CHEPA WORKING PAPER ERIES
Paper 09-01

Preferences over the Fair Division of Goods: Information, Good, and Sample Effects in a Health Context

Jeremiah Hurley[a,b,c, +]
Neil Buckley[d]
Kate Cuff[1]
Mita Giacomini[b,c]
David Cameron[a,b]

[a]Department of Economics, McMaster University
1180 Main Street West
Hamilton, ON L8S 4M4
[b]Centre for Health Economics and Policy Analysis, McMaster University
1200 Main Street West
Hamilton, Ontario L9H 3Z3
[c]Department of Clinical Epidemiology and Biostatistics, McMaster University
1200 Main Street West
Hamilton, Ontario L9H 3Z3
[d]Department of Economics, York University
2005 TEL Building, Atkinson Faculty of Liberal and Professional Studies
4700 Keele Street, Toronto, Ontario, M3J 1P3

+ Corresponding author
Department of Economics, McMaster University
1180 Main Street West
Hamilton, ON L8S 4M4
hurley@mcmaster.ca
Tel: 905-525-9140, ext 24593
Fax: 905-521-8232

January20, 2008

CHEPA WORKING PAPER SERIES

The Centre for Health Economics and policy Analysis (CHEPA) Working Paper Series provides for the circulation on a pre-publication basis of research conducted by CHEPA faculty, staff and students. The Working Paper Series is intended to stimulate discussion on analytical, methodological, quantitative, and policy issues in health economics and health policy analysis. The views expressed in the papers are the views of the author(s) and do not necessarily reflect the views of the Centre or its sponsors. Readers of Working Papers are encouraged to contact the author(s) with comments, criticisms, and suggestions.

Abstract

Greater recognition by economists of the influential role that concern for distributional equity exerts on decision making in a variety of economic contexts has spurred interest in empirical research on the public judgments of fair distribution. Using a stated-preference experimental design, this paper contributes to the growing literature on fair division by investigating the empirical support for each of five distributional principles — equal division among recipients, Rawlsian maximin, total benefit maximization, equal benefit for recipients, and allocation according to relative need among recipients — in the division of a fixed bundle of a good across settings that differ with respect to the good being allocated (a health care good — pills, and non-health care but still health-affecting good — apples) and the way that alternative possible divisions of the good are described (quantitative information only, verbal information only, and both). It also offers new evidence on sample effects (university sample vs. community samples) and how the aggregate ranking of principles is affected by alternative vote-scoring methods. We find important information effects. When presented with quantitative information only, support for the division to equalize benefit across recipients is consistent with that found in previous research; changing to verbal descriptions causes a notable shift in support among principles, especially between equal division of the goods and total benefit maximization. The judgments made when presented with both quantitative and verbal information match more closely those made with quantitative-only descriptions rather than verbal-only descriptions, suggesting that the quantitative information dominates. The information effects we observe are consistent with a lack of understanding among participants as to the relationship between the principles and the associated quantitative allocations. We also find modest good effects in the expected direction: the fair division of pills is tied more closely to benefit-related criterion than is the fair division of apples (even though both produce health benefits). We find evidence of only small differences between the university and community samples and important sex-information interactions.

Keywords: Distributive Justice, Equity, Resource Allocation, Health Care
JEL: C9, D63, I1

Introduction

Economists increasingly seek a greater understanding of individuals' judgments of distributional equity. This interest in equity judgments arises from the growing recognition that social, other-regarding preferences — including attitudes regarding equity — direct individual, firm and government behaviour in a wide variety of economically important decision contexts (Charness and Rabin 2002; Konow 2003), including pricing decisions (Kahneman et al. 1986), the allocation of property rights in emerging markets (Young 1995), regulatory policy (Zajac 1995), and the allocation of goods, services and opportunities by governmental and non-governmental institutions in a wide variety of non-market settings such education and health care (Elster 1992). These types of evidence challenge economists to re-think the role of equity in economic analysis and have spurred empirical research investigating the public's views on equity.

Equity is in many respects more elusive than efficiency. People frequently disagree on the equity-relevant outcomes and on what constitutes an equitable distribution of those outcomes. Yet, research demonstrates that when making equity judgments people draw on a small set of core concepts such as need, desert, responsibility and maximization (Konow 2003). Judgments vary across individuals and contexts, however, because the weights people put on these core equity concepts depends on both the characteristics of those making the judgments and the features of the distributional problem itself.

Using both stated-preference and revealed-preference experiments, research on fair distribution has documented the systematic relationships between equity judgments, the characteristics of the distribution problem and the characteristics of those rendering the judgments, enabling the development of more descriptively accurate theories of equity. Konow (2003) provides a comprehensive review of the findings regarding fair division; here we highlight only selected prominent themes. Experimental evidence documents, for example, that people's judgments of the just distribution of a good are more egalitarian when the good is needed (in the sense that it provides a health benefit) than when it is desired simply to satisfy tastes (Bar-Hillel and Yaari 1993; Yaari and Bar-Hillel 1984). In production contexts, judgments of just distribution favour recipients who are more productive and are responsible for their greater differing productivities (e.g., Faravelli 2007; Gaertner and Schwettmann 2007; Schokkaert and Devooght 2003; Schokkaert and Lagrou 1983; Schokkaert and Overlaet 1989). Differences in productivity, however, carry less weight when they are beyond the control of individuals. Such evidence is consistent with the notion of "responsibility-fair" compensation, which compensates individuals only for disadvantages that arise from differences in productivity beyond their control (e.g., natural talent) and which holds them responsible for differences in productivity arising from factors under their control (e.g., effort) (Fleurbaey 1998). People are even

willing to bear a cost (in the form of reduced total output to be shared by their group) to allocate resources toward a less productive but more needy or deserving member of the group, though the willingness to do so falls as the cost rises (Gaertner 1994; Gaertner et al. 2001; Gaertner and Jungeilges 2002; Nord et al. 1995; Yaari and Bar-Hillel 1984).

Judgments of fair distribution vary across cultures (Gaertner et al. 2001; Jungeilges and Theisen 2008; Schokkaert et al. 2007; Schokkaert and Devooght 2003), and researchers have investigated the relationship between fairness judgments and individual characteristics such as sex, age, political ideology and education. The relationship between equity judgments and education has received particular scrutiny in part because many studies draw their samples from university students, and especially economics students. A person's overall level of education has generally not been found to exert a large effect on equity judgments (Schokkaert & Capeau 1991;Gaertner & Schwettmann 2007), a finding consistent with the general conclusion in the broader experimental economics literature of no substantial differences between university and community samples (Ball and Cech 1996).[1] Finally, studies find greater consensus regarding equity judgments when descriptions of a distribution problem include more concrete detail regarding both the individuals involved and the good being allocated than when they are framed in generic, abstract language, presumably because the richer descriptions reduce the variation in implicit assumptions respondents make regarding aspects of a scenario not explicitly described (Faravelli 2007).

This paper contributes to the growing literature on fair division by investigating the empirical support for each of five distributional principles — equal division among recipients, Rawlsian maximin, total benefit maximization, equal benefit for recipients, and allocation according to relative need among recipients — across settings that differ with respect to the good being allocated and the way alternative divisions of the good are described. In addition, it offers new evidence on sample effects (university sample vs. community samples); distinguishes support for a minimum-allocation principle and the principle of total benefit maximization that previous research has at times confounded; and it elicits judgments of both the most-fair and least-fair division of the good, allowing us to examine how aggregate rankings of the principles are affected by alternative vote-scoring methods.

Our stated-preference design builds explicitly on the seminal studies of Yaari and Bar-Hillel (1993; 1984) investigating the just division of a fixed amount of a good (e.g., grapefruit) between two individuals. Their studies showed that, even for the same good, support for alternative theories of just distribution differs markedly when the underlying motivation for consuming a good varied between need, tastes, and beliefs. We instead compare how judgments of the fair division differ for two distinct goods, both of which are needed because of their beneficial health effects: one (pain-relief pills) is

[1]This conclusion regarding the influence of overall level of education differs from that for economics training specifically, for which studies often find a large effect (Amiel and Cowell 1999; Engelmann and Strobel 2004; Faravelli 2007; Fehr et al. 2006). The extent to which such effects of economics training arise from selection effects or training effects is debated.

explicitly a health care good; the other (apples) is not. Yaari and Bar-Hillel (1984) also found that, when a good was needed, the vast majority of respondents chose as most-just the unequal division of the goods that equalized the benefit obtained by each recipient. In the survey, Yaari and Bar-Hillel presented alternative choice options using only quantitative information. If there were 12 grapefruit to divide between two individuals, for example, the choice alternatives were listed as 6:6, 2:10, 12:0, or 0:12. But because alternative equity principles can lead to the same quantitative allocation, the underlying equity principle, or reasoning, generating these judgments sometimes remains ambiguous. In the fair-division problems they analysed, for instance, the principles of equal benefit for each recipient, proportionality in meeting needs, Rawlsian maximin, and certain bargaining-based conceptions of equity all generate the same quantitative division that participants chose most frequently.

We sought to gain more detailed insight into the underlying equity principles guiding such choices by varying the way choice alternatives are described. We described alternative divisions in three ways: (1) using quantitative information only, as did Yaari and Bar-Hillel and, to our knowledge, as have all other studies of fair division but one (Schokkaert et al. 2007); (2) using only verbal (written)[2] descriptions of five alternative distributional principles; and (3) using both verbal descriptions of alternative principles and the quantitative allocations associated with each principle. This design provides insight into the underlying equity principles motivating participants' judgments and the extent to which participants understand the correspondence between the principle themselves and the divisions they generate. The only other work of which we are aware that compares verbal and quantitative descriptions in a study of fair division is Schokkaert et al.'s (2007) study of fair division in a production context, which found that verbal and quantitative descriptions led to important differences in support for the no-envy criterion and a principle of responsibility. Amiel and Cowell (1999) also studied verbal and quantitative descriptions, but they did so as part of an investigation of judgments of inequality. They found little difference in judgments based on based on verbal descriptions of income distributions compared to those based on numerical distributions.

