Seidl, Christian; Camacho Cuena, Eva; Morone, Andrea

Working Paper

Income Distributions versus Lotteries Happiness, Response-Mode Effects, and Preference

Economics working paper / Christian-Albrechts-Universität Kiel, Department of Economics, No. 2003,01

Provided in cooperation with:
Christian-Albrechts-Universität Kiel (CAU)

Suggested citation: Seidl, Christian; Camacho Cuena, Eva; Morone, Andrea (2003) : Income Distributions versus Lotteries Happiness, Response-Mode Effects, and Preference, Economics working paper / Christian-Albrechts-Universität Kiel, Department of Economics, No. 2003,01, urn:nbn:de:101:1-200910133567 , http://hdl.handle.net/10419/22062

Income Distributions versus Lotteries

Happiness, Response-Mode Effects, and Preference Reversals

by Eva Camacho-Cuena, Christian Seidl and Andrea Morone

C|A|U
Christian-Albrechts-Universität Kiel
Department of Economics

Economics Working Paper
No 2003-01

INCOME DISTRIBUTIONS VERSUS LOTTERIES: HAPPINESS, RESPONSE-MODE EFFECTS, AND PREFERENCE REVERSALS

Eva Camacho-Cuena[*], Christian Seidl[**], and Andrea Morone[***]

[*]*Institut für Volkswirtschaftslehre der Christian–Albrechts–Universität zu Kiel, Germany, and University Jaume I, Castellón, Spain.*

[**]*Institut für Volkswirtschaftslehre der Christian–Albrechts–Universität zu Kiel, Germany.*

[***]*Institut für Volkswirtschaftslehre der Christian–Albrechts–Universität zu Kiel, Germany, and ESSE, University of Bari, Italy.*

Abstract

This paper provides a comparative experimental study of risky prospects (lotteries) and income distributions. The experimental design consisted of multi–outcome lotteries and *n*–dimensional income distributions arranged in the shapes of ten distributions which were judged in terms of ratings and valuations, respectively. Material incentives applied. We found heavy response–mode effects, which cause inconsistent behavior between rating and valuation of lotteries and income distributions in more than 50% of all cases. This means that ethical inequality measures lack support in peoples' perceptions. In addition to classical preference reversals between generalized P–bets and $–bets we observed three additional patterns of preference reversal, two of which apply only to income distributions. Dominating Lorenz curves and Lorenz curves cutting others from below receive decidedly higher ratings (which implies risk and inequality aversion), but lower valuations. The transfer principle is largely violated. The rating of lotteries is a decreasing function of skewness, the rating of income distributions is a decreasing function of standard deviation. The valuation of lotteries is an increasing function of standard deviation and kurtosis, and the valuation of income distributions is an increasing function of standard deviation, skewness, and kurtosis.

KEYWORDS: Income Distribution, Lotteries, Income Happiness, Inequality and Risk Aversion, Ethical Inequality Measures, Preference Reversal.

JEL NUMBER: C91, D31, D63, D81.

1. Introduction

1.1 Relationships Between Lotteries and Income Distributions

Many scholars have recognized the close relationship between risky prospects and income distributions. For instance, Kolm (1969) and Atkinson (1970) established the concept of the *equally distributed equivalent income* [EDE] by analogy with the *certainty equivalent* [CE] of a lottery.[1] Instead of applying results from the theory of risky prospects to income distributions, some authors took the other way round, to wit, they applied tools taken from the analysis of income distributions to the analysis of risky prospects. It was, in particular, Lopes (1984, 1987) who put Lorenz curves to good use to study lottery experiments.[2]

Following Friedman's (1953) lead, other scholars, in particular Strotz (1958, 1961) and Kanbur (1979, 1982), have modelled the emergence of income distributions as a resultant of decisions under risk. Still other scholars modelled the welfare evaluations of income distributions in terms of expected utility.[3] Other scholars showed the correspondence of social welfare functions and income inequality measures.[4]

1.2 Income Happiness

Work on lottery preferences is well established since the seminal study of von Neumann and Morgenstern (1944). Income happiness has been studied in a number of ways, first, using field data for time–series and cross–section investigations, second, employing experiments to observe the happiness pattern generated by divers payoff structures, and, third, by canvassing the happiness bred by different distributional shapes. Time–series investigators have shown constant mean happiness ratings in the

[1]Other similarities exist between the transfer principle on the one hand, and mean preserving contractions and stochastic dominance on the other, between inequality aversion and risk aversion, between Lorenz dominance and risk aversion, and between happiness with income distributions and lottery preferences. See also Rothschild and Stiglitz (1970, 1971, 1973), and, for a generalized presentation, Nermuth (1993).

[2]Curiously enough, Lopes (1984), p. 481, went even as far as to reconvert the parameter ε of Atkinson's inequality measure into a measure of subjects' risk attitudes, which the economist readily identifies as the Arrow–Pratt measure of relative risk aversion.

[3]Cf., e.g., Vickrey (1945, 1960, 1961), Fleming (1952), Goodman and Markovitz (1952), Harsanyi (1953, 1955), Dworkin (1981) Dahlby (1987), Kolm (1985, 1998), Epstein and Segal (1992), Fleubaey (1998).

[4]Cf., e.g., Blackorby and Donaldson (1978), Cowell (1985), Cowell and Kuga (1981), Chakravarty (1990), Blackorby, Bossert, and Donaldson (2001).

lapse of time, even across periods of vigorous income growth.[5] In contrast to that, cross–section analyses have shown a distinct positive correlation of happiness with income levels.[6]

The lesson of cross–sectional field data shows us that *relativity* matters for income happiness. This has by and large been confirmed by experimental research. Loewenstein, Thompson, and Bazerman (1989) and, in particular, Bazerman, Loewensein, and White (1992) observed that, in the space of payments to self and one other person, subjects rate a more equal payoff distribution higher, even if it implies inferior payments for self than a more unequal distribution.[7] This attitude demonstrates a robust violation of the Pareto principle, which caused McClelland and Rohrbaugh (1978) to entitle their paper with the question "Who Accepts the Pareto Axiom?".

These findings readily translate into happiness in the workplace, endowed, however, with a preference inversion between happiness perception and job choice. Subjects express greater happiness for jobs with less pay when salaries are more equally distributed than for jobs with more pay which falls off from their mates' salaries. At the same time, when faced with job choices, subjects opt for the higher–paid job, accepting thus some relative deprivation resulting from the unequal salaries.[8] Tversky and Griffin (1991, p. 117) explain this behavior as the resultant of two countervailing effects, viz. the *endowment* effect (depending on the quality and the intensity of an event), and the *contrast* effect (depending on an event's similarity with or relevance for other events). They argue that judgments of well–being are insufficiently sensitive to endowment, whereas choice is insufficiently sensitive to contrast. Therefore, welfare policy derived from Pareto optimality could result in allocations that make most people less happy because it ignores the effect of social comparison. A preoccupation with judgment, on the other hand, may be misleading because it ignores endowment effects.

The contrast effect has led Parducci (1968, p. 90) to claim that happiness results from the shape of the distribution:

> What the theory suggests is that happiness is a negatively skewed distribution. If the best can come only rarely, it is better not to include it in the range of experiences at all. The average level of happiness can be raised by arranging life so that high levels of satisfaction come frequently,

[5]Cf., e.g., Easterlin (1974, 1995, 2001), Smith (1979), Kenney (1999), Blanchflower and Oswald (2000). For individuals, it seems that, in the course of time, subjects put up with their (un)fortunate fate: Brickman, Coates, and Janoff–Bulman (1978) did not observe major differences in the reported happiness of the winners of top lottery prizes and paraplegics, respectively, when compared with control groups. Of course, adaptation takes place only after a longer spell.

[6]Cf., e.g., Duncan (1975), Veenhoven (1993), Diener and Oishi (2002). Notice, however, that questions posed within happiness polls may be severely impaired by framing effects; for a striking example see Turner and Krauss (1978).

[7]For similar findings cf. also Conrath and Deci (1969), Radzicki (1976), McClelland and Rohrbaugh (1978), Rohrbaugh, McClelland, and Quinn (1980), Messick and Sentis (1985), Charness and Grosskopf (2001) observe a negative correlation of happiness and willingness to lower another person's payoff below one's own. For contrary results cf. Hoffman and Spitzer (1982, 1985) and van Avermaet (1974).

[8]Cf., e.g., Schmitt and Marwell (1972), Ross and McMillen (1973), Austin, McGinn, and Susmilch (1980), Tversky and Griffin (1991), Blount and Bazerman (1996), Traub, Seidl, and Morone (2002). Clark and Oswald (1996) observed related results for British field data.

even if this requires renunciation of the opportunity for occasional experiences that would be even more gratifying.

1.3 Methodological Advances

Before describing our investigations, let us accentuate the methodological advances of this research.

First, joint analyses of risky prospects and income distributions are much in their infancy.[9] The most comprehensive joint analysis of risky prospects and income distributions so far seems to be Bernasconi's (2002) paper. This author investigated distributional axioms and their counterparts in risk analysis. He tested the independence axiom, the betweenness axiom (randomization aversion, neutrality, or preference), the transfer principle/mean preserving contractions, and Pareto dominance/first order stochastic dominance. Bernasconi did not observe dramatic systematic differences between framing modes,[10] but found a joint rejection of Harsanyi's social welfare function with respect to the evaluation of income distributions, and expected utility for the evaluation of lotteries.

