	6 (30%)	[8%, 61%]
responder	cluster 1 (# 22)	6[53](27%)	[7%, 57%]
	cluster 2&3 (# 33)	18 (55%)	[31%, 76%]
all	106	51 (48%)	[35%, 61%]

role	nr. of obs.	DG $\succ$ UG, DG vs. UG	
proposer	cluster 1 (# 24)	6 (25%)	[7%, 53%]
	cluster 2 (# 24)	7 (29%)	[9%, 58%]
responder	cluster 1 (# 33)	6 (25%)	[7%, 53%]
	cluster 2 (# 13)	3 (23%)	[3%, 62%]
	cluster 3 (# 12)	2 (17%)	]0%, 58%]
all	106	24 (23%)	[13%, 35%]

G.3 Summary

To sum up appendix G, we find that the new ethical criterion is at play in all sets of procedurally varying beliefs and behaviour and hence, amongst all types of non-'EQ'-subjects. On the one hand, there are subjects who still choose a given procedure due to *postclass 1* arguments or purely procedural efficiency concerns even in the presence of a small material confound. In these cases, the material confound which we measure is either too small to crowd out the purely procedural concern at hand, or the material incentive is too small to be perceived. On the other hand, the motives underneath this paper's purely procedural preferences – see 6.3 – also explain statistically why many subjects choose *against* their incentives. The *simlicity* concern does not carry over to non-'EQ' responders. Instead, non-'EQ'-responders' choice of the yes-no game also links to *postclass 1*. Interestingly, the interaction effect $con \cdot post$ which *reduced* the likelihood of a purely procedural concern on the set of 'EQ'-subjects is never significant for non 'EQ'-subjects. Purely procedural concerns might hence be *more* frequent among non 'EQ'- than among 'EQ'-subjects.

[53]We use only Logits where *postclass 1* arguments had a marginal effect with $p - value < 0.05$. If we also consider weaker significance levels, there are further estimated 5 responders in cluster 1 who change their behaviour out of a *postclass 1* motivation. These responders expect a payoff advantage in the ultimatum game but state to be indifferent.

H Appendix section 7.3: Is there a selection effect?

A selection effect would imply that 'EQ'-subjects differ from all other subjects in some characteristic which is *critical* for a purely procedural choice, and that therefore, the new type of preference which we report is either significantly more, or less prevalent in non 'EQ'- than in 'EQ'-subjects. To test for such an effect, we use the motivations behind 'EQ'-subjects' purely procedural choices – the characteristics which were *critical* for their purely procedural choices – and test whether these motivations are per se more relevant to 'EQ'-, than to non 'EQ'-subjects.[54]

Moral argumentation & simplicity. We could not confirm that 'EQ'-proposers or 'EQ'-responders differ from their non-'EQ' counterparts when making a moral judgement. Specifically, 'EQ'-proposers and 'EQ'-responders cannot be confirmed to make *more* use of those moral arguments – i.e. the first class of postconventional arguments *postclass1*, see section 6.3 – which were positively linked to the purely procedural choices we report (Wilcoxon Rank Sum tests, proposers: $p-value = 0.67$, responders: $p-value = 0.60$). Moreover, 'EQ'-proposers and 'EQ'-responders cannot be confirmed to score *lower* on variable $con \cdot post$ which was negatively linked to purely procedural choices and which therefore makes these choices *less* likely (Wilcoxon Rank Sum tests, proposers: $p-value = 0.62$, responders: $p-value = 0.40$). Comparing the simplicity rankings, 'EQ'-responders deem the yes-no game less often simpler than the ultimatum game than non-'EQ' responders (exact Wilcoxon Rank Sum test, $p-value < 0.05$). *A negative selection effect* might therefore have occurred in section 6.1 by underestimating the frequency of responders preferring the yes-no game.

For each motive, we also derive the critical 'strength' at which the binary logit models in section 6.3 start to predict a purely procedural choice, if all other explanatory variables take on their mean value and perform Fisher's exact test to see whether there are significantly more 'EQ'-, than non-'EQ'-subjects who score above this critical threshold. We did not find any significant difference for any explanatory variable in any type of procedural choice, or any role. 'EQ'- and non 'EQ'-responders do not even differ in their simplicity rankings of the procedures around the respective critical threshold. However, the 45% of proposers who care *most* for postconventional argumentation always have non-'EQ' beliefs and actions. Some proposers might choose procedurally variant actions or hold procedurally variant beliefs *because* they deem the procedures unjust.

Efficiency motive. Many 'EQ'-proposers and responders preferring the dictator over the ultimatum game stated in an open form post experimental questionnaire that they did so because the dictator game prevents zero payoffs for *either* party. The purely procedural nature of this efficiency concern was particularly credible for 'EQ' responders: knowing that they would always accept in both games, and expecting the equal split for sure, they opted for the procedure where they had no influence at all. While 45% of all 'EQ'-subjects ('EQ'-proposers: 39%, 'EQ'-responders: 58%) stated this reason for their choice, also 33% of all non 'EQ'-subjects (proposers: 33%, responders: 33%) did so. This is surprising since for these belief conditions, one would have expected either self-interest, or an outcome based other-regarding concern to matter. Again, the efficiency motive is not reported significantly more often by either 'EQ'-proposers or 'EQ'-responders than by their non 'EQ'-counterparts.

[54] The selection effect could also operate such that a link between these motivations and a purely procedural preference exists exclusively in 'EQ'-subjects. However, we have shown in the previous section that this is not the case.