We study equity judgments for health-related allocation problems both for analytic reasons — the concept of need arises naturally in health-related settings — and for policy reasons — the health care sector is large (10% or more of GDP in many developed nations (OECD 2007)), health care evokes stronger equity concern than just about any other commodity (though the precise concept of equity to guide system development and resource allocation is highly contested (Culyer and Wagstaff 1993; Hurley 2000; Williams and Cookson 2000)), and large-scale public intervention in the health care sector means that governments explicitly guide the allocation of a large proportion of health care

[2] The term "verbal" can refer to both oral (i.e. spoken) descriptions and to written descriptions that use words rather than numbers. Throughout this paper, unless otherwise noted explicitly, all references to verbal descriptions mean written descriptions using words rather than numbers.

resources. Indeed, many governments explicitly divide a fixed health budget among regional health authorities or institutions (Rice and Smith 2001), facing a distribution problem that corresponds precisely to that investigated in much research on fair division. Governments increasingly divide such fixed budgets using formula-based allocation methods that appeal explicitly to equity principles, such as needs-based funding, for which the empirical support has been little tested (Rice and Smith 2001; Smith et al. 2001). We are aware of only two studies (Kahneman and Varey 1991; Schokkaert and Devooght 2003) that use a health care setting to study fair division.[3]

We find important information effects. When presented with quantitative information only, support for the division to equalize benefit across recipients is remarkably similar to that observed by Yaari and Bar-Hillel (1993). Changing from quantitative to verbal descriptions causes a notable shift in support among principles, especially between equal division of the goods and total benefit maximization. The verbal-only responses also reveal that among the three principles that lead to this quantitative allocation, the proportionality-based principle of allocation according to relative need receives the most support, followed by the egalitarian principle of equal benefit, and finally Rawlsian maximin. The judgments made when presented with both quantitative and verbal information match more closely those made with quantitative-only descriptions rather than verbal-only descriptions, suggesting that the quantitative information dominates. The information effects we observe are consistent with a lack of understanding among participants as to the relationship between the principles (as described verbally) and the associated quantitative allocations. We also find modest good effects in the expected direction: the fair division of pills is tied more closely to benefit-related criteria than is the fair division of apples (even though both produce health benefits). And we find evidence of only small differences between the university and community samples.

2.0 The Questionnaire and Survey Procedures

We administered a stated-preference survey to elicit judgments of fairness in the division of a fixed, exogenously determined, amount of a good between two individuals. Following Yaari and Bar-Hillel (1984; 1993), we sought impartial judgments of fair division: participants were put in the position of dis-interested, third-party observers with no stake in the outcomes, asked to render a judgment that had no consequences for themselves and that involved no strategic interaction with other participants. Below we describe in detail the design choices we made and the motivation for those choices. For reference, Figure 1 presents two sample vignettes.

[3]There is a large medical literature on rationing and resource allocation in clinical contexts (Ubel 2001), and a literature on priority-setting in health care that deals in part with distributional equity (and especially equity-efficiency trade-offs) (e.g., Cookson and Dolan (1999)). Although these literatures provide considerable insight into aspects of people's reasoning about equity in allocation, its focus is distinct from this study and the broader economic literature on fair division.

2.1. The Goods to be Allocated

We studied the fair division of two goods: an explicit health care good — pain-relief pills — and a non-health care good — apples — that in this case was described as providing recipients a necessary vitamin but no other benefit (i.e., they were not desired for taste). Hence, both goods are needed in the sense that their consumption is required to maintain or improve a recipient's health.[4] We chose to compare these two types of goods for a number of reasons. Yaari and Bar-Hillel (1993; 1984) show that, even for a non-health care good (grapefruit, avocados), judgments of just distribution differ markedly when the good is needed for a health-reason compared to when it is simply desired to satisfy tastes (with much greater emphasis on equalizing benefit across recipients when the good is needed to maintain health). Presumably this effect would only be stronger if a needed health care good were compared against a standard consumption commodity. Furthermore, many have argued that the distributional concern about health care derives solely from health care's instrumental role in influencing the distribution of health (e.g., Culyer and Wagstaff 1993), and that the fair distribution of health care should derive solely from its effect on the distribution of health. Comparing pain-relief pills and vitamin-providing apples allows us to test whether people's judgment of the fair distribution of a health-affecting good derives solely from this instrumental relationship, or whether a type of "health care" effect exists whereby the fair distribution of health care is judged differently than a non-health care good even when the latter also generates health benefits. The possibility of such an effect is suggested by Walzer (1983) or Elster (1992) who argue that notions of equity are highly particularistic, or "local," varying across domains defined in part by the good in question.

The fair distribution of a health-affecting, non-health-care good is also a matter of some policy importance. Governments increasingly define health-related policy objectives in terms of the level and distribution of population health. Given that many of the most important determinants of health lie outside the health care system (Barer et al. 1994), policies increasingly emphasize action on non-heath-care determinants of health such as those in the physical environment (exposure to toxic substances), social environment (early childhood education), and transportation sector (mass transit). If the health effects of such non-health care determinants little influence views on the equitable distribution of such goods, implementing policies to affect improvements in health through non-health-care determinants will be that much harder.

All distributional vignettes pertained to the division of a fixed amount of either pills or apples between two potential recipients who differ in their ability to derive health benefit from the good in question. For example, one individual obtained 2 hours of pain relief per pill while the second

[4] The concept of need is debated in economics (as well as other disciplines). Our use of the term to refer to a situation in which a good generates health benefits (rather than simply utility benefits) is consistent both with previous literature on fair division (e.g., Yaari and Bar-Hillel (1993; 1984)) and the dominant definition of need in health economics (Culyer 1995; Culyer and Wagstaff 1993; Hurley 2000; Williams 1978).

obtained 1 hour of pain relief, or one individual metabolized 2 units of vitamin per apple while the second metabolized 1 unit. The differences in ability to derive benefit from the good were not caused by differences in the recipients' behaviours for which they could be held responsible, precluding effects associated with notions of responsibility-fair compensation. These differential productivities allow us to distinguish whether the equity judgments focus on the goods space itself (e.g., an equal division of the good) or in the outcomes space (e.g., allocate to equalize health benefit or to maximize health benefit). Benefit was expressed in terms of health gain.

2.2 The Distributional Principles

We investigate the support for five equity principles. The first three principle have been extensively investigated in previous work either because of their intuitive appeal or their link to prominent theories of justice: *equal division* of a good among recipients; division to generate *equal benefit* to each of the recipients; and the *maximin* division, which maximizes the benefit to the least-well-off individual and is most closely associated with Rawls' *Theory of Justice* (Rawls 1971). The fourth principle — division according to *relative need* among the recipients — is commonly invoked in the health care sector, is the stated allocation objective of many public health care systems (Smith et al. 2001), and is commonly cited within systems of fiscal federalism as a principle to guide funding allocation from higher to lower levels of government. It calls for proportionality in responding to needs, a principle at the foundation of many conceptions of equity (Young 1995). The fifth principle, *maximization of total benefit* among recipients, is more commonly viewed by economists as an efficiency criterion, but it derives from utilitarian theories of justice and is therefore seen by many as an equity principle. Associated with each principle is a corresponding division of the good: for the bundle of 12 apples in vignette (a) of Figure 1, for example, equal division of the apples would allocate 6 apples to each of Smith and Jones; total benefit maximization would allocate all 12 apples to Jones, and equal benefit, relative need and maximin would each allocate 4 apples to Jones and 8 to Smith.

We also indirectly test for a sixth principle similar in spirit to one that has variously been called a minimum, or "fixed floor," principle (Elster 1992). In our context, the minimum-floor principle argues that "a fair division gives at least something to each individual." Previous studies of the fair division of a fixed amount of single good between two individuals with differing productivities have at times confounded this minimum floor principle with maximization of total benefit. Total benefit maximization among individuals of differing (linear) productivities requires that the more productive individual receive all of the good and the less productive individual receives nothing, making separate identification of these principles becomes impossible unless an individual maximum-benefit constraint is imposed beyond which further consumption confers no benefit to an individual. For the apple vignettes we therefore test a distribution problem with no such constraint against an identical distribution problem with a maximum benefit constraint which ensures that even the total benefit-

maximizing division gives apples to each individual.[5] The constrained vignettes included the following additional information from that listed in vignette (a) presented in Figure 1:

> Both Jones and Smith are interested in the consumption of apples only insofar as such consumption provides vitamin F. The maximum amount of vitamin F that each individual's body can absorb in a single day is 80 mg. All the other traits of the fruit (such as taste, calorie content, etc.) are of no consequence to them.

As a result of this constraint, the total benefit maximizing division gives 8 apples to Jones and 4 apples to Smith rather than all 12 apples to Jones. We identify the effect of the constraint using between-subject variation: each respondent faced either only constrained (75% of respondents) or only unconstrained apple vignettes (25% of respondents).

2.3 Description of Alternative Divisions of the Good

We test the impact of three alternative ways to describe potential divisions to respondents: using only quantitative information regarding alternative divisions; using only verbal descriptions of alternative distributional principles; and using a combination of verbal descriptions of the principles and the associated quantitative allocations. Three of the principles being examined — division according to relative need, division to equalize benefit, and maximin — generate the same quantitative allocation (that equalizes benefit across recipients). In previous work on fair-division problems similar to ours (Yaari and Bar-Hillel (1993) and Kahneman and Varey (1991)), more than three-quarters of those when presented with only quantitative descriptions chose the division that equalizes benefit across the recipients. The vignettes that provide only verbal descriptions of the alternative equity principles provide insight into the reasoning, or equity principles, used by participants when choosing the equal-benefit division.

A change from quantitative to verbal descriptions may also generate broader effects on judgments. The purely quantitative information on alternative divisions of the available supply of the good emphasizes end-state distributional equity, focusing solely on the final distribution of the good. In contrast, the purely verbal descriptions of the alternative equity principles to guide the division draw on notions of procedural equity, focusing on the principles and the associated processes that determine the distribution. Procedural equity is premised on the notion that fair processes should generate fair outcomes. The two types of information also appeal to different types of logic: the verbal description of principles calls for deductive reasoning from the principles to the distribution they generate; the quantitative outcome information calls for inductive reasoning from quantities to

[5] Because the pain-relief pill vignettes include a natural maximum benefit constraint (once a person obtains 24 hours of pain relief, further consumption or pills provides no benefit), it is not possible to test for this effect with respect to the division of pills.

principles. Closely related to this, the two types of information present distinct cognitive challenges. The verbal information requires participants to infer distributions from principles; in many cases, a participant may not correctly infer the final distribution associated with a principle. The quantitative-only descriptions may challenge some participants' ability to think clearly about the distributional problem given the widespread discomfort among general public with even basic arithmetic and the general public's difficulties processing quantitative information (Paulos 1988; Tversky and Kahneman 1988).