Second, material incentives seem to have hardly ever been used in experiments on income distributions.[11] Although Camerer and Hogarth (1999) provided evidence that the role of material incentives seems to have been overstated by economists,[12] the widespread absence of material incentives is alarming, because, *if* they matter for income distributions, there is no chance of detecting this dependence, as they were never applied. In the present paper, material incentives were applied both to motivate subjects to reveal their true preferences and to warrant that they make efforts at a proper understanding of the experimental design.

Third, the experimental stimuli of most experiments with lotteries and virtually all experiments of income happiness consist of binary relations, i.e., payments to self and other.[13] Yet risky events are

[9]Cf. Cowell and Schokkaert (2001) for a literature survey. Amiel, Cowell, and Polovin (2001) report a predominance of Dalton cases [Dalton (1920) has considered both equal proportionate and equal absolute additions to all incomes to increase income inequality] for inequalitiy perceptions. Yet their experimental design confuses lottery dominance with the perception of income inequality.

[10]It seems that his rather heterogeneous subject groups impaired the quality of his data, as he did not control for systematic differences in his subjects' characteristics (students of a state university versus students of a private university with high fees).

[11]Cf., e.g., Amiel and Cowell (1992, 1994a,b, 1998, 199a,b), Harrison and Seidl (1994a,b), Amiel, Cowell, and Polovin (2001), Bernasconi (2002). Exceptions are the papers by Traub, Seidl, Schmidt, and Levati (2001), by Schmidt, Seidl, Traub, and Levati (2002), and by Seidl, Traub, and Morone (2002), but these three papers are still unpublished. The only published work using material incentives seems to be the article by Beckman, Formby, Smith, and Zheng (2002).

[12]Psychologis ts do not consider material incentives as the hub of a decent experimental design. They often award course credits to their subjects, which may well substitute monetary payoffs.

[13]The binary concept of inequality aversion as developed by Loewenstein, Thomp son, and Bazerman (1989) was generalized by Fehr and Schmidt (1999), p.822, to the n–person case, but has not yet been tested in experiments. Bolton and Ockenfels (2000) model a subject's utility as a function of own absolute payoff and his or her share in total payoffs, but not as a function of payoff distribution. Similar ideas were developed by philosopher Temkin (1986, 1993). Temkin suggests that inequality aversion results from the complaints of income recipients in the low

seldom dichotomous beyond the laboratory, but consist of multiple outcomes, and binary income distributions cannot claim relevance beyond a Robinson–and–Friday world. Multi–outcome lotteries, it is true, have been pioneered by Schneider and Lopes, but they used them either to critically re–examine the reflection effect [Schneider and Lopes (1986)], or to investigate subjects' risk attitudes [Lopes (1984, 1987)]. Analyses of income happiness by way of field data do not investigate subjects' emotions vis–à–vis income distributions, but consider either subjects' relative position across income echelons, or with respect to a reference point, such as mean income. The present paper is based on multi-outcome lotteries and multiple income distributions throughout.

Fourth, it is well known from experimental work that response-mode effects abound in many elicitation procedures of subjects' attitudes. To check for response-mode effects, happiness with lotteries and income distributions was elicited in terms of two response modes, viz. rating scales and valuation (EDE and CE, respectively).

1.4 Investigations

After a description of our experiment, we investigate four issues in this paper.

In Section 3.1 we scrutinize the preference–reversal phenomenon. Preference reversal was first observed by Lichtenstein, Lindman, and Slovic [14] as a response–mode effect in the evaluation of lotteries. The experimental design to demonstrate that is quite easy: There are two lotteries, a so–called P–bet, which accords a modest payoff with a high probability, and a so–called \$–bet, which accords a high payoff with a low probability. A substantial fraction of subjects express preference for the P–bet, but assign a higher CE (usually measured in terms of a selling price[15]) to the \$–bet.

This prompts, first, the question of whether and in what manner preference reversal in terms of lotteries extends also to multi–outcome lotteries. Indeed, Casey (1991) generalized the P–bet as a negatively skewed distribution and the \$–bet as a positively skewed distribution, but it seems that he prematurely abandoned research with multi–outcome lotteries.[16]

---

income echelons akin to relative deprivation. However, he seems to have neglected possible complaints of income recipients in the high income echelons, as they may well consider the poor persons' incomes as being still too high. Levine's (1998) model aims at an explanation of altruism and spitefulness rather than at a modelling and a test of income happiness.

[14] Lindman (1965, 1971), Slovic and Lichtenstein (1968), Lichtenstein and Slovic (1971). For a comprehensive literature survey cf. Seidl (2002).

[15] Combining high lottery payoffs with bid prices, Casey (1991) observed reverse preference reversals.

[16] For his work with multi–outcome lotteries he used an experimental design akin to that one developed by Schneider and Lopes (1986) and Lopes (1984, 1987). But, as Casey (1991, p. 237), other than Weber (1984), did not observe major differences from binary lotteries, he did not resume working with multi–outcome lotteries in his second experiment. He reports (p. 232) that Weber (1984) had found distinctly less preference reversals for three–outcome bets. However, Casey could not evidence that for his experiment.

Second, it prompts the question of whether preference reversal is confined to the juxtaposition of negatively and positively skewed distributions only, or whether preference reversal exists also for lottery pairs beyond positively and negatively skewed lotteries. This would imply the discovery of new patterns of preference reversal.

Third, it prompts the question of whether the preference reversal phenomenon carries over to income distributions as well, that is, whether observational inconsistencies exist also between preferences among income distributions and their associated EDEs. To illustrate, suppose *x* and *y* denote two income distributions arranged in nondecreasing order with the same mean and in the same dimension. Let denote a subject's preference or happiness relation in the space of income distributions. Then we would expect

$$\mathrm{EDE}(x)\mathrm{EDE}(y) \Leftrightarrow xy. \qquad (1)$$

In terms of the Atkinson–Kolm–Sen terminology, is expressed in terms of a homothetic social welfare function.[17] Now, if (1) is violated,[18] the perception of income distributions, too, depends on the response mode. This means that, if preference reversal haunts income distributions in a similar way as it haunts risky prospects, then ethical measures of inequality become devoid of a perceptional bedrock.

Whereas preference reversal implies the comparison of the ratings and the valuations of lotteries and income distributions, respectively, pairs of lotteries and income distributions can be compared according to the pattern of their cumulants. This comes up to their comparison in terms of Lorenz curves, to which we turn in Section 3.2. A Lorenz curve can either dominate another or intersect another. When the respective lotteries or income distributions have the same mean, Lorenz domination is equivalent to respecting mean–preserving contractions (for lotteries) or the transfer principle (for income distributions). Moreover, it comes up to risk aversion (for lotteries; see Lopes (1984, 1987)) or to inequality aversion (for income distributions). In this paper we investigate whether Lorenz dominance is matched by the ratings and by the evaluations of lotteries and income distributions, respectively.

Lorenz curves which intersect exactly once provide also interesting patterns to be investigated. Subjects, who mind an unequal income distribution at the lower end of a Lorenz curve less than at the upper end, should opt for lotteries or income distributions whose Lorenz curve cuts another from below. We also investigate which pattern is matched by the ratings and the evaluations of lotteries and income distributions, respectively. An alternative check of risk aversion or the transfer principle is the comparison of a lottery's CE or an income distribution's EDE with its mean, μ. Risk aversion holds if

[17] For nonhomothetic social welfare functions relation (1) continues to hold if we choose a reference welfare level *w* such that $W(x)wW(y)$. For technical details cf. Blackorby and Donaldson (1978), p. 64.
[18] Note that (1) is already violated if one inequality sign is strict and points in the opposite direction. Thus, we do not restrict ourselves to strict preference reversals which require that both inequality signs are strict and point in opposite directions.

CE<μ, inequality aversion holds if EDE<μ. In Section 3.3 of this paper, we investigate violations of risk and inequality aversion, in particular violations of the transfer principle.

The influence of the shape of a lottery or an income distribution on subjects' happiness (in particular, Parducci's conjecture that negatively skewed distributions breed happiness) seems to have never been experimentally investigated in a systematic way. In order to do this, the endowment effect and the contrast effect [Tversky and Griffin (1991)] have to be disentangled, and the contrast effect has to be isolated. This requires to analyze the shapes of different lotteries or income distributions with the same mean. In particular, Parducci's (1968) claim that negatively skewed distributions breed greater happiness has not been precisely specified. Does it apply to lotteries, to income distributions, and does it depend on the response mode? In Section 3.4 of this paper we investigate this question together with a check of ordering and cultural effects.

Of course, we are well aware that happiness is a multifarious phenomenon which is decisively shaped by perceptions of distributional equity.[19] Therefore, we adopted a simple experimental design and avoided any remarks (e.g., concerning work effort or talents) which might have triggered equity considerations which could not be controlled for. Also we carried out our experiments in terms of the local currency and concluded them well before the introduction of the EURO (€) to avoid effects of money illusion and transitory effects of yet insufficient acquaintance with and adaptation to the new currency. For the sake of analytical comparability, however, we express all figures and tables in terms of €.

2. The Experiment

The experimental design consisted of two experiments, one concerning lotteries, and one concerning income distributions. Each experiment encompassed two parts, a rating part, and a valuation part. Both experiments were administered at the ESSE laboratory at the University of Bari in Italy, as well as at the LEE laboratory at the University Jaume I in Castellón, Spain. 53 subjects participated in the lottery experiment and 57 subjects participated in the income distribution experiment in Bari; 52 subjects participated in the lottery experiment and 50 subjects participated in the income distribution experiment in Castellón. Subjects were only admitted to one experiment to avoid anchor effects. The data of three subjects had to be discarded,[20] which left us with the following usable data: 52 subjects for lotteries in

[19]Cf. Miller (1995) for a good survey of empirical results. Subjects' perceptions are often blurred and inconsistent. Moreover, there are large differences in attitudes across nations.