The vignettes that present both the verbal descriptions of the alternative principles and the associated final allocations allow us to test which type of information dominates when making equity judgments: when there is a discrepancy between judgments based solely on the process-oriented principles and those based on the end-state distributions, do subsequent judgments made when given both types of information adhere more closely to the principles or the final distributions?

2.4 *Most Fair and Least Fair Divisions*

All studies of fair distribution of which we are aware ask respondents only which division they judge to be "most fair" or "most just," and assess support for each division based on a plurality voting rule that considers only the number of first-place votes each receives. This ignores all other information on how participants rank the alternatives. Although we felt that it would be too burdensome to ask participants to provide full rankings of the five principles, in addition to asking them which division they judge to be most-fair, we also asked them which division they judge to be least-fair.

This additional information is useful in two ways. It allows us to test whether the treatment effects we investigate have different impacts at the high and low ends of the rank distribution. It also allows us to investigate the robustness of the plurality-based rankings to two alternative vote-scoring methods. One is a negative voting rule that uses only the information on the least-fair division by assigning a value of 0 to the least-fair division and a value of 1 to all others (Cox 1987; Myerson 2002). The "winner" is the alternative that receives the smallest number of last-place votes. A ranking based on such information may be of particular interest to risk-averse policymakers who often seek as much to avoid choices that engender strong negative reactions as to identify the potentially elusive choice that garners the most positive support. It is also possible that even if there is no strong consensus on a single most-equitable alternative, there may be strong consensus on the least-equitable.

The second scoring rule is the Borda rule, which exploits information on the full ranking of alternatives and is one of the more commonly used alternative aggregation approaches when the number of choice options exceeds two (Mueller 1989). Information on only the most- and least-fair divisions is not sufficient to fully rank allocations using the Borda method when there are five

alternatives, but under reasonable assumptions (given our observed pattern of ranking) it is sufficient to gain insight whether the Borda method would select a different alternative than the plurality method.

2.5 *Survey Design*

Our design results in 9 distinct vignettes: 3 pill-based vignettes (one for each information type); 3 unconstrained apple vignettes; and 3 constrained apple vignettes. The survey was based on a full factorial experimental design in which participants faced all treatments in controlled and varied sequential order allowing for both within- and between-subject comparisons.[6] Therefore, the survey presented each participant with a series of six vignettes; each vignette presented a single distribution problem. For each vignette, participants were asked to indicate the division they judged to be most fair and the division they judged to be least fair. For the quantitative-only vignettes participants were also allowed to write down a division other than those listed. Hence, we obtained 12 judgments from each participant. We controlled for possible order effects by randomizing in three ways: whether a participant first saw an apple vignette or a pill vignette; whether they first made judgments under verbal-only information or quantitative-only information (the description with both types always came third); and the order in which choice options were listed in each vignette. This randomization ensures that our findings are robust against both order effects in each of these dimensions and certain types of lazy, unreflective behavior such as simply choosing the first alternative listed.

2.6 Survey Administration and Sample

Subjects were recruited from a Canadian university (McMaster University) and its surrounding community (Hamilton, Ontario). University subjects were recruited through a variety of means, including advertisements in the university newspaper and notices posted on the university web-site, in high-traffic commons areas, and introductory economics classes (none of which was taught by study researchers). Community subjects were recruited through two means, local public libraries (approximately 15% of community sample) and local shopping malls (about 85%). Subjects completed the survey on a computer terminal that automatically saved responses to a database. All subjects provided informed consent and were paid a fixed fee for participating that did not depend in any way on their choices or on the choices of others in the experiment. The study was approved by the McMaster University Research Ethics Board.

We sampled a total of 560 individuals, 307 from the university and 253 from the community (Table 1). As expected, the university and community samples differ along a number of dimensions: the university sample is younger and rates its health status higher on average than does the community sample; it also has a higher proportion of females. The vast majority (82%) of the

[6] Except, as noted, for the constrained vs. unconstrained analysis, which is based solely on between-subject comparisons.

university sample is undergraduates, and a plurality comes from the faculties of science and engineering, followed by social science, business, humanities and health sciences. (Most university respondents have had either no economics training or at most introductory economics.) The community sample achieved substantial variation in socio-economic status. Comparison of our community sample against 2006 census data confirmed that the sample broadly corresponds to the population of Hamilton with respect to age, education level, parental status, and employment status; our sample includes a slightly larger proportion of renters than the general population and has a lower median income.

2.7 Data Analysis

We analyzed the responses in two ways. The first was descriptive analyses using frequency distributions and cross-tabulations of subject responses. Standard statistical tests on these cross-tabulations (e.g., Chi-squared tests) are not valid, however, because repeated observations from each subject induces correlation among the observations, causing standard errors to be underestimated. To address this problem we also estimated multinomial-logit choice models that adjust for the lack of independence among repeated observations from each individual (Agresti 1996; Agresti 2002; Long and Freese 2006). Through these models we formally tested for a good effect (pills vs. apples), an information effect (verbal description of principles vs. both verbal and quantitative information), two types of sample effects (university vs. community; male vs. female), a constraint effect (constrained vs. unconstrained), and for interactions among these dimensions of the distribution problems.

The presentation of results below emphasizes the descriptive cross-tabulation that more readily convey relevant patterns in the data. All references to statistical significance in the textual commentary on these cross-tabulations are based on the results of the multinomial-logit models. Full results of the multinomial-logit models are presented in the Appendix.

3.0 The Observed Equity Judgments

Table 2 summarizes the equity judgments made by participants. It presents the proportion of observations for which each equity principle was chosen as most-fair (panel A) and as least-fair (panel B). For each panel, the rows correspond to a particular subset of the observations defined by the good, constraint, sample, and information used to describe the alternative divisions. The columns correspond to the alternative equity principles. We present separately results for the equal-benefit principle when listed in the quantitative-only vignettes, for which it was one of three choice options, and when listed in vignettes with verbal descriptions or both verbal and quantitative descriptions, for which it was one of five choice options. In addition, for responses to vignettes with verbal descriptions or both verbal and quantitative information, we list the sum of responses for the three principles that lead to the identical quantitative division that produces equal benefit. We discuss first the equity

judgments made when presented with only quantitative information. These compare most directly with previous research and serve as a baseline for subsequent examination of information effects.

3.1 Judgments of equity when presented with quantitative information only

Responses aggregated over goods and samples show that, when presented with only quantitative information, the division that provides equal benefit to each of the recipients is chosen as the most-fair division more than three-quarters of the time (78.4%) (Table 2, panel A-a). Equal division is the next most frequently chosen allocation (15.1%), and total benefit maximization receives the least support (5.5%). The preferences regarding the least-fair division (panel B-e) exactly reverse those for most-fair: total benefit maximization is judged to be least-fair in over 82% of responses, followed by equal division of the good (10.5%) and equal-benefit (7.1%).

As in previous studies, when judging fairness the vast majority of respondents focus on the outcome space, not the goods space. The support for the equal-benefit division as most-fair is remarkably close to that observed by Yaari and Bar-Hillel more than 20 years ago in samples of Israeli students applying for admission to Hebrew University (Bar-Hillel and Yaari 1993; Yaari and Bar-Hillel 1984) and by Kahneman and Varey (1991) in a sample from the United States. In Yaari and Bar-Hillel's base scenario 82% of respondents chose the division that equalized benefit across recipients, with similar findings across a number of minor variations on this base scenario (see Table 1, Bar-Hillel and Yaari 1993); Kahneman and Varey (1991) found that 77% of their respondents chose the division of pills that equalized pain relief between two individuals. The congruence of support across three cultures and two decades is remarkable.

A comparison of responses for apples and pills reveals statistically significant, but modest differences across the two goods (panels A-b, B-f). The equal-benefit division is the dominant choice as most-fair for both apples and pills, but support is slightly higher for pills than for apples (83.2% vs. 73.6%). This greater support for the equal-benefit division when allocating pills is associated with less support for equal division (10.9% vs.19.5%). A corresponding pattern is present for judgments of the least-fair division: support for equal division as the least-fair is slightly higher for pills than for apples (12.7% vs. 8.4%). For both the most-fair and least-fair judgments, the modest differences in the patterns of choices across the goods are consistent with a distinct view of health care. The choices for pills exhibit a stronger link between equity judgments and both the amount and the distribution of benefits than do the choices for apples. This is as one might expect: as a non-health care good, apples are not traditionally of particular equity concern, making their equal division more plausible as the most-fair division.

When we break the apples responses down further to test for the "minimum floor" principle by comparing responses with an individual-level benefit constraint against those without a constraint, we

observe the expected effect. For judgments of the most-fair division the proportion of respondents who chose total benefit maximization is more than twice as large (7.1% vs. 3.0%) for the constrained vignette in which both individuals receive some apples than it is for the unconstrained vignette in which one individual gets all of the apples and the other gets none. Similarly, respondents are more likely to choose total benefit maximization as the least-fair for the unconstrained vignettes than for the constrained vignettes (86.6% vs. 82.8%). In each case the absolute difference between the proportions is about 4%, which, while not large in absolute terms, is a large proportion of the possible difference given the baseline level of support for total benefit maximization. We also observe a large, unanticipated effect of the maximum benefit constraint on the support for dividing the goods equally. Imposing the benefit constraint causes support for equal division as the most-fair to fall from 30.4% to 15.8% and support for equal division as the least-fair to increase from 5.9% to 9.2%. The benefit constraint may focus greater attention on the outcomes space, causing respondents to shift away from equal division, which focuses solely on the goods space.

The distribution of responses for the constrained apple vignettes more closely approximates the response-distribution for pills than does response distribution for the unconstrained apple vignettes. This is as one might expect – as noted, the pill vignettes have an inherent benefit constraint because of the limited length of a day. In fact, comparison of responses to pill vignettes and only the apple responses for the constrained vignettes reveals a small, non-significant difference in the distributions, demonstrating the importance of controlling explicitly for the minimum-floor principle when allocating a good between individuals of differing productivities.

We also observe statistically significant differences in equity judgment across the university and community sample, though again the differences are modest and in no instances do the rankings differ between the two samples (panels A-c, B-g). Respondents from the university sample are more likely to rank equal benefit as the most-fair division (83.2% vs. 72.5%), with most of this higher level of support coming from total benefit maximization (2.0% vs. 9.9%). Similarly, the university respondents are more likely to rank total benefit maximization as least fair (90.1% vs. 72.1%), with this higher level of support coming from both equal division and equal benefit. The university respondents focus more on distribution within the outcomes space than do community respondents.

Because the university sample has a higher proportion of females than does the community sample, and previous research suggests that in general females have more egalitarian attitudes than males (Konow 2003), we tested whether this sample effect might be a spurious relationship arising from the different proportions of females in the samples. Indeed, a sex effect is present (panel A-d; panel b-h)): females are more likely to choose the equal-benefit division a most-fair (84.4% vs. 72.5%) and less likely to choose it as least-fair (4.0% vs. 10.1%). Even after controlling for sex, however, a significant university-community effect of similar magnitude to that noted above remains.

In summary, the equity judgments made when presented with only quantitative information on alternative divisions confirm previous finding of strong support for the division that equalizes benefit across recipients, exhibit modest good effects in the expected direction between pill and apples, modest sample effects, and the expected effect of imposing a maximum benefit constraint. In none of the cases, however, do the differences observed challenge the basic conclusion that the division that equalizes benefit across recipients is the dominant choice as most-fair and benefit maximization is the dominant choice as least-fair.[7]

3.2 Comparing Equity Judgments: Verbal Descriptions of Equity Principles versus Quantitative Information Only

The choice distributions for vignettes in which alternative allocation principles are described verbally include all five equity principles. Starting again with the distribution of equity judgments aggregated across goods and samples, a number of effects are notable. Relative need is chosen most frequently as the most-fair principle (42.7%), followed by the principle of division to provide equal benefit to each recipient (26.0%), maximin (11.6%), total benefit maximization (12.1%), and finally, equal division of the good (7.7%) (panel A-a). The distribution of least-fair judgments again exactly reverses that of most-fair judgments with relative need garnering the smallest support as least-fair (5.4%) and equal division the largest support (45.4%) (panel B-e). Among the three principles that lead to the same quantitative division, therefore, the principle of relative need — which calls explicitly for using the limited supply of a good to respond proportionally to each individual's needs — dominates both equal-benefit and Rawlsian maximin.

The sum of most-fair responses for these three principles very nearly equals the support of the equal-benefit division with only quantitative information (80.3% vs. 78.4%). Over 86% of respondents who chose the quantitative equal-benefit division also chose one of the three principles that map into it. This correspondence breaks down, however, for judgments of the least-fair division: the sum of support for equal benefit, relative need and maximin as least-fair is four times that of the quantitative equal-benefit division (27.7% vs. 7.1%); and for least-fair judgments, only 48% of those who chose the quantitative equal-benefit division also chose one of the three verbal principles that correspond to this division. Judgments of least-fair display less consensus when presented with verbal information only than those based on quantitative information only. While over 82% choose total benefit maximization as least-fair when presented with quantitative information only, no option receives even majority support as least-fair when presented with only verbal descriptions of the principles.

[7] Tests for interaction effect between good and sample revealed only weak interaction effects, none of which modify the conclusions from the simpler models, i.e. the good effect was the same in both the university and the community sample and vice-versa. See the results presented in the Appendix.

The support for total benefit maximization and equal division differs substantially when presented with verbal descriptions instead of the quantitative divisions. More than twice as many respondents judge total benefit maximization as most fair when provided with only verbal descriptions of the allocation principles (12.1% vs. 5.5%) and, even more dramatically, less than one-third as many choose it as least-fair when presented with verbal information only rather than quantitative information (26.9% vs. 82.4%). Correspondingly, less than half as many respondents choose equal division as most fair when presented with verbal information only rather than the quantitative information (7.7% vs. 15.1%) while more than four times as many choose it as least fair (45.4% vs. 10.5%). The overall patterns of differences between judgments made with verbal only and quantitative-only information imply that respondents focus more on the outcomes space when presented with the verbal descriptions, perhaps because the verbal descriptions emphasize more explicitly the relationship between the alternatives and potential benefit.

Disaggregating the responses by apples and pills again reveals modest, though statistically significant good effects (panels A-b, B-f). Compared to apples, for the division of pills respondents are more likely to choose as most-fair total benefit maximization (14.3% vs. 9.8%) and equal benefit (29.1% vs. 22.9%), and less likely to choose equal division (4.5% vs. 10.9%). This repeats the pattern observed for quantitative-only vignettes in which benefit-related principles receive more support as most-fair for pills than for apples. For judgments of the least-fair division, the good effect is concentrated on equal division and maximin; in this case the greater support for equal division as the least-fair allocation for pills compared to apples (49.5% vs. 41.4%) is associated with a lower level of support for maximin as the least-fair for pills (12.9% vs. 19.1%). The ranking of the two divisions that are directly comparable between the quantitative and verbal vignettes — total benefit maximization and equal division — differ for the two types of information. When presented with quantitative information only, for both apples and pills total benefit maximization is ranked last as most-fair and equal division is ranked second last; for verbal information only, however, total benefit maximization is ranked last for apples but equal division is ranked last for pills. No such reversal occurs for judgments of the least-fair division.

Disaggregating response by university and community respondents reveals modest, statistically significant sample effects. University respondents are less likely to choose total benefit maximization as the most-fair (10.6% vs. 13.8%), less likely to choose maximin (9.3% vs. 14.4%), and more likely to choose equal benefit (30.1% vs. 21.0%). Relative need is most-frequently chosen in both sub-samples. For judgments of the least-fair division (Panel 2B, g), university respondents are correspondingly more likely to choose total benefit maximization as the least-fair (33.6% vs. 18.8%) and less likely to choose equal benefit (3.3% vs. 10.1%), and again the rank of these two is the same across the two subsamples. Equal division is chosen least-often as most-fair and most-often as least-fair by both the university and community respondents. We do observe some differences in rankings

between the community and university samples lower down in the distribution — total benefit maximization is ranked ahead of maximin among university respondents while the opposite is true for community respondents — but these rank differences are driven by small differences in the proportion of respondents choosing each of them.

Surprisingly, when respondents are presented with only verbal information we observe no statistically significant effect of sex on judgments of the most-fair division. The percentage of males and females choosing each of total benefit maximization or equal divisions differ by less than 1% (12.4% vs. 11.7% and 7.3% vs. 8.1%, and although there is some variation across males and females for each of maximin, equal-benefit and relative need, the sum across them differs by only 2% between males and females (82.3% vs. 80.3%). A sex effect is present for the least-fair judgments, but it is different from the pattern observed with quantitative information only. Now females are actually less likely than males to choose total benefit maximization as least-fair (25.2% vs. 28.6%) and more likely to choose equal division (49.1% vs. 41.8%).

The important findings that emerge from these verbal-only vignettes are the strong, very stable support for relative need as the most-fair allocation principle, with maximin receiving the least support among those that lead to the same quantitative division; the greater support (compared to the quantitative-only vignettes) for total benefit maximization as most-fair (and correspondingly lesser support as least-fair); the changed impact of sex on equity judgments; and the weaker consensus on the least-fair distribution.[8]

3.3 Equity Judgments with Both Verbal and Quantitative Information

The distribution of choices made with both types of information correspond more closely to those based on only quantitative information than those based on only verbal information. For example, support for total benefit maximization as most-fair is 4.3% when described using both types of information, 5.5% when described using quantitative information only, and 12.1% when using verbal information only; similarly, support for total benefit maximization as least-fair is 72.0% when described using both types of information, 82.4% when described using quantitative information only and 26.9% when using verbal only. The support for equal division when respondents were given both types of information consistently falls between the support when given quantitative only and that when given verbal only, but especially for least-fair judgments, it lies closer to the results for quantitative- only vignettes. When presented with both types of information, a higher proportion of those who chose the

[8]Tests for interaction effect between good and sample revealed no statistically significant interaction effects among the most-fair responses and only weak ones among least-fair response, none of which modify the conclusions from the simpler models See the results presented in the Appendix.

quantitative equal-benefit division also chose one of the three principles that map into this division than when presented with verbal information only.

The quantitative information dominates the verbal descriptions of the underlying principles. This may happen for two reasons: first, the quantitative information is less abstract and perhaps easier to understand; second, the focus of the quantitative information on the end-state allocations matches better the nature of the allocation problem, which more naturally calls for end-state distributional judgments rather than procedural judgments.

Comparison of the choice distributions for verbal-only and "both" reveals two patterns of note: the information effect is smallest for the relative-need and equal-benefit divisions for judgments of both the most-fair and least-fair division; and support for maximin as most-fair is consistently higher (and support as least-fair consistently lower) when it is described using both verbal and quantitative information rather than just verbal information. This may arise because maximin is perhaps the least intuitive of the principles, so the addition of quantitative information reassures people that it does not lead to an unacceptable allocation.[9]

3.4 Aggregate Rankings under Alternative Vote-scoring Methods

Table 3 lists the resulting aggregate rankings of the alternative divisions under the three vote-scoring methods examined: plurality rule (on which we have been focusing until now), negative scoring, and Borda scoring. Panel A of the table presents the results for all three scoring rules for the quantitative-only vignettes for which there are only three divisions and we can completely rank them using the most-fair and least-fair responses, and the plurality and negative scoring rules for verbal only and both verbal and quantitative information. The Borda analysis for the verbal only and "both" judgments appears in panel B and is limited to a consideration of the two most highly ranked alternatives under the plurality rule, equal benefit and relative need. We discuss our approach to this in more detail below.