[20]One subject in Italy rated every lottery with 10, telling the experimenter that this was his fortune number. One subject in Italy provided the same EDE for all distributions. One subject in Spain provided CEs which all exceeded the maximum payoff of the respective lotteries.

Italy, 56 subjects for income distributions in Italy, 51 subjects for lotteries in Spain, 50 subjects for income distributions in Spain.

The stimulus material consisted of ten distributions the graphs of whose density functions are displayed in Figures 1, 2, and 3. Distributions 1–3 are negatively skewed, Distributions 4–7 are positively skewed (the distributional shape which governs all empirical income distributions), Distribution 8 is unimodal, Distribution 9 is rectangular, and Distribution 10 is bimodal. The distributions were presented in the format developed by Lopes (1984, 1987) and Schneider and Lopes (1986). Each distribution had the same expected value of some €1,800, save for differences in rates of exchange and rounding errors in order to secure decent numbers in terms of the local currency (Lire and Pesetas, respectively).[21] The exact parameters of the distributions (mean, standard deviation, skewness, kurtosis[22], minimum, maximum, range, and Gini coefficient) are shown in Table 1.

Insert Figures 1, 2 and 3 about here

Insert Table 1 about here

Both lotteries and income distributions may be arranged in terms of Lorenz curves. Two Lorenz curves may either intersect or one may dominate the other. As these relationships have important implications for risk aversion (for lotteries) and for the transfer principle (for income distributions), as well as for subjects' attitudes to low or high lottery prizes and incomes, respectively, we show the pattern of Lorenz relationships of our experimental design in Figure 4: An increasing arrow means that the Lorenz curve of the lottery or income distribution of the respective line cuts the Lorenz curve of the lottery or income distribution of the respective column from below, where intersections within two percentage points from the lower and the upper end were ignored. A horizontal arrow means that the Lorenz curve of the lottery or income distribution of the respective line dominates the Lorenz curve of the lottery or income distribution of the respective column. A tilde means that parts of the respective Lorenz curves coincide.

Insert Figure 4 about here

Let us first focus on the experiment pertaining lotteries. At the beginning, subjects were asked to read carefully the instructions and the payment regulations. To make sure that subjects properly understood the experiment, they had then to pass an examination consisting of ten multiple–choice questions. Subjects were informed that for each incorrectly answered question they had to face a 10% cut of their payoff; if they had only a record of five or less correct answers, they would be excluded from any payoff.[23]

---

[21] Due to such influences the average level of entries in terms of € was some 3.4% lower in Spain than in Italy. The actual figures for the means were about €1,807 in Italy and €1,745 in Spain.

[22] Kurtosis is defined as the fourth central moment of the distribution less 3 (i.e., the value of the fourth central moment of a normal distribution with parameters $\mu=0$ and $\sigma=1$).

[23] Out of 110 subjects in Italy, only five scored at 6 or 7 correctly answered questions for both experiments; all others scored at least at eight correctly answered questions. In Spain, 11 out of 102 subjects scored at 7 for both experiments; all others scored better.

Then subjects received a booklet with two times the ten lotteries as described in Table 1 and presented in the Schneider-Lopes format in terms of the local currencies. The order of presentation was (1,4,5,2,3,8,9,10,6,7) in Italy, and, to control for order effects, (7,6,10,9,8,3,2,5,4,1) in Spain.[24] Subjects were arranged in groups of about ten. The lottery prices were arranged in terms of 100 tally marks. Subjects were told that each tally mark in the lotteries represented exactly one ticket equal in value to the amount listed in the respective line of the distribution of the lottery. Subjects had an equal chance to draw one of the 100 tickets of the respective lottery. Subjects were asked to state on a 20–point rating scale their degree of happiness [1 means very unhappy, 20 means very happy] to play the respective lottery, as well as their CE (as a selling price) which was elicited by way of the Becker–DeGroot–Marschak [BDM] incentive scheme, whose working was carefully explained to subjects.

For *each* subject, a pair of lotteries was drawn at random, and the higher ranked lottery[25] was played out, whose result represented the first part of tokens. The second part of tokens came from the BDM incentive scheme. Another lottery was drawn for each subject. Then a draw was made from a uniform distribution defined on the support of this distribution. If the draw was less than CE, the respective lottery was played out. If the draw was greater or equal CE, then subject got tokens amounting to the drawn number (second part of tokens). A subject's total of tokens was then made up as the sum of the two token parts. Payoffs were determined by dividing the total number of tokens by 500.

The income-distribution part of the experiment differed only in minor points from the lottery part. Subjects were told that the population consisted of 100 millions of income earners, and that each tally mark in a distribution represented exactly 1 million of income earners. The figures represented monthly incomes because subjects are more accustomed to monthly salaries in Italy and Spain. Subjects were solicited to imagine to have an equal chance to become one of the 100 millions of income earners in this society. Subjects were told that they would not know ex ante their precise income in this society. All they knew was the distribution of monthly incomes. They were then asked to state on a 20–point rating scale their degree of happiness to enter a society in which the respective income distribution obtained. The rating scale extended from 1 (very unhappy) to 20 (very happy).

Thereafter, subjects were asked to imagine that they could alternatively enter a society in which all income earners had the *same* monthly income. They were invited to indicate this level of income such that they were *indifferent* between the respective income distribution and the alternative in which each person receives the same income [EDE].

Subjects were arranged in groups of about ten persons. In contrast to the lottery part of the experiment, subjects were informed that income distributions had to obtain for the group as a whole. Therefore, *one participant* of the group would be randomly chosen, and, for this particular person, two

[24]We assumed only modest cultural effects between Italy and Spain, which allows to test order effects. Contrary to that, we are able to show in Section 3.4 that order effects are absent, but some cultural effects exist for the ratings of income distributions only.

income distributions would then be randomly chosen. The higher rated income distribution would become the group's income distribution, and all subjects in this group would be assigned tokens according to this same income distribution. Thereby, every subject had to resume responsibility for the income distribution of the whole group. A separate draw was made from this very distribution for any subject in the group. This constituted the first part of tokens of a subject. The second part of tokens came from the BDM incentive scheme applied to each particular subject's statement of EDE for the selected income distribution. For this income distribution a draw was made from a uniform distribution defined on the support of the group's income distribution; if the draw was less than EDE, then a draw from this income distribution was made; if the draw was greater or equal to EDE, then the subject got tokens amounting to the drawn number (second part of tokens). A subject's total of tokens was then made up as the sum of the two token parts. Payoffs were determined by dividing the total number of tokens by 500. Subjects received a mean payoff of about €6.50. Every session lasted about one hour.

3. Results

When screening the data, we noticed that subjects made different use of the 20–point rating scale. Some settled more on the lower end, some on the upper end, and some dwelt on extremes. To avoid assigning different weights to subjects, we calibrated the rating scales, assigning a 1 to the lowest ranked lottery or income distribution, and a 10 to the highest ranked lottery or income distribution according to the formula:

$$r_i = 1 + [R_i - \min{}_j\{R_j\}]\frac{9}{\max{}_j\{R_j\} - \min{}_j\{R_j\}}$$

where R_i's denote the noncalibrated and the r_i's the calibrated ratings.

The results are arranged in four subsections. First we shall analyze preference reversals, second the conformity of subjects' behavior with the Lorenz relations of the experimental design, third violations of the transfer principle, and fourth order effects and happiness brought about by different distributional shapes.

[25]Ties were resolved by a random device.

3.1 Preference Reversals

To study preference reversals, we start with a summary statistic of the results, which is provided by Table 2.

Insert Table 2 about here

So far, preference reversals were studied exclusively in terms of lotteries. Lottery preferences were elicited either by way of a choice between two lotteries, or by way of rating lotteries on a point scale,[26] and comparing them with their CEs. To have an amenable experimental design and to avoid the necessity to control for intransitivities, we settled on the latter method,[27] i.e., we elicited subjects' preferences by the above–mentioned 20–point rating scale for income distributions and lotteries, which was calibrated to its pure ordering on a 10–point rating scale.

When canvassing Table 2 for deviations of ratings and valuations for *pairs* of distributions or groups of pairs of distributions, we encounter a wealth of preference reversals. Most spectacularly, Table 2 shows us that the average ratings of the negatively skewed lotteries and income distributions are higher than the average ratings of the positively skewed lotteries and income distributions,[28] whereas the opposite holds for the valuations, that is, the CEs and the EDEs are lower for the negatively skewed distributions than for the positively skewed distributions.[29] Recall that this is the generalized version of the *classical preference reversal* phenomenon, which is, according to Table 2, not confined to lotteries, but extends also to income distributions!

Moreover, Table 2 suggests that we strike three additional patterns of preference reversals: First, there is a tendency for negatively skewed distributions to exhibit higher ratings and lower valuations than the unimodal, rectangular, and bimodal distributions. This applies both for lotteries and income distributions. Second, there is a tendency for distributions (4) and (5) to exhibit higher ratings and lower valuations than distributions (6) and (7). This phenomenon is confined to income distributions only. Third, Table 2 shows a tendency for distributions (8), (9), and (10) to exhibit higher ratings and lower valuations than distributions (6) and (7), a phenomenon which is, too, confined to income

---

[26]See, for the latter method, Slovic and Lichtenstein (1968), pp.10-11; Goldstein and Einhorn (1987), p.239; Schkade and Johnson (1989), p.219; Tversky, Slovic and Kahneman (1990), p.213. Similarly to ours, Goldstein and Einhorn (1987) and Tversky, Slovic and Kahneman (1990) used rating scales reaching from 0 to 20 points.