Focusing first on the quantitative-only vignettes (panel A-i), it is no surprise given the results presented already using the plurality rule that the aggregate ranking is invariant to the scoring rule used: equal benefit ranks first, equal division second and total benefit maximization third. For the verbal-only vignettes, the aggregate ranking of relative need and equal benefit divisions as first and second is invariant to whether the plurality or the negative scoring rule is employed; equal division ranks last in all but one case for which it ranks second last. The most frequent rank differences between the plurality and negative scoring rules occur for maximin and total benefit maximization, in which they trade the 3rd and 4th ranks in the overall analysis, the analysis of the fair division of pills and

[9] Again, tests for interaction effect between good and sample revealed no statistically significant interaction effects among the most-fair responses and only weak ones among least-fair response, none of which modify the conclusions from the simpler models See the results presented in the Appendix.

in the university sample. All of these rank changes are driven by the plurality scoring rule. When both quantitative and verbal information are presented, once again the aggregate rankings are invariant to the scoring method: relative need and equal benefit rank first and second; maximin third, equal division fourth and total benefit maximization now ranks last in all cases. When quantitative information is presented (either solely or in combination with verbal information), therefore, the aggregate rankings are invariant to the scoring methods used and total benefit maximization always ranks last. The aggregate rankings are more stable under the negative scoring rule than under the plurality rule: no differences occur across goods or samples under the negative scoring rule

Because we cannot fully rank the five divisions using the Borda scoring rule, the analysis of the Borda rule for verbal information and both verbal and quantitative information focuses on relative need and equal benefit, which always ranked first and second under the plurality and negative scoring rules (Table 3, panel B). Under the Borda scoring rule, the relative aggregate ranking of the relative-need and equal-benefit divisions depends only on the sum across observations of the difference in rank between the two. We know this difference exactly when the two make up the most-fair/least-fair pair, and we have two types of partial information: when one of them is ranked as most-fair or least-fair, we know its relative ranking, but we do not know the exact difference in rank between them; when neither was chosen as most-fair or least-fair, we know neither the relative rank nor the exact difference in rank, only that they both fall in positions 2, 3 or 4. We examine three cases that make differing assumptions about the difference in ranks when unknown. First, the best-case scenario for relative need: whenever we do not know the exact difference in ranks, assume it is the maximum difference possible in favor of relative need. Second, the best-case scenario for equal benefit in which we assume the opposite: that the difference in rank is always to the maximum possible advantage to the equal benefit alternative. Finally, we examine a middle case in which the probability of observing a given distance in rank between the two decreases with the magnitude of the difference.[10]

As expected, under the best-case scenario for relative need, it ranks above equal benefit in all cases; for the best-case scenario for equal-benefit, relative need always ranks second to equal-benefit. In many cases, however, the Borda scores differ by only a small amount, so relatively minor changes in rankings can reverse the difference. For the middle case the Borda rank reverses in a minority of the cases across information types, samples and goods. For the division of pills, for example, the two alternatives would rank differently in the community and university samples; the alternatives rank differently across information sets within each sample; and the alternatives rank differently across pills and apples within the university sample when verbal information only is

[10]Given that the two principles receive the most support overall, that are closely related conceptually, and that in every instance when one was chosen as most-fair, the other was least-often chosen as the least-fair, when we know only the relative rank we assume that there is a 75% chance that the ranks differ by only 1, a 15% chance that they differ by 2, and a 10% chance that they differ by 3. In the small proportion of observations in which we do not know either the relative ranking or distance, we assume even chances that each ranks above the other.

provided and within the community sample when both verbal and quantitative information are presented. These calculations are only illustrative, but while the overall picture is one of considerable stability of aggregate rankings among alternative scoring rules, under plausible conditions the rankings sometimes differ between the plurality scoring and Borda scoring, highlighting the potential value of collecting additional information beyond simply that of the most-preferred alternative.

4.0 Discussion

This study re-affirms some findings from previous research regarding fairness in distribution and introduces evidence on a number of aspects of fair division not previously studied. It re-affirms that when presented with alternative quantitative allocations of a fixed supply of a good that is differentially needed by recipients, the vast majority of respondents choose as most-fair the division that equalizes benefit across recipients. Indeed, the concordance between our findings from Canada in 2007, those of Yaari and Bar-Hillel from Israel from as far back as the late 1970s, and Kahneman and Varey from the United States in the late 1980s is remarkable given the potential cultural differences among respondents. Our findings for the vignettes with only verbal descriptions of alternative distributional principles show further that this judgment is most often motivated by the desire to respond proportionately to the differing needs of recipients than by explicit appeal to equality of benefit. The consistent high level of support for the principle of allocation according to relative need as most-fair stands out: across goods, information types, and samples, its support (with one exception), always fell between 40% and 44%.

Equal division and total benefit maximization are consistently judged as less fair than any of the principles that focus on the distribution of benefit (equal benefit, need-based, maximin). Total benefit maximization ignores distributional effects, and, as noted earlier, is more properly seen as an efficiency criterion. In a non-production context where there is no trade-off between the size of the pie and its distribution, the negative distributional consequences of maximizing benefit are more salient. Equal division focuses on goods *per se* and not the benefits associated with the allocation of the goods. In need-related settings, attention shifts from the goods themselves to the benefits they generate.

The modest differences in equity judgments that we observe between pills — the explicit health care good — and apples — the health-affecting non-health-care-good — are consistent with our hypothesis that some people see health care as distinct, even from a non-health-care good that produces a health benefit. The benefit-related divisions as a group receive more support as most-fair for pills than apples. But the overall pattern across the two goods is that both goods were valued instrumentally for their impact on health. Our design strove to present two goods as identically as possible except that one was health care and one was not, so that they would differ only in this one

dimension. Debriefing interviews with subjects indicate that we may not have been as successful in this as we hoped. At least some of the respondents focused on other aspects of the two goods. Although both goods produce health benefits, some perceived them as different types of health benefits: pills represented a curative service that produced immediate gain while the apples' vitamin provided a preventive health benefit; some respondents saw pain relief as more serious than a vitamin deficiency. In the end, it is unclear the extent to which the differences between the two goods on which we wanted them to focus were the most salient aspects of the goods.

Our findings lend further credence to reasonableness of basing this and similar types of research on convenient, university-based samples. Although differences between the university and community samples were statistically significant, they were generally modest and would not alter any fundamental conclusions regarding equity judgments of fair division. This may derive in part because our university sample drew from across the university, with representation from all Faculties of study and from both students and staff. The lack of meaningful difference between the two samples may not extend to samples drawn from single disciplines (such as economics). But our results do imply that convenient, university-based samples can generalize beyond the campus.

Perhaps our most important findings are those of the impact on equity judgments of verbal descriptions of equity principles compared to quantitative information. Although we varied this primarily to identify the underlying equity reasoning that motivated choice of equal-benefit distributions when presented with quantitative information only, the different information had a broader impact on equity judgments. Support for total benefit maximization as most-fair is substantially higher for vignettes that presented only verbal descriptions of distributional principles than when presented only quantitative distributions. Support of maximin is consistently higher when both verbal and quantitative information is provided than when only verbal descriptions are presented. Consensus on the most- and least-fair distributions is lower when presented with only verbal descriptions than with quantitative information. These types of information effects also differ across different parts of the rank distribution: their effect is more pronounced among judgments of the least-fair division than the most-fair. And we observe a strong sex-information interaction, with strong sex effects when presented with quantitative information but no sex effect (in the case of most-fair judgments) or a different sex effect (in the case of least-fair judgments) when presented with only verbal descriptions. This raises the possibility that some of the sex effects documented in previous research on fair division, which has generally presented only quantitative information, may not hold more generally. In any event, this finding deserves further investigation. The only other study of which we are aware that has examined these types of informational effects in studies of fair division (Schokkaert et al. 2007) also found large differences between responses to verbal and quantitative information, but the different foci of that study and ours do not allow comparison of the specific findings of each.

An obvious question is why such differences arise. Although for short-hand we call them simply “verbal” and “quantitative”, the two methods of description differ in a number of ways beyond simply the use of words vs. numbers: the verbal description of an allocation principle is more abstract than is a concrete listing of how much of the good each recipient receives; the verbal description of a principle calls for a more deductive style of reasoning, while the actual distribution calls, if anything, for a induction from a concrete , numeric distribution back to principles; and, as noted, the verbal description of a principle emphasizes procedural equity while the quantitative outcomes emphasize end-state distribution. The fact that the judgments made when given both verbal and quantitative information align more closely with those made when given only quantitative information suggests that differences between the verbal only vignettes and those that included quantitative information likely arise because some individuals do not understand the distributional implications of the various principles. That is, they chose a principle that has intuitive appeal as a notion of fairness without appreciating the division implied by application of the principle. Our study was not designed to test this, but the data do allow us to gain some insight into this issue. Respondents faced two sets of judgments, one for apples and one for pills. During the first set, they made equity judgments for quantitative-only and verbal-only vignettes before they saw the vignette that provided both types of information, thereby revealing the correspondence between principles and quantitative divisions. When they made the second set of judgments, therefore, they had been made aware of the relationship between the principles and the quantitative divisions. If they had not initially understood this relationship, their second set of responses should exhibit more agreement between the quantitative-only vignettes and the verbal-only vignettes. Because we randomized the order of the two goods, we do not need to worry about confounding between the second set of choices and the good. Our results are consistent with learning: there is more agreement between the choices made with quantitative only information and verbal-only information in the second set of responses than in the first set. This is especially true for total benefit maximization (e.g., there is less than 10% agreement on the first set of responses but approximately 40% agreement on the second set of responses). We also observe a greater degree of agreement between choosing equal-benefit in the quantitative-only vignettes and choosing one of the three principles consistent with this allocation. These conclusions are tentative given that this study was not designed to test this hypothesis, but this should be examined in future research.

These findings regarding the impact of information have both methodological and policy implications. When multiple principles of division generate the same quantitative allocation, gaining insight into the principles and logic that underlie respondents’ choices can be valuable both because it can inform a broader understanding of equity-based reasoning and because the principles may not always align with the same quantitative division, e.g., maxmin and equal benefit will not lead to the same allocation if people start differing baseline levels of welfare. Although it will often be possible to

manipulate scenarios appropriately to distinguish such principles, when this is not possible researchers can test the principle directly through, for example, verbal descriptions as we have done. But our results suggest that responses to vignettes that provide only verbal descriptions of equity principles may be less reliable, and that more trust can be placed in vignettes that include both verbal and quantitative descriptions.

The findings also imply a potential paradox for policy. Policies that have important distributional effects are generally articulated and justified by appeal to equity principles. That is, they are generally "sold" to the public by appeal to general principles (the tax burden will be shared in proportion to one's ability-to-pay, payment will vary in accord with the benefits received, health care will be allocated according to need; etc.). So support for implementation is based on the kinds of information presented in the verbal descriptions. But the effects are measured and documented in quantitative terms, much like the information presented in the quantitative-only vignettes. People's (apparent) inability to appreciate the quantitative implications of alternative distributional principles may lead to a systematic discord between the policies they support in principle and those that they would support when faced with the results of a successfully implemented policy that achieved exactly what was proposed. The contentiousness of distributional policies may derive not just from differing conceptions of equity across individuals; it may also arise from the different judgments an individual makes when presented with different kinds of information.

Acknowledgements

We acknowledge helpful comments from Michel Grignon, Stuart Mestelman, Andrew Muller, Aleksandra Gajic and members of the polinomics seminar group at McMaster University. We also acknowledge research assistance provided by Olga Rakita and Diedre DeJean. This research was funded by the Canadian Institutes of Health Research (Grant # 76670). We also acknowledge funding from the Ontario Ministry of Health and Long-term Care to the Centre for Health Economics and Policy Analysis, McMaster University. The views expressed are those of the authors alone.

Figure 1: Two Sample Vignettes

(a) Vignette 1: Apples, Unconstrained, Quantitative Information only

A bag of twelve apples is to be distributed between Jones and Smith. The following information is given, and is known also to both Jones and Smith:

- Jones and Smith are identical in all respects except how well their bodies metabolize apples.
- Doctors have determined that Jones's metabolism is such that his body derives 10 milligrams of vitamin F from each apple consumed.
- Doctors have also determined that Smith's metabolism is such that his body derives 5 milligrams of vitamin F from each apple consumed.
- Both Jones and Smith are interested in the consumption of apples only insofar as such consumption provides vitamin F - and the more vitamin F the better. All the other traits of the fruit (such as taste, calorie content, etc.) are of no consequence to them.
- After the apples are divided between them, Jones and Smith will not be able to trade apples between themselves or transfer apples to a third person.

The apples are to be divided between Jones and Smith. As a third-party, you are asked to decide how to divide the apples between Jones and Smith. Below we list some possible ways to divide the apples.

(a) Jones: 6 apples (yielding 60 mg of vitamin F)
Smith: 6 apples (yielding 30 mg of vitamin F)

(b) Jones: 12 apples (yielding 120 mg of vitamin F)
Smith: 0 apples (yielding 0 mg of vitamin F)

(c) Jones: 4 apples (yielding 40 mg of vitamin F)
Smith: 8 apples (yielding 40 mg of vitamin F)
(d) other

What do you judge to be the *fairest* division of the apples? Please choose one of the above allocations ((a)-(c)) or choose (d) and specify a different allocation of the apples.
What do you judge to be the *least fair* division of the apples among the listed above allocations? Please choose one of the above allocations ((a)-(c)) .

(b) Vignette 2: Pain-relief Pills, Verbal Information only

A limited supply of pain relief medication is to be distributed between Williams and Taylor, both of whom suffer from a painful disease. This pain medication can provide total relief from the pain. The following information is given, and is known also to both Williams and Taylor:

- Doctors have determined that Williams's metabolism is such that one pill gives him two hours of pain relief.
- Doctors have also determined that Taylor's metabolism is such that one pill gives him one hour of pain relief.
- Williams and Taylor are identical in all respects except their metabolism.
- After the pills are divided between them, Williams and Taylor can not trade the pills between themselves or transfer the pills to a third person.

The pills are to be divided between Williams and Taylor and Smith. As a third-party, you are asked to decide how to divide the pills between Williams and Taylor. Below we list some possible ways to divide the pills.

(a) Divide the pills in such a way that the total number of hours of pain relief obtained by both Williams and Taylor is as large as possible.
(b) Divide the pills in such a way that Williams, whose body is less able to derive pain relief from the pills, receives at least as much pain relief as Taylor.
(c) Divide the pills in such a way that Williams and Taylor each receive the same amount of pain relief.
(d) Divide the pills in such a way that Williams and Taylor each get the same number of pills.
(e) Divide the pills in such a way that Williams's and Taylor's needs for pain relief are met equally.

What do you judge to be the *fairest* division of the pills? Please choose one of the above allocations ((a)-(e)).
What do you judge to be the *least fair* division of the pills? Please choose one of the above allocations ((a)-(e)).

Table 1: Descriptive Statistics: University and Community Samples

	University	Community	All
Sample Size	307 (54.8%)	253 (45.2%)	560 (100%)
Female (%)	185 (60.3%)	93 (36.8%)	278 (49.6%)
Mean age	21.7 (sd = 5.8)	41.4 (sd=16.5)	30.6 (sd=15.4)
Self-assessed Health Status			
Poor	4 (1.3%)	13 (5.1%)	17 (3.0%)
Fair	12 (3.9%)	32 (12.6%)	44 (7.9%)
Good	85 (27.7%)	82 (32.4%)	167 (29.8%)
Very Good	141 (45.9%)	80 (31.6%)	221 (39.5%)
Excellent	65 (21.2%)	46 (18.2%)	111 (19.8%)
McMaster Respondents			
University Status			
Undergraduate	253 (82.4%)		
Graduate	30 (9.8%)		
Staff	17 (5.5%)		
Other	7 (2.3%)		
Faculty			
Science / Eng	144 (46.9%)		
Social Science	52 (16.9%)		
Business	41 (13.4%)		
Humanities	25 (8.1%)		
Health Sci	21 (6.8%)		
Other	24 (7.8%)		
Community Respondents			
Dwelling Type			
Rent Home		135 (55.0%)	
Own Home		114 (45.0%)	
Parental Status			
Parent – Yes		125 (49.4%)	
Parent – No		128 (50.6%)	
Education Level			
< Secondary School		38 (15.0%)	
Secondary Graduate		104 (41.1%)	
Post-secondary Graduate		111 (43.9%)	
Income			
No Income		11 (4.3%)	
Less than $20,000		83 (32.8%)	
$20K to $49,999		82 (32.4%)	
$50K to $99,999		58 (22.9%)	
$100K or more		19 (7.5%)	
Employment Over Last 12 Months			
No		81 (32.0%)	
Yes		172 (68.0%)	
Ever Health Sector Worker			
No		202 (79.8%)	
Yes		51 (20.2%)	

Table 2: The Distribution of Equity Judgments regarding the Most-Fair Allocation

	Maximize Total Benefit	Equal Division of Goods	Maximin	Relative Need	Equal Benefit Principle: Verbal	Equal Benefit: Quantitative Information	Sum (iii, iv, v)	Other
	(i)	(ii)	(iii)	(iv)	(v)	(vi)		
(A) MOST FAIR								
(a) Aggregated								
Quantitative	5.5%	15.1%	–	–	–	78.4%		1.0%
Verbal	12.1%	7.7%	11.6%	42.7%	26.0%	–	80.3%	
Both	4.3%	11.3%	17.1%	41.0%	26.3%	–	84.5%	
(b) By Good								
Quantitative								
Apples	6.1%	19.3%	–	–	–	73.6%		1.1%
No Constraint	3.0%	30.4%	–	–	–	65.2%		1.5%
Constraint	7.1%	15.8%	–	–	–	76.2%		0.9%
Pills	5.0%	10.9%	–	–	–	83.2%		0.9%
Verbal Only								
Apples	9.8%	10.9%	12.9%	43.6%	22.9%	–	79.3%	
Pills	14.3%	4.5%	10.4%	41.8%	29.1%	–	81.3%	
Both								
Apples	4.3%	15.4%	14.8%	40.9%	24.6%	–	80.4%	
Pills	4.3%	7.1%	19.5%	41.1%	28.0%	–	88.6%	
(c) By Sample								
Quantitative								
University	2.0%	14.0%	–	–	–	83.2%		0.8%
Community	9.9%	16.4%	–	–	–	72.5%		1.2%
Verbal Only								
University	10.6%	8.0%	9.3%	42.0%	30.1%	–	81.4%	
Community	13.8%	7.3%	14.4%	43.5%	21.0%	–	78.9%	
Both								
University	2.1%	11.6%	16.3%	43.8%	26.2%	–	86.3%	
Community	6.9%	10.9%	18.2%	37.6%	26.5%	–	82.2%	
(d) By Sex								
Quantitative								
Male	7.6%	18.6%	–	–	–	72.5%		1.2%
Female	3.4%	11.5%	–	–	–	83.4%		0.7%
Verbal Only								
Male	12.4%	7.3%	13.1%	40.4%	26.8%	–	82.3%	
Female	11.7%	8.1%	10.1%	45.0%	25.2%	–	80.3%	
Both								
Male	4.3%	12.8%	16.1%	38.3%	28.5%	–	82.9%	

HURLEY J, BUCKLEY N, CUFF K, GIACOMINI M, CAMERON D, Female	4.3%	9.7%	18.1%	43.7%	24.1%	–	85.9%

Table 2 cont'd: The Distribution of Equity Judgments regarding the Least-Fair Allocation