[27]The choice method of preference elicitation is more appropriate for simple experiments, whereas the rating method is preferable for more complicated experimental designs. Note that both methods are equivalent. Having applied both methods, Tversky, Slovic and Kahneman (1990) p.213, report: "The data reveal no discrepancy between choice and rating."

[28]Using the Wilcoxon signed ranks test the differences are statistically significant at the 1% level.

[29]Using the Wilcoxon signed ranks test, the differences are statistically significant at the 1% level for the lotteries in Italy and for the income distributions in Italy and Spain. For lotteries in Spain, the difference is statistically significant at the 5% level.

distributions. Thus, we observe another pattern of preference reversals which hold both for lotteries and income distributions, and two more patterns of preference reversals which hold for income distributions only.

We just noted some tendencies of traditional and new preference reversals. Let us now check their significance. Table 3 presents the results of a Wilcoxon test of preference reversal. If the average rating of the distribution in a line of this table exceeds the rating of the distribution in the respective column, while, at the same time, the valuation of the distribution of this column exceeds the valuation of the distribution of the respective line, and both differences are significant at the 5% level under a Wilcoxon test, then there appears a respective entry in Table 3.[30] We see that our conjecture about preference reversal is confirmed for many relations. There are only two significant preference reversals [cells (1,3) and (8,9)] outside the regions of the the tendencies for preference reversals.

Insert Table 3 about here

By comparison with Table 3, notice the particularities of distributions (6) and (7): They have low minimum values and the highest maximum values of payoffs and incomes, respectively, and, thus, the highest standard deviations. Inequality aversion suggests, therefore, a higher rating of income distributions (1)–(5) and (8)–(9) as compared with the ratings of income distributions (6) and (7). The valuation, on the other hand, receives its direction from the maximum incomes under the respective income distributions.[31]

Tables 2 and 3 show us the incidence of preference reversals for aggregate data. Individual data contribute another quality of information to study preference reversals. Tables 4–7 contain the respective results.

Insert Tables 4–7 about here

These tables are arranged that, when reading the lines, the lottery or income distribution of the respective line has a higher rating than the lottery or income distribution of the respective column, whereas the CE or the EDE of the lottery or the income distribution of the line is smaller than the CE or EDE of the lottery or the income distribution of the respective column. When reading the columns, the lottery or income distribution of the respective column has a lower rating than the bttery or income distribution of the respective line, whereas the CE or EDE of the lottery or income distribution of the respective column is greater than the CE or EDE of the lottery or income distribution of the respective

[30] LI means lottery for Italian subjects, LS lottery for Spanish subjects, DI income distribution for Italian subjects, and DS means income distribution for Spanish subjects.

[31] Slovic, Griffin and Tversky (1990) explain preference reversal by the joint operation of the prominence hypothesis and the compatibility hypothesis. Probability is more prominent for the rating of distributions, whereas, for the evaluation exercise, attributes are weighted more heavily in the comparison of alternatives when they were common. As valuation is cast in terms of money, desirable results, that is, high payoffs or incomes, determine valuation. For greater details, see Seidl (2002), Section 4.3.

line. To illustrate, cell (1,8) in Table 4 tells us that 25 out of 52 Italian subjects displayed a preference reversal in the sense that they rated lottery (1) higher than or equal to lottery (8), but assigned a CE to lottery (1) which is smaller than or equal to the CE assigned to lottery (8), where at least one inequality holds strictly. Cell (8,1) in Table 4 tells us that none out of 52 Italian subjects showed a preference reversal between these two lotteries which is opposite to the one in cell (1,8).

Note that all entries in Tables 4–7 concern inconsistencies between ratings and valuations.[32] All taken together, we observe 47.6% inconsistencies for lotteries out of a total of 2340 cases [45 comparisons of distributions times 52 subjects] in Italy and 52.9% in Spain. Inconsistencies for income distributions amount to 57.0% in Italy and 57.5% in Spain. The complementary percentages refer to consistent behavior.

Inconsistencies which feature a marked asymmetric behavior are addressed as preference reversals. In order to identify preference reversals, we applied a binomial test to probe whether the entries in the cells (*i*,*j*) and (*j*,*i*) are significantly different or not. Recall that a negatively skewed distribution is a generalized P–bet, and a positively skewed distribution is a generalized $–bet. Then classical preference reversal would predict a high incidence in the area delimited by the cells (1,4), (1,7), (3,4), and (3,7), and a low incidence in the area delimited by cells (4,1), (4,3), (7,1), and (7,3). Table 4 shows us that classical preference reversal holds for eleven out of twelve cases, the cells (2,4) and (4,2) forming the sole exception. The same holds for classical preference reversal for the Spanish data on lotteries in Table 5, where the cells (3,5) and (5,3) form the sole exception. A new type of preference reversal is manifested as a high incidence in the area delimited by cells (1,8), (1,10), (3,8), and (3,10), and a low incidence in the area delimited by cells (8,1), (8,3), (10,1), and (10,3). This applies fully to the Spanish data and to the Italian data with two exceptions out of nine cases. There are no other areas of similar patterns of preference reversals for Italy and Spain with the exception of two cases [cells (8,9) and (9,8) and cells (2,3) and (3,2), respectively]. Thus, the results observed from Tables 2 and 3 for lotteries are duly reflected in Tables 4 and 5.

Whereas Tables 4 and 5 show only two kinds of preference reversal, Tables 6 and 7 reveal a plethora of preference reversals. Classical preference reversal [high incidence in the area delimited by cells (1,4), (1,7), (3,4), and (3,7), and a low incidence in the area delimited by cells (4,1), (4,3), (7,1), and (7,3)] is prevalent both for the Italian [three exceptions] and Spanish [two exceptions] data. The new preference reversal discovered for lotteries [high incidence in the area delimited by cells (1,8), (1,10), (3,8), and (3, 10), and low incidence in the area delimited by cells (8,1), (8,3), (10,1), and (10,3)] is established also for income distributions with one exception for the Italian data.

[32] Note the difference of the data making up Table 2 on the one hand, and Tables 4–7 on the other: Whereas Table 2 contains subjects' average ratings and valuations encompassing their consistent behavior, Tables 4-7 are restricted to inconsistent behavior only.

The second type of new preference reversals noted for the aggregate income distribution data is also reflected in the individual data on income distributions: There is a distinct pattern of preference reversal between distributions (4) and (5) on the one hand, and (6) and (7) on the other, which signals a prevalence of inequality aversion for ratings and equality aversion for valuations. Note that this pattern of preference reversal is absent for lottery data.

The third type of preference reversal, i.e., income distributions (8), (9), and (10) on the one hand, and (6) and (7) on the other, is fully evidenced for the Spanish data [even for (9) against (6) in contrast to Table 3], and evidenced only for (8) versus (6) and (7) for the Italian data [in accordance with Table 3]. It, too, signals inequality aversion for ratings and equality aversion for valuations.

Some minor patterns of preference reversal are also shown in the data, such as (1) and (2) versus (3), yet most of them reflect no common feature but seem to result from cultural effects dividing the Italian and Spanish data. Cultural effects are resumed in Section 3.4.

Theoretical considerations and inspection of Tables 2–7 have shown that there exists definite patterns of preference reversals among the income distributions and lotteries of our experimental design. Moreover, although these patterns seem to be more similar within income distributions and lotteries, respectively, the preference reversal patterns bear also similarity between income distributions on the one hand, and lotteries on the other. To investigate that we compare the structure of the border distributions of the individual data on preference reversals. Table 8 shows the Pearson correlation coefficients and the Spearman rank correlation coefficients between the border distributions of Tables 4–7.

Insert Table 8 about here

Above–diagonal entries in Table 8 are the correlation coefficients of the right margins of Tables 4–7, below–diagonal entries in Table 8 are the correlation coefficients of the bottom margins of Tables 4–7. We see that the correlation coefficients of preference reversals between the lotteries and between the income distributions in Italy and Spain are highest.[33] Moreover, Table 8 shows similar structures of preference reversals between the lotteries and the income distributions, both within and between the countries. Although this similarity is less pronounced than the similarity of lotteries and income distributions, respectively, across the countries, it is nevertheless statistically significant at least at the 5% level.

Recall that consistent behavior of ratings and valuations makes up the complement to the total of cases. Although we did our best to detect principles governing consistent behavior, we failed to pinpoint specific patterns.

[33]There are two exceptions, viz. both correlation coefficients for the lotteries of the right margin distributions of Tables 4 and 5.

3.2 Conformity of Behavior with Lorenz Relations

Notice that the transfer principle in the field of income distributions is equivalent to mean–preserving contractions in the field of lotteries. Every transfer satisfying the transfer principle shifts the Lorenz curve closer to the diagonal. Any mean–preserving contraction of lotteries, too, shifts the associate Lorenz curve of the respective lottery closer to the diagonal. Thus, risk averse and inequality averse subjects should prefer Lorenz curves closer to the diagonal; the opposite should hold for risk or inequality loving subjects [Lopes (1984), p. 475].

What about intersecting Lorenz curves? Suppose that the Lorenz curve of lottery or income distribution *x* cuts the Lorenz curve of lottery or income distribution *y*; suppose further that the lotteries or income distributions have the same mean. Then subjects who want to avoid the expectation of relatively low payoffs or incomes should prefer income distributions [lotteries] whose Lorenz curves lie near the diagonal at the low end, and subjects who are sympathetic to the expectation of relatively high payoffs or incomes should prefer lotteries or income distributions whose Lorenz curves lie close to the diagonal at the high end [Lopes (1987), p. 270]. Then, if the Lorenz curve of *x* intersects the Lorenz curve of *y* from below, *x* should be preferred to *y* by subjects who do not mind low payoffs or incomes provided that they are outnumbered by sufficiently many moderate or high payoffs or incomes.

We employ the mean calibrated ratings and valuations to canvass conformity with the Lorenz relations of the experimental design as exposed in Figure 4. A summary statistic is provided in Table 9. This table is based on the data provided in Table 9. Its entries are calculated from eight times forty-five comparisons [(10×9)/2] of pairs of distributions with the relations arranged in Figure 4. The presentation of the results is separated for Lorenz dominance and Lorenz cutting from below and normalized for the total number of the respective Lorenz relations according to Figure 4. For instance, the entry 92.3% in the cell "Lotteries/Cutting Lorenz Curves/Ratings/Italy" means that 12 out of the 13 crossing Lorenz curves of Figure 4 coincide for the figures exposed in Table 2 for the Italian data on lottery ratings. The entries under "All cases" refer to the coincidence of the data from Table 2 with all 45 Lorenz relations of Figure 4. What strikes us at first sight is the inverse mirror–image of the first two and the second two columns in Table 9. While the large majority of mean ratings corresponds with Lorenz dominance and Lorenz curves cutting others form below, the large majority of mean valuations is opposite the relations as displayed in Figure 4. Moreover, there are notable differences within this pattern: For lotteries, the mean ratings are higher for the Lorenz curves cutting others from below. This means that subjects have a look at the higher incomes and prefer respective lotteries if higher incomes outnumber low incomes. This figure shrinks to about two thirds for Lorenz dominance. This means that, for dominating Lorenz curves, two thirds display risk aversion on average. This pattern prevails also for the rating of income distributions in Spain, but is contrary for the income distributions in Italy. Here people display a high degree of inequality aversion, but care somewhat more for the low incomes in case of intersecting Lorenz curves.

For the valuation exercise, only some 10% in Italy and some 15% in Spain conform with the entries in Figure 4. This reflects the impression, observed in the preceding section, that it is the high payoffs and incomes which determine valuations. This shows that inequality and risk attitudes are largely determined by response–mode effects: In the rating mode, subjects' behavior is more coined by risk and inequality aversion. In the valuation mode, subjects' behavior is more determined by risk sympathy and equality aversion, which is a reflection of a greater influence of the high payoffs or incomes due to the compatibility hypothesis.

Insert Table 9 about here

Conformity with the Lorenz relations can also be investigated for individual data. For this purpose we screened for each subject his or her data for the 45 pairwise comparisons of lotteries, summed over all subjects and all 13 crossing Lorenz relations and 32 Lorenz dominations, and expressed the respective figures as percentages of 13 or 32 times the number of subjects in the respective group. The results of these data are shown in Table 10. Although the results are less pronounced for the individual data than for the aggregate data, the basic results hold good: The majority of ratings conforms with the relations in Figure 4, the majority of valuations is opposite to the relations in Figure 4. Table 10 contains but one exception to this rule [Income Distributions/Cutting Lorenz Curves/Rating/Italy].[34]

Insert Table 10 about here

Again Lorenz dominance is more frequently confirmed for the ratings of income distributions than for lotteries, whereas the rating of Lorenz curves, which cut others from below, conforms less frequently with the Lorenz relations of Figure 4 for income distributions than for lotteries. This shows, that, in terms of ratings, more subjects are inequality averse than risk averse.

For the valuations, the mirror image of the ratings is also reflected in the individual data: On average, only some 42% of the valuations of lotteries and some 37.5% of the valuations of income distributions conform with the Lorenz relations as displayed in Figure 4. Conformity for the lotteries is by some 4.5 percentage points higher than conformity for the income distributions. There is a striking difference between Italy and Spain concerning the valuation of income distributions whose Lorenz curves cut others from below. For this case we observe a conformity rate which is by 6.2 percentage points lower for Bari than for Castellón. This, too, reflects more concern for lower incomes in Bari than in Castellón.

[34]Bari subjects care more for lower income echelons, which might be caused by the fact that people are less prosperous in Bari than in Castellón.

3.3 Violations of the Transfer Principle

The results of the previous sections demonstrate pronounced response–mode effects of the evaluation of income distributions and lotteries. The CEs and EDEs are, therefore, no reliable tools for unambiguous assessment of the value which a subject attributes to an income distribution or a lottery. This means that ethical or Kolm–Atkinson–Sen–type inequality measures lack an empirical bedrock.

Another objection against these inequality measures is their empirical violation of the transfer principle. Ethical inequality measures (let them be denoted by *I*) are theoretically required to satisfy

$$0 \leq I = 1 - \frac{EDE}{m} \leq 1 \qquad (2)$$

This can hold only if *0£ EDE£ m*, where *m* denotes mean income. $EDE>m$ implies violation of the transfer principle, the sacred cow of inequality measurement. If equal income distributions can be rules out (which is the case of our experimental design), *EDE³m* implies violation of the transfer principle [and *CE³m* implies violation of risk aversion]. As the expected value [mean income] of our lotteries [income distributions] is some €1,807 for Italy and some €1,745 for Spain, Table 2 shows us that the $EDE<m$ is violated for the means for all but the negatively skewed income distributions. Notice, in contrast to that, that mean CEs exceed *m* only for most positively skewed and the rectangular distributions. When restricting our inspection to the EDE and CE parameters only, we would end up with the finding that, with respect to the means, subjects are somewhat more risk averse than inequality averse.[35]

We analyze violations of the transfer principle and risk aversion by using individual data. Table 11 displays the respective results.

Insert Table 11 about here

Table 11 confirms preponderance of violations of the transfer principle with the important exception of negatively skewed income distributions for the Italian data. For the domain of lotteries, more risk sympathy is registered for Italy than for Spain, with the exception of negatively skewed distributions [except distribution (2)] and the rectangular distribution. Notice that the violation rates of the transfer principle exceed the violation rates of risk aversion, with some exceptions among the negatively skewed distributions.

[35] However, the mean ratings invalidate this one-sided conjecture, a phenomenon which is due to the ubiquity of

3.4 Order Effects ans Happiness Engendered by Distributional Shapes

Finally we tested for order and cultural effects as well as for lottery and income happiness. For this purpose we combined the data of both Italy and Spain to explain the ratings and valuations of lotteries and income distributions by distributional parameters. We started with standard deviation, skewness, kurtosis, maximum and minimum payoff (income), range, Gini coefficient, and with the probability of the maximum and minimum payoff (income). Moreover, for each of these variables we employed a dummy variable for Italy and Spain. First, we tested for multicollinearity based on variance inflation factors and had to eliminate all variables with exception of standard deviation, skewness, and kurtosis, as well as their dummies. This left us with the equation

$$D = C + a\ SD + \Delta_a\ SD + b\ SK + \Delta_b\ SK + g\ KU + \Delta_g\ KU + e, \qquad (3)$$

to be estimated, where D denotes the dependent variable [calibrated rating or valuation] as a function of a constant C, the standard deviation SD, the skewness SK, and the kurtosis KU. The Δ's denote dummy variables, where Δ=0 denotes Italy and Δ=1 denotes Spain. ε is the usual error term. Then we applied the method of stepwise regression, successively eliminating coefficients until all remaining coefficients were significant at the 5% significance level. The estimates of the coefficients are presented in Table 12.

Insert Table 12 about here

Recall that we presented the stimulus material in the opposite order in Italy and Spain. With the exception of the rating of distributions, all dummy variables prove to be insignificant. This allows us to reject order effects because they should have been reflected in all four regressions. The significant coefficients of the dummy variables for the rating of distributions can, therefore, be identified as cultural effects, which we have also noted above.

Most spectacular, Table 12 shows that the signs of the explaining variables work in opposite directions for ratings and valuations. The opposite signs of the explaining variables for ratings and valuations is, thus, another precipitation of preference reversal.

Lottery rating depends only on skewness: Negative [positive] skewness increases [decreases] lottery happiness. This provides a splendid evidence for Parducci's hypothesis that "happiness is a negatively skewed distribution".

The rating of distributions is a decreasing function of the standard deviation.[36] Skewness and kurtosis matter for the Spanish data, such that negatively skewed and more peaked distributions breed higher happiness of income distributions for our Spanish subjects.

---

preference reversals.

[36] The standard deviation may well be considered as a proxy for Temkin's aggregate complaints. Cf. also Devooght (2002).

CE is an increasing function of standard deviation and kurtosis. This means that more dispersed an less peaked lotteries receive higher valuations. EDE adds skewness to this explanation. It is an increasing function of standard deviation, skewness, and kurtosis. This means that more dispersed, less skewed and less peaked income distributions receive higher valuations.

4. Conclusion

Although there is a close relationship between income distributions and risky prospects, their joint analysis is much in its infancy. Moreover, multi–outcome distributions and lotteries have never been employed systematically, material incentives were only rarely used, preference reversal was never tested for income distributions (although the EDE has become the central hub of ethical inequality measures), and the influence of the distributional shapes on the evaluation of distributions and their perception of happiness has not been systematically investigated.

The experimental design encompasses ten distributions (three negatively skewed, four positively skewed, one rectangular, one unimodal, and one bimodal), which were used as stimuli for an income–distribution and a lottery experiment, which was administered to more than 50 subjects each both in Bari and Castellón. Subjects' comprehension of the experimental setting was examined before the experiment proper and material payoffs were applied. Subjects were asked to rate the lotteries or income distributions and were solicited to supply their CEs or EDEs using a BDM incentive scheme.