	Maximize Total Benefit	Equal Division of Goods	Maximin	Relative Need	Equal Benefit Principle: Verbal Description	Equal Benefit: Quantitative Information Only	Sum (iii, iv, v)	Other
	(i)	(ii)	(iii)	(iv)	(v)	(vi)		
(B) LEAST FAIR								
(d) Aggregated								
Quantitative	82.4%	10.5%	–	–	–	7.1%		0.0%
Verbal	26.9%	45.4%	16.0%	5.4%	6.3%	–	27.7%	
Both	72.0%	13.3%	7.3%	3.0%	4.3%	–	14.7%	
(e) By Good								
Quantitative								
Apples	83.8%	8.4%	–	–	–	7.9%		0.0%
No Constraint	86.7%	5.9%	–	–	–	7.4%		0.0%
Constraint	82.8%	9.2%	–	–	–	8.0%		0.0%
Pills	81.1%	12.7%	–	–	–	6.3%		0.0%
Verbal Only								
Apples	28.6%	41.4%	19.1%	5.2%	5.7%	–	30.0%	
Pills	25.2%	49.5%	12.9%	5.5%	7.0%	–	25.4%	
Both								
Apples	78.6%	9.3%	5.9%	3.0%	3.2%	–	12.1%	
Pills	65.4%	17.3%	8.8%	3.0%	5.5%	–	17.3%	
(f) By Sample								
Quantitative								
University	90.1%	6.5%	–	–	–	2.6%		0.0%
Community	72.1%	15.4%	–	–	–	12.5%		0.0%
Verbal Only								
University	33.6%	43.7%	16.6%	2.9%	3.3%	–	22.8%	
Community	18.8%	47.6%	15.2%	8.3%	10.1%	–	33.6%	
Both								
University	79.2%	11.2%	5.1%	2.9%	3.3%	–	11.3%	
Community	63.2%	15.8%	10.1%	5.3%	5.5%	–	20.9%	
(d) By Sex								
Quantitative								
Male	77.5%	12.4%	–	–	–	10.1%		
Female	87.4%	8.6%	–	–	–	4.0%		
Verbal Only								
Male	28.6%	41.8%	14.9%	6.2%	8.5%	–	29.6%	
Female	25.2%	49.1%	17.1%	4.5%	4.1%	–	25.7%	
Both								

HURLEY J, BUCKLEY N, CUFF K, GIACOMINI M, CAMERON D,							
Male	69.2%	11.9%	9.0%	3.7%	6.2%	–	18.9%
Female	74.8%	14.8%	5.6%	2.3%	2.5%	–	10.4%

Table 3: Comparison of Alternative Vote-scoring Methods

Panel (A)	Overall			Apples			Pills			University Sample			Community Sample		
	Plural	Neg	Borda	Plural	Neg	Borda	Plural	Neg	Borda	Plural	Neg	Borda	Plural	Neg	Borda
(i) Quantitative Information Only															
Equal Division	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Equal Benefit	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Benefit Max	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
(ii) Verbal Information Only															
Equal Division	5	5		4	5		5	5		5	5		5	5	
Equal Benefit	2	2		2	2		2	2		2	2		2	2	
Benefit Max	4	3		3	3		4	3		4	3		3	3	
Relative Need	1	1		1	1		1	1		1	1		1	1	
Maximin	3	4		5	4		3	4		3	4		4	4	
(iii) Both Verbal & Quantitative															
Equal Division	4	4		4	4		4	4		4	4		4	4	
Equal Benefit	2	2		2	2		2	2		2	2		2	2	
Benefit Max	3	3		3	3		3	3		3	3		3	3	
Relative Need	1	1		1	1		1	1		1	1		1	1	
Maximin	5	5		5	5		5	5		5	5		5	5	

Table 3 cont'd: Comparison of Alternative Vote-scoring Methods

Panel (B)	University Sample						Community Sample					
	Apples			Pills			Apples			Pills		
	Best Case for Relative Need	Worst Case for Relative Need	Middle Case	Best Case for Relative Need	Worst Case for Relative Need	Middle Case	Best Case for Relative Need	Worst Case for Relative Need	Middle Case	Best Case for Relative Need	Worst Case for Relative Need	Middle Case
(i) Verbal Information												
Equal Benefit	2	1	2	2	1	1	2	1	2	2	1	2
Relative Need	1	2	1	1	2	2	1	2	1	1	2	1
(ii) Both Verbal and Quantitative												
Equal Benefit	2	1	2	2	1	1	2	1	2	2	1	1
Relative Need	1	2	1	1	2	2	1	2	1	1	2	2

For all observations for which the exact rank distance between relative need and equal benefit is unknown, the best case assumes the maximum distance in favour of relative need; the worst case assumes the maximum in favour of equal benefit; the middle case assumes a weighted linear combination of possible distances where the weight decreases with rank distance.

Appendix

General notes to appendix tables:

- *p< 0.10; **p< 0.05; ***p< 0.01
- The odds ratios presented are sometimes referred to as relative risk ratios (e.g., in STATA)
- The distributional alternative:
    - ED = equal division of the goods
    - EB = division to equalize benefits across recipients
    - MB = division to maximize total benefits
    - RN = division according to relative need across the individuals
    - MM = maximin allocation.
- All multinomial logit analyses adjust the standard errors for lack of independent among repeated observations.

Table A1: Multinomial Logit Results: Odds Ratios for Judgments Regarding the Most-fair and Least-fair Divisions with Quantitative Information Only

	Goods Effect		Sample Effect		Constraint Effect	Sex Effect
	Pills vs. Apples		University vs. Community		Constrained vs. Unconstrained	Female vs. Male
Most Fair						
Observations	1109		1109		554	1109
Wald Chi^2	27.2***		24.3***		15.2***	16.6***
ED vs. EB	0.500***		0.744		0.444***	0.531***
MB vs. EB	0.728		0.172***		2.037	0.385***
MB vs. ED	1.458		0.232***		4.590***	0.725
Least Fair						
Observations	1120		1120		560	1120
Wald Chi^2	7.3**		45.8***		1.5	15.8***
ED vs. EB	1.899**		2.019**		1.434	1.777*
MB vs. EB	1.217		6.020***		0.885	2.881***
MB vs. ED	0.641**		2.981***		0.617	1.622**

Note: The analysis of Most Fair for dropped 11 observations with allocations not listed in the survey (listed as “Other” in Table 2A).

Table A2: Multinomial Logit Results: Odds Ratios for the Most-fair and Least-fair Divisions

	Verbal Information Only					Both Verbal and Quantitative Information		
	Goods Effect		**Sample Effect**	**Sex Effect**		**Goods Effect**	**Sample Effect**	**Sex Effect**
	Pills vs. Apples		University vs. Community	Females vs. Males		Pills vs. Apples	University vs. Community	Females vs. Males
Most Fair								
Observations	1120		1120	1120		1120	1120	1120
Wald Chi^2	30.8***		15.3***	3.4		26.3***	16.2***	5.9
ED vs. RN	0.427***		1.129	1.001		0.463***	0.912	0.667**
EB vs. RN	1.328**		1.488**	1.846		1.133	0.849	0.740**
MM vs. RN	0.840		0.666*	0.690*		1.308*	0.768	0.987
MX vs. RN	1.517**		0.792	0.847		0.996	0.262***	0.889
ED vs. EB	0.322***		0.759	1.184		0.409***	1.074	0.901
MM vs. EB	0.633**		0.447***	0.816		1.154	0.905	1.333
MX vs. EB	1.142		0.532***	1.002		0.879	0.309***	1.202
ED vs. MM	0.509**		1.696*	1.450		0.354***	1.188	0.676
MX vs. MM	1.806***		1.189	1.815		0.762	0.342***	0.901
MX vs. ED	3.549***		0.701	0.846		2.150**	0.288***	1.333
Least Fair								
Observations	1120		1120	1120		1120	1120	1120
Wald Chi^2	16.5***		49.1***	13.7***		30.7***	33.7***	15.6***
ED vs. RN	1.117		2.595**	1.620		1.865*	3.327***	1.978*
EB vs. RN	1.140		0.915	0.671		1.722	2.893**	0.646
MM vs. RN	0.630*		3.091***	1.583		1.485	2.345*	0.982
MX vs. RN	0.824		5.060***	1.217		0.832	5.858***	1.723
ED vs. EB	0.980		2.836***	2.414***		1.083	1.150	3.060***
MM vs. EB	0.552**		3.378***	2.360***		0.862	0.811	1.520
MX vs. EB	0.723		5.530***	1.815**		0.483**	2.025**	2.667***
ED vs. MM	1.774***		0.840	1.023		1.256	1.419	2.014**

MX vs. MM	1.310		1.637**	0.769		0.560***	2.499***	1.755**
MX vs. ED	0.738**		1.950***	0.752**		0.446***	1.761***	0.872

Table A3: Odds Ratios for Sample and Sex Effects with Simultaneous Control

	Verbal Only			**Both Verbal and Quantitative**	
	Sample Effect	**Sex Effect**		**Sample Effect**	**Sex Effect**
	University vs. Community	Females vs. Males		University vs. Community	Females vs. Males
Most Fair					
Observations	1120			1120	
Wald Chi^2	19.5***			19.6**	
ED vs. RN	1.137	0.971		1.078	0.775
EB vs. RN	1.588***	0.761		1.198	0.756**
MM vs. RN	0.713	0.748		0.756	0.916
MX vs. RN	0.814	0.889		0.582***	0.969
ED vs. EB	0.716	1.277		0.900	1.022
MM vs. EB	0.449***	0.983		0.631	1.207
MX vs. EB	0.513***	1.169		0.486***	1.278
ED vs. MM	1.594	1.299		1.426	0.847
MX vs. MM	1.142	1.889		0.770	1.058
MX vs. ED	0.716	0.916		0.540**	1.250
Least Fair					
Observations	1120			1120	
Wald Chi^2	60.5***			76.1***	
ED vs. RN	2.427***	1.321		2.682***	1.393
EB vs. RN	1.004	0.670		1.607	0.596
MM vs. RN	2.939***	1.234		2.806***	1.098
MX vs. RN	5.283***	0.833		4.536***	1.064
ED vs. EB	2.417***	1.971**		1.669	2.337***
MM vs. EB	2.926***	1.842**		1.746*	1.842*
MX vs. EB	5.261***	1.243		2.823***	1.786**
ED vs. MM	0.826	1.071		0.956	1.269

MX vs. MM	1.799***	0.675		1,617***	0.969
MX vs. ED	2.177***	0.631***		1.691***	0.764*

Table A4: Good-Sample Interaction Effects with Quantitative Information Only

Goods x Sample							
	Goods Effect: Pills vs. Apples		Sample Effect: University vs. Community		Interaction Effect Pills x University		
Most Fair							
ED vs. EB	0.526***		0.772		0.902	Obs	1109
MB vs. EB	0.882		0.258***		0.335**	Wald Chi^2	45.4***
MB vs. ED	1.677		0.334**		0.371		
Least Fair							
ED vs. EB	2.361***		2.881**		0.545	Obs	1120
MB vs. EB	1.139		5.660***		1.137	Wald Chi^2	59.6***
MB vs. ED	0.482***		1.965**		2.088**		

Table A5: Good-Sample Interaction Effects with Verbal Information Only

	Goods Effect: Pills vs. Apples		Sample Effect: University vs. Community		Interaction Effect Pills x University			
Most Fair								
ED vs. RN	0.480**		1.182		0.813		Obs	1120
EB vs. RN	1.120		1.281		1.324		Wald Chi^2	49.8***
MM vs. RN	0.738		0.586**		1.318			
MX vs. RN	1.692**		0.916		0.793			
ED vs. EB	0.429**		0.923		0.614			
MM vs. EB	0.659		0.458***		0.996			
MX vs. EB	1.511		0.715		0.599			
ED vs. MM	0.650		2.016**		0.617			
MX vs. MM	2.293***		1.562		0.602			
MX vs. ED	3.526***		0.775		0.975			
Least Fair								
ED vs. RN	1.295		3.175***		0.686		Obs	1120
EB vs. RN	1.318		1.193		0.607		Wald Chi^2	69.7***
MM vs. RN	0.750		3.759***		0.660			
MX vs. RN	0.557*		4.260***		1.551			
ED vs. EB	0.983		2.661**		1.130			
MM vs. EB	0.569		3.150***		1.088			
MX vs. EB	0.423**		3.571***		2.556*			
ED vs. MM	1.727**		0.845		1.036			
MX vs. MM	0.743		1.134		2.349**			
MX vs. ED	0.430***		1.342		2.262***			

Table A6: Good-Sample Interaction Effects with Both Verbal and Quantitative Information

	Goods Effect: Pills vs. Apples		Sample Effect: University vs. Community		Interaction Effect Pills x University			
Most Fair								
ED vs. RN	0.467***		0.928		0.989		Obs	1120
EB vs. RN	1.286		0.955		0.797		Wald Chi^2	42.7***
MM vs. RN	1.417		0.829		0.865			
MX vs. RN	0.878		0.193***		1.755			
ED vs. EB	0.363***		0.972		1.241			
MM vs. EB	1.102		1.102		1.086			
MX vs. EB	0.683		0.202***		2.202			
ED vs. MM	0.329***		1.120		1.144			
MX vs. MM	0.620		0.233***		2.029			
MX vs. ED	1.882		0.208***		1.774			
Least Fair								
ED vs. RN	1.534		2.687		1.287		Obs	1120
EB vs. RN	1.436		2.333		1.306		Wald Chi^2	68.9***
MM vs. RN	2.154*		4.392**		0.327			
MX vs. RN	0.870		6.934***		0.731			
ED vs. EB	1.068		1.152		0.985			
MM vs. EB	1.500		1.882		0.250*			
MX vs. EB	0.606		2.972**		0.560			
ED vs. MM	0.712		0.612		3.942***			
MX vs. MM	0.404***		1.579		2.239*			
MX vs. ED	0.567**		2.581***		0.568			

References

Agresti A. 1996. *An Introduction to Categorical Data Analysis*. New York : John Wiley and Sons.

Agresti A. 2002. *Categorical Data Analysis*. New York: John Wiley and Sons.

Amiel Y, Cowell F. 1999. *Thinking About Inequality: Personal Judgment and Income Distributions*. Cambridge: Cambridge University Press.

Ball S, Cech P-A. 1996. Subject Pool Choice and Treatment Effects in Economic Laboratory Research. In *Research in Experimental Economics, Vol. 6*, ed. Isaac RM, Greenwich, Conn: JAI Press.

Bar-Hillel M, Yaari M. 1993. Judgments of Distributive Justice. In *Psychological Perspectives on Justice: Theory and Applications*, ed. Mellers B, Baron J,55-84 pp. Cambridge: Cambridge University Press. 55-84 pp.

Barer ML, Evans RG, Marmor TR, Eds. 1994. *Why are Some People Healthy and Others Not? The Determinants of the Health of Populations*. New York: A. de Gruyter.

Charness G, Rabin M. 2002. Understanding Social Preferences with Simple Tests. *The Quarterly Journal of Economics*:817-69

Cookson R, Dolan P. 1999. Public views on health care rationing: a group discussion study. *Health Policy* 49:63-74

Cox G. 1987. Electoral Equilibrium under Alternative Voting Institutions. *American Journal of Political Science* 31:82-108

Culyer AJ. 1995. Need: The Idea Won't Do - But We Still Need It. *Social Science and Medicine* 40(6):727-30

Culyer AJ, Wagstaff A. 1993. Equity and Equality in Health and Health Care. *Journal of Health Economics* 12(4):431-57

Elster J. 1992. *Local Justice*. New York: Russell Sage Foundation.

Engelmann D, Strobel M. 2004. Inequality Aversion, Efficiency, and Maximin Preferences in Simple Distribution Experiments. *American Economic Review* 94(4):857-69

Faravelli M. 2007. How Context Matters: A Survey-based Experiment on Distributive Justice. *Journal of Public Economics* 91(7-8):1399-422

Fehr E, Naef M, Schmidt M. 2006. Inequality Aversion, Efficiency, and Maximin Preferences in Simple Distribution Experiments: Comment. *American Economic Review* 96(5):1912-7

Fleurbaey M. 1998. Equality Among Responsible Individuals. In *Freedom in Economics*, ed. Laslier J-Fea,206-234 pp. London: Routledge. 206-234 pp.

Gaertner W. 1994. Distributive Justice: Theoretical Foundations and Empirical Findings. *European Economic Review* 38(711):720

Gaertner W, Jungeilges J. 2002. Evaluation via Extended Orderings: Empirical Findings from Western and Eastern Europe. *Social Choice and Welfare* 19:29-55

Gaertner W, Jungeilges J, Neck R. 2001. Cross-cultural Equity Evaluations: A Questionaire-experimental Approach. *European Economic Review* 45:953-63

Gaertner W, Schwettmann L. 2007. Equity, Responsbility and the Cultural Dimension. *Economica* 74(276):627-49

Hurley J. 2000. The Normative Economics of Heath and Health Care. In *Handbook of Health Economics*, ed. Culyer AJ, Newhouse JP,56-118 pp. Amsterdam: North Holland. 56-118 pp.

Jungeilges J, Theisen T. 2008. A Comparative Study of Equity Judgments in LIthuania and Norway. *Journal of Socio-Economics* 37:1090-118

Kahneman D, Varey C. 1991. Notes on the Psychology of Utility. In *Interpersonal Comparisons of Well-being*, ed. Elster J, and Roemer J,127-163 pp. Cambridge: Cambridge University Press. 127-163 pp.

Kahneman D, Knetsch J, Thaler R. 1986. Fairness as a Constraint on Profit Seeking: Entitlements in the Market. *American Economic Review* 76(4):728-41

Konow J. 2003. Which if the Fairest of All? A Positive Analysis of Justice Theories. *Journal of Economic Literature* 41(4):1188-239

Long JS, Freese J. 2006. *Regression Models for Categorical Dependent Variables Using Stata*. College Station Texas: Stata Press.

Mueller D. 1989. *Public Choice II*. New York: Cambridge University Press.

Myerson RB. 2002. Comparison of Scoring Rules in Poisson Voting Games. *Journal of Economic Theory* 103:219-51

Nord E, Richardson J, Street A, Kuhse H, Singer P. 1995. Maximizing Health Benefits Vs. Egalitarianism: An Australian Survey of Health Issues. *Social Science and Medicine* 41(10):1429-37

OECD. 2007. *OECD Health Data 2007*. Paris: OECD.

Paulos JA. 1988. *Innumeracy: Mathematical Illiteracy and its Consequences*. New York: Hill and Wang.

Rawls J. 1971. *A Theory of Justice*. Cambridge: Harvard University Press.

Rice N, Smith P. 2001. Capitation and Risk Adjustment in Health Care Financing: An International Progress Report. *Milbank Quarterly* 79(1):81-113

Schokkaert E, Devooght K. 2003. Responsibility-sensitive Fair Compensation in Different Cultures. *Social Choice and Welfare* 21:207-42

Schokkaert E, Devooght K, Capeau B, Lelli S. 2007. *Allocating and Indivisible Good: A Questionaire-experimental Study of Intercultural Differences*. Discussion Paper 07-16, Department of Economics, KULeuven, Leuven

Schokkaert E, Lagrou L. 1983. An Empirical Approach to Distributive Justice. *Journal of Public Economics* 21:33-52

Schokkaert E, Overlaet B. 1989. Moral Intuitions and Economics Models of Distributive Justice. *Social Choice and Welfare* 6(19):31

Smith P, Rice N, Carr-Hill RA. 2001. Capitation Funding in the Public Sector. *Journal of the Royal Statistical Society, A* 164(2):217-57

Tversky A, Kahneman D. 1988. Rational Choice and the Framing of Decisions. In *Decision Making: Descriptive, Normative and Prescriptive Interactions*, ed. Bell D, Raiffa H, Tvesky A,167-192 pp. Cambridge: Cambridge University Press. 167-192 pp.

Ubel P. 2001. *Pricing LIfe: Why It's Time for Health Care Rationing*. Cambridge, MA: MIT Press.

Walzer M. 1983. *Spheres of Justice*. Oxford: Basil Blackwell.

Williams A. 1978. Need - An Economic Exegisis. In *Economic Aspects of Health Services*, ed. Culyer A, Wright K,32-45 pp. London: Martin Robertson. 32-45 pp.

Williams A, Cookson R. 2000. Equity in Health. In *Handbook of Health Economics*, ed. Culyer AJ, Newhouse JP, 35: Amsterdam: North-Holland.

Yaari ME, Bar-Hillel M. 1984. On Dividing Justly. *Social Choice and Welfare* 1:1-24

Young HP. 1995. *Equity in Theory and Practice*. Princeton: Princeton University Press.

Zajac E. 1995. *Political Economy of Fairness*. Cambridge, MA: MIT Press.