The experimental data evidenced the following results:

1. We observed four patterns of preference reversals:
   - (a) Classical preference reversal was confirmed for generalized P–bets and $–bets both for lotteries and income distributions. The ratings of the negatively skewed lotteries and income distributions tend to exceed the ratings of the positively skewed income distributions and lotteries. The opposite holds for the respective CEs and EDEs.
   - (b) The negatively skewed lotteries and income distributions tend to exceed the ratings of the unimodal, rectangular, and bimodal lotteries and income distributions. The opposite holds for the respective CEs and EDEs. This documents a new kind of preference reversal which extends to both lotteries and income distributions.
   - (c) Positively skewed income distributions with high minimum income and low maximum income (i.e., low standard deviation) exhibit higher ratings and lower valuations than positively skewed income distributions with low minimum income and high maximum income (i.e., high standard deviation). This new preference reversal is confined to income distributions only.

(d) Unimodal, rectangular, and bimodal income distributions exhibit higher ratings and lower valuations than positively skewed income distributions with low minimum income and high maximum income (i.e., high standard deviation). This new preference reversal is confined to income distributions only.

2. The ratings of the lotteries and income distributions reflect Lorenz dominance, which signals a prevalence of risk and inequality aversion. Moreover, the ratings assign higher ratings to lotteries and income distributions whose Lorenz curve cuts the Lorenz curve of other lotteries or income distributions from below, that is they do not mind low payoffs or incomes provided that they are outnumbered by sufficiently many moderate or high payoffs or incomes. The opposite pattern is observed for the valuations, for which risk and inequality sympathy prevail.
3. The transfer principle is violated in more than 50% of all cases with the exception of income distributions for the Italian data. This signals considerable equality aversion, which, too, reflects response–mode effects, as the transfer principle is tested by way of comparisons of EDEs and m. Note that equality aversion even exceeds risk sympathy.
4. Order effects can be ruled out. Cultural effects exist only for the rating of income distributions. The explaining variables for ratings and valuations exhibit opposite signs. In particular we observed the following relationships:
   (a) The rating of lotteries is a decreasing function of skewness, which validates the Parducci hypothesis, i.e., negatively skewed lotteries breed greater happiness.
   (b) The rating of income distributions is a decreasing function of standard deviation. For Spain, the rating of distributions is also a decreasing function of skewness and kurtosis, which means that negatively skewed and more peaked distributions breed higher happiness of income distributions for the Spanish subjects.
   (c) The valuation of lotteries is an increasing function of standard deviation and kurtosis, which means that more dispersed and less peaked lotteries receive higher valuations.
   (d) The valuation of income distributions is an increasing function of standard deviation, skewness, and kurtosis. This means that more dispersed, less skewed and less peaked income distributions receive higher valuations. The valuation–response–mode exhibits thus equality aversion.
5. The high incidence of inconsistencies between ratings and valuations (more than 50%) documents major response–mode effects. Ratings seem to follow the prominence hypothesis, whereas valuations seem to follow the compatibility hypothesis. This invalidates ethical or Kolm–Atkinson–Sen–type inequality measures if peoples' imaginations of distributional equity are taken the measuring rod.

Acknowledgements

This research was supported by a grant from the European Commission under contract No. ERBFMRXCT 980248. We are indebted to Michal Birnbaum, Stefan Traub, and Martin Missong for very helpful comments. The usual disclaimer applies.

Instructions, the multiple–choice questions of subjects' examination, and the data of the results of this experiment are available from Eva Camacho–Cuena, email: camacho@bwl.uni-kiel.de, upon request.

5. References

Amiel, Y. and Cowell, F. A. (1992). 'Measurement of Income Inequality: Experimental Test by Questionnaire', *Journal of Public Economics*, vol.47, pp.3–26.

Amiel, Y. and Cowell, F. A. (1994a). 'Inequality Changes and Income Growth', In: W. Eichhorn (Ed.), *Measurement of Welfare and Inequality*, Heidelberg-Berlin: Springer-Verlag, pp.3–26.

Amiel, Y. and Cowell, F. A. (1994b). 'Income Inequality and Social Welfare', In: J. Creedy (Ed.), *Poverty and Income Distribution*, Aldershot: Edward Elgar, pp.193–219.

Amiel, Y. and Cowell, F. A. (1998). 'Distributional Orderings and the Transfer Principle: A Reexamination', *Research on Economic Inequality*, vol.8, pp.195–215.

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

Amiel, Y. and Cowell, F. A. (1999b). 'Income Transformation and Income Inequality', In: D. J. Slottje (Ed.), *Advances in Econometrics, Income Distribution and Scientific Methodology, Essays in Honor of Camilo Dagum*, Heidelberg - New York: Physica-Verlag, pp.209–232.

Amiel, Y., Cowell, F. A. and Polovin, A. (2001). 'Risk Perceptions, Income Transformations and Inequality', *European Economic Review*, vol.45, pp.964–976.

Atkinson, A. B. (1970). 'On the Measurement of Inequality', *Journal of Economic Theory*, vol.2, pp.244–263.

Austin, W., McGinn, N. C. and Susmilch, C. (1980). 'Internal Standards Revised: Effect of Social Comparisons and Expectancies on Judgements of Fairness and Satisfaction', *Journal of Experimental Social Psychology*, vol.16, pp.426–441.

Bazerman, M. H., Loewenstein, G. F. and White, S. B. (1992). 'Reversal of Preference in Allocation Decisions: Judging an Alternative versus Choosing Among Alternatives', *Administrative Science Quarterly*, vol.37, pp.220–240.

Becker, G. M., DeGroot, M. H. and Marschak, J. (1964). 'Measuring Utility by a Single-Response Sequential Method', *Behavioral Science*, vol. 9, pp. 226–232.

Beckman, S. R., Formby, J. P., Smith W. J., Zheng, B. (2002). 'Envy, Malice and Pareto Efficiency: An Experimental Examination', *Social Choice and Welfare*, vol.19, pp.349–67.

Bernasconi, M. (2002). 'How Should Income be Divided? Questionnaire Evidence from the Theory of 'Impartial Preferences'', In: P. Moyes, C. Seidl and A. Shorrocks (Ed.), *Inequalities: Theory, Experiments and Applications*, *Journal of Economics/ Zeitschrift für Nationalökonomie*, Supplement 9, pp. 163–195.

Blackorby, C., Bossert, W. and Donaldson, D. (2001). 'Population Ethics and the Existence of Value Functions', *Journal of Public Economics*, vol.82, pp.301–308.

Blackorby, C. and Donaldson, D. (1978). 'Measure of the Relative Equality and Their Meaning in Terms of Social Welfare', *Journal of Economic Theory*, vol.18, pp.59–80.

Blanchflower, D. G. and Oswald, A. J. (2000). 'Well-Being Over Time in Britain and the USA', National Bureau of Economic Research, Working Paper No.7487, Cambridge, MA.

Blount, S. and Bazerman, M. H. (1996). 'The Inconsistent Evaluation of Absolute Versus Comparative Payoffs in Labor Supply and Bargaining', *Journal of Economic Behavior and Organization*, vol.30, pp.227–240.

Bohm, P., Lindén, J. and Sonnengård, J. (1997). 'Elicting Reservation Prices: Becker-DeGroot-Marschak Mechanisms vs. Markets', *Economic Journal*, vol.107, pp.1079–1089.
Bolton, G. E. and Ockenfels, A. (2000). 'A Theory of Equity, Reciprocity and Compensation', *American Economic Review*, vol.90, pp.166–193.
Brickman, P., Coates, D. and Janoff-Bulman, R. (1978). 'Lottery Winners and Accident Victims: Is Happiness Relative? ', *Journal of Personality and Social Psychology*, vol.36, pp.917–927.
Camerer, C. F. and Hogarth, R. M. (1999). 'The Effects of Financial Incentives in Experiments: A Review and Capital-Labor-Production Framework', *Journal of Risk and Uncertainty*, vol.19, pp.7–42.
Casey, J. T. (1991). 'Reversal of the Preference Reversal Phenomenon', *Organizational Behavior and Human Decision Processes*, vol.48, pp.224–251.
Chakravarty, S. R. (1990). *Ethical Social Index Numbers*, Heidelberg: Springer-Verlag.
Charness, G. and Grosskopf, B. (2001). 'Relative Payoffs and Happiness: An Experimental Study', *Journal of Economic Behavior and Organization*, vol.45, pp.301–328.
Clark, A. E. and Oswald, A. J. (1996). 'Satisfaction and Comparison Income', *Journal of Public Economics*, vol.61, pp.359–381.
Conrath, D. W. and Deci, E. L. (1969). 'The Determination and Scaling of a Bivariate Utility Function', *Behavioral Science*, vol.14, pp.316–327.
Cowell, F. A. (1985). "A Fair Suck of the Sauce Bottle' or What Do You Mean by Inequality? ', *The Economic Record*, vol.61, pp.567–579.
Cowell, F. A. and Kuga K. (1981). 'Inequality Measurement: An Axiomatic Approach', *European Economic Review*, vol.15, pp.287–305.
Cowell, F. A. and Schokkaert, E. (2001). 'Risk Perceptions and Distributional Judgments', *European Economic Review*, vol.45, pp.941–952.
Dahlby, B. G. (1987). 'Interpreting Inequality Measures in a Harsanyi Framework', *Theory and Decision*, vol.22, pp.187–202.
Dalton, H. (1920). 'Measurement of the Inequality of Incomes', *Economic Journal*, vol.30, pp.348–361.
Devooght, K. (2002). 'Measuring Inequality by Counting 'Complaints': Theory and Empirics', Discussion Paper No. DARP 59, STICERD; London School of Economics.
Diener, E. and Oshi, S. (2002). 'Money and Happiness: Income and Subjective Well-Being Across Nations', In: E. Diener and E. M. Suh (Ed.), *Subjective Well-Being Across Cultures*, Cambridge, MA: MIT Press, [forthcoming].
Duncan, O. D. (1975). 'Does Money Buy Satisfaction? ', *Social Indicators Research*, vol.2, pp.267–274.
Dworkin, R. (1981). 'What is Equality? Part 1: Equality of Welfare', *Philosophy and Public Affairs*, vol.10, pp.185–246.
Easterlin, R. A. (1974). 'Does Economic Growth Improve the Human Lot? Some Empirical Evidence', In: P. A. David and M. W. Reder (Ed.), *Nations and Households in Economic Growth, Essays in Honor of Moses Abramovitz*', New York and London: Academic Press, pp.89–125.
Easterlin, R.A. (1995). 'Will Raising the Incomes of All Increase the Happiness of All? ', *Journal of Economic Behavior and Organization*, vol.27, pp.35–47 .
Easterlin, R.A (2001). 'Income and Happiness: Toward a Unified Theory', *Economic Journal*, vol.111, pp.465–484.
Epstein, L.G. and Segal, U. (1992). 'Quadratic Social Welfare Functions', *Journal of Political Economy*, vol.100, pp.691–712.
Fehr, E. and Schmidt, K. M. (1999). 'A Theory of Fairness, Competition and Cooperation', *Quarterly Journal of Economics*, vol.114, pp.817–868.
Fleming, M. (1952). 'A Cardinal Concept of Welfare', *Quarterly Journal of Economics*, vol.66, pp.366-384 .
Fleurbaey, M. (1998). 'Equality Among Responsible Individuals', In: J.-F. Laslier, M. Fleurbaey, N. Gravel and A.Trannoy (Ed.), *Freedom in Economics: New Perspectives in Normative Analysis*, London: Routledge, pp.206–234.

Friedman, M. (1953). 'Choice, Chance, and the Personal Distribution of Income', *Journal of Political Economy*, vol.61, pp.277–290 .
Goldstein, W. and Einhorn, H.J. (1987). 'Expression Theory and the Preference Reversal Phenomenon', *Psychological Review*, vol.94, pp.236–254.
Goodman, L. and Markovitz, H. (1952). 'Social Welfare Functions Based on Individual Rankings', *American Journal of Sociology*, vol.57, pp.257–262.
Harrison, E. and Seidl, C. (1994a). 'Acceptance of Distributional Axioms: Experimental Findings', In: W. Eichhorn (Ed.), *Models and Measurement of Welfare and Inequality*, Heidelberg-Berlin: Springer-Verlag, pp.67–99.
Harrison, E. and Seidl, C. (1994b). 'Perceptual Inequality and Preferential Judgments: An Empirical Examination of Distributional Judgments', *Public Choice*, vol.19, pp.61–81.
Harsanyi, J. C. (1953). 'Cardinal Utility in Welfare Economics and in the Theory of Risk Taking', *Journal of Political Economy*, vol.61, pp.434–435 .
Harsanyi, J. C. (1955). 'Cardinal Welfare, Individualistic Ethics, and Interpersonal Comparison of Utility', *Journal of Political Economy*, vol.63, pp.309–321 .
Hoffman, E. and Spitzer, M. L. (1982). 'The Coase Theorem: Some Experimental Results', *Journal of Law and Economics*, vol.25, pp.73–98.
Hoffman, E. and Spitzer, M. L. (1985). 'Entitlements, Rights, and Fairness: An Experimental Examination of Subjects' Concepts of Distributive Justice', *Journal of Legal Studies*, vol.14, pp.259–297 .
Kanbur, S. M. (1979). 'Of Risk Taking and the Personal Distribution of Income', *Journal of Political Economy*, vol.87, pp.769–797.
Kanbur, S. M. (1982). 'Entrepreneurial Risk Taking, Inequality, and Public Policy: An Application of Inequality Decomposition Analysis of the General Equilibrium Effects of Progressive Taxation', *Journal of Political Economy*, vol.90, pp.1–21.
Kenney, C. (1999). 'Does Growth Cause Happiness or does Happiness Cause Growth? ', *Kyklos*, vol.52, pp.3–26.
Kolm, S.-C. (1969). 'The Optimal Production of Social Justice', In: J. Margolis and H. Guitton (Ed.), *Public Economics*, London: Macmillan, pp.145-200.
Kolm, S.-C. (1985). *Le contrat social libéral: Philosophie et pratique du libéralisme*, Paris: Presses Universitaires de France.
Kolm, S.-C. (1998). 'Chance and Justice: Social Policies and the Harsanyi-Vickrey-Rawls Problem', *European Economic Review*, vol.42, pp.1393–1416.
Levine, D. (1998). 'Modeling Atruism and Spitefulness in Experiments', *Review of Economic Dynamics*, vol.1, pp.593–622.
Lichtenstein, S. and Slovic, P. (1971). 'Reversal of Preferences Between Bids and Choices in Gambling Decisions', *Journal of Experimental Psychology*, vol.89, pp.46–55.
Lindman, H. R. (1965). *The Measurement of Utility and Subjective Probabilities*, Unpublished Doctoral Dissertation, University of Michigan.
Lindman, H. R. (1971). 'Inconsistent Preferences Among Gamblers', *Journal of Experimental Psychology*, vol.89, pp.390–397.
Loewenstein, G. F., Thompson L. and Bazerman, M.H. (1989). 'Social Utility and Decision Making in Interpersonal Context', *Journal of Personality and Social Psychology*, vol.57, pp.426–441.
Lopes, L. L. (1984). 'Risk and Distributional Inequality', *Journal of Experimental Psychology: Human Perception and Performance*, vol.10, pp.465–485.
Lopes, L. L. (1987). 'Between Hope and Fear: The Psychology of Risk', *Advances in Experimental Social Psychology*, vol.20, pp.255–295.
McClelland, G. and Rohrbaugh, J. (1978). 'Who Accepts the Pareto Axiom? The Role of Utility and Equity in Arbitration Decisions', *Behavioral Science*, vol.23, pp.446–456.
Messick, D. M. and Sentis, K. P. (1985). 'Estimating Social and Nonsocial Utility Functions From Ordinal Data', *European Journal of Social Psychology*, vol.15, pp.389–399.
Miller, D. (1995). 'Popular Beliefs about Social Justice', In: S. Svallfors (Ed.), *In the Eye of the Beholder*, Umeå: Bank of Sweden Tercentary Foundation, pp.71–103.

Nermuth, M. (1993). 'Different Economic Theories with the Same Formal Structure: Risk, Income Inequality, Information Structures, etc.', In: W. E. Diewert, K. Spremann and F. Stehling (Ed.), *Mathematical Modelling in Economics—Essays in Honor of Wolfgang Eichhorn*, Heidelberg: Springer-Verlag, pp.271–277.
Parducci, A. (1968). 'The Relativism of Absolute Judgments', *Scientific American*, vol.219, pp.84–90.
Radzicki, J. (1976). 'Technique of Conjoint Measurement of Subjective Value of Own and Others' Gains', *Polish Psychological Bulletin*, vol.7, pp.179–186.
Rohrbaugh, J., McClelland, G. and Quinn, R. (1980). 'Measuring the Relative Importance of Utilitarian and Egalitarian Values: A Study of Individual Differences About Fair Distribution', *Journal of Applied Psychology*, vol.65, pp.34–49.
Ross, M. and McMillen, M. J. (1973). 'External Referents and Past Outcomes as Determinants of Social Discontent', *Journal of Experimental Social Psychology*, vol.9, pp.437–449.
Rothschild, M. and Stiglitz, J. E. (1970). 'Increasing Risk I: A Definition', *Journal of Economic Theory*, vol.2, pp.225–243.
Rothschild, M. and Stiglitz, J. E. (1971). 'Increasing Risk II: Its Economic Consequences', *Journal of Economic Theory*, vol.3, pp.66–84.
Rothschild, M. and Stiglitz, J. E. (1973). 'Some Further Results on the Measurement of Inequality', *Journal of Economic Theory*, vol.6, pp.188–203.
Schkade, D.A. and Johnson, E.J. (1989). 'Cognitive Processes in Preference Reversals', *Organizational Behavior and Human Decision Processes*, vol.44, pp.203–231.
Schmidt, U., Seidl, C., Traub, S. and Levati, M. V. (2002). 'Lorenz, Pareto, Pigou: Who Scores Best? Experimental Evidence on Dominance Relations of Income Distributions', Discussion Paper, University of Kiel.
Schmitt, D. R. and Marwell, G. (1972). 'Withdrawal and Reward Allocation in Response to Inequity', *Journal of Experimental Social Psychology*, vol.8, pp.207–221.
Schneider, S. and Lopes, L. L. (1986). 'Reflection in Preferences Under Risk: Who and When May Suggest Why', *Journal of Experimental Psychology: Human Perception and Performance*, vol.12, pp.535–548.
Seidl, C. (2002). 'Preference Reversal: A Literature Survey', *Journal of Economic Surveys*, vol. 16, pp. 621–655.
Seidl, C., Traub, S., and Morone, A. (2002). 'Relative Deprivation, Personal Income Satisfaction, and Average Well–Being under Different Income Distributions', Discussion Paper, University of Kiel.
Slovic, P., Griffin, D., and Tversky, A. (1990). 'Compatibility Effects in Judgment and Choice', In: R. M. Hogarth (Ed.), *Insights in Decision Making: A Tribute to Hillel J. Einhorn*, Chicago and London: The University of Chicago Press, pp.5–27.
Slovic, P. and Lichtenstein, S. (1968). 'Relative Importance of Probabilities and Payoffs in Risk Taking', *Journal of Experimental Psychology*, vol.78/3, Part 2, pp.1–18.
Smith, T. W. (1979). 'Happiness: Time Trends, Seasonal Variations, Intersurvey Differences, and Other Mysteries', *Social Psychology Quarterly*, vol.42, pp.18–30.
Strotz, R. H. (1958). 'How Income Ought to be Distributed, A Paradox in Distributive Ethics', *Journal of Political Economy*, vol.66, pp.189–205.
Strotz, R. H. (1961). 'How Income Ought to be Distributed: Paradox Regained', *Journal of Political Economy*, vol.69, pp.171–178.
Temkin, L. S. (1986). 'Inequality', *Philosophy and Public Affairs*, vol.15, pp.99-121.
Temkin, L. S. (1993). *Inequality*, Oxford: Oxford University Press.
Traub, S., Seidl, C., Schmidt, U. and Levati, M.V. (2001). ' Friedman, Harsanyi, Rawls, Boulding—or Somebody Else? An Experimental Investigation of Distributive Justice', University of Kiel: Discussion Paper.
Traub, S., Seidl, C., and Morone, A. (2002). ' Relative Deprivation, Personal Income Satisfaction and Average Wellbeing under Different Income Distributions', University of Kiel: Discussion Paper.

Turner, C. F. and Krauss, E. (1978). 'Fallible Indicators of the Subjective State of the Nation', *American Psychologist*, vol.33, pp.456–470.
Tversky, A. and Griffin, D. (1991). 'Endowment and Contrast in Judgments of Well-Being', In: F. Strack, M. Argyle, and N. Schwarz (Ed.) *Subjective Well-Being*, Oxford: Pergamon Press, pp.101–118.
Tversky, A., Slovic, P. and Kahneman, D. (1990. 'The Causes of Preference Reversal', *American Economic Review*, vol. 80, pp.204–217.
van Avermaet, E. (1974). *Equity: A Theoretical and Experimental Analysis*, Santa Barbara: University of California, Unpublished Doctoral Dissertation.
Veenhoven, R. (1993). 'Happiness in Nations, Subjective Appreciation of Life in 56 Nations 1946–1992', Rotterdam; Erasmus University, Discussion Paper.
Vickrey, W. (1945). 'Measuring Marginal Utility by Reactions to Risk', *Econometrica*, vol.13, pp.319–333.
Vickrey, W. (1960). 'Utility, Strategy and Social Decision Rules', *Quarterly Journal of Economics*, vol.74, pp.507–535.
Vickrey, W. (1961). 'Risk, Utility and Social Policy', *Social Research*, vol.28, pp.205–217.
von Neumann, J. and Morgenstern, O. (1944), *Theory of Games and Economic Behavior*, Princeton: Princeton University Press.
Weber, E. U. (1984). 'Disappearance of Preference Reversal With Three-Outcome Gambles', Paper presented at the Meeting of the Psychonomics Society, San Antonio 1984, [quoted from Casey (1991)].

FIGURES AND TABLES

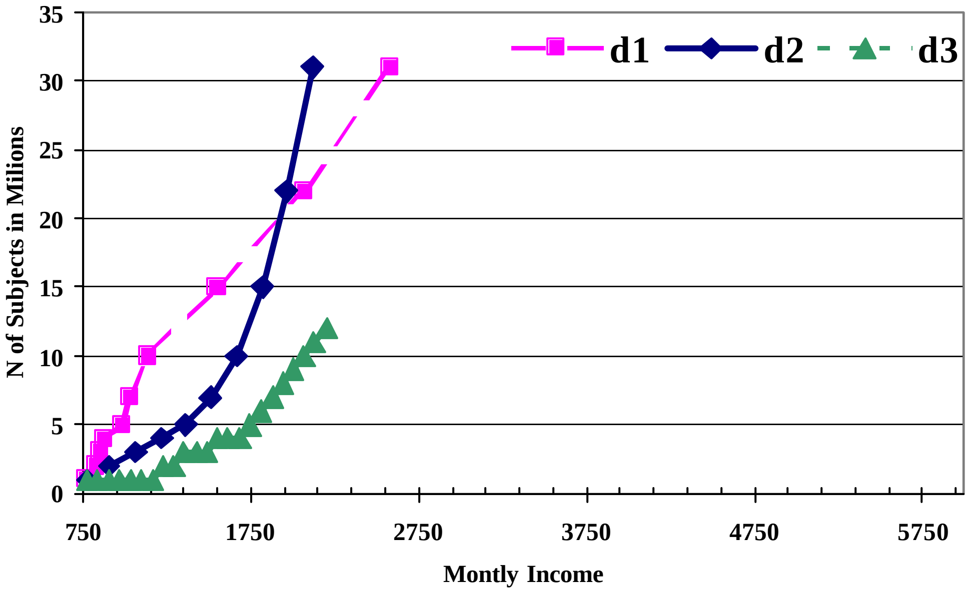

Figure 1: Negatively Skewed Distributions

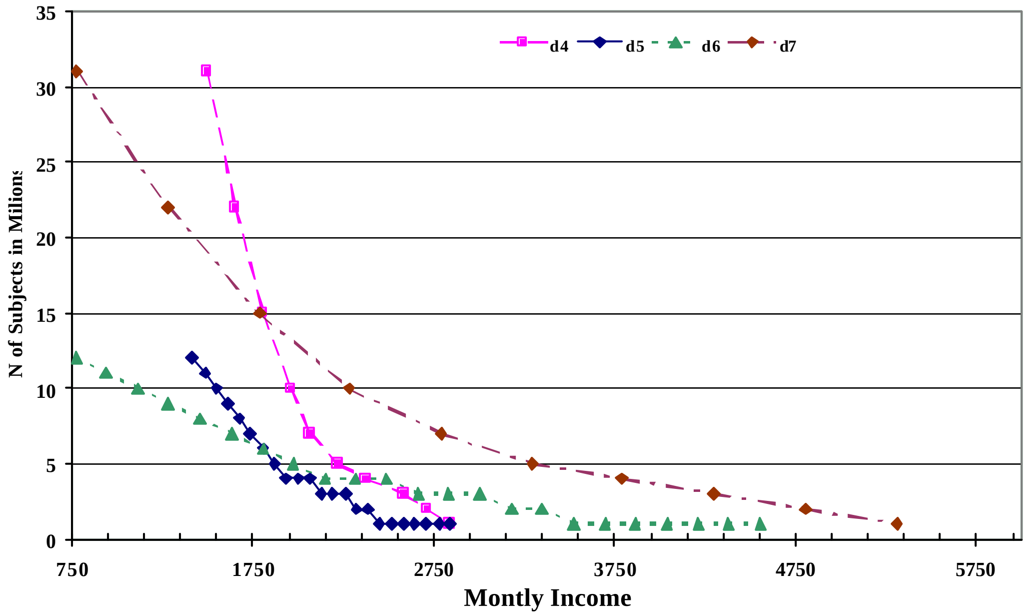

Figure 2: Positively Skewed Distributions

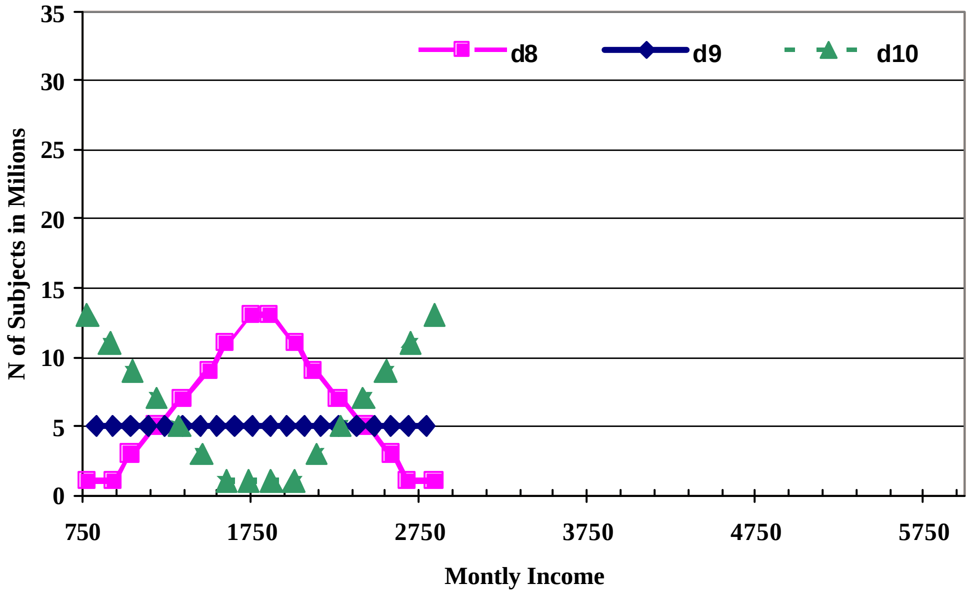

Figure 3: Unimodal, Rectangular and Bimodal Distributions.

	1	2	3	4	5	6	7	8	9	10
1				↗	↗	→	→	↗	↗	→
2	→		→	↗	↗	→	→	↗	→	→
3	→			↗	↗	→	→	↗	→	→
4					→	→	→		→	→
5						→	→		→	→
6							→ ∼			
7										
8				↗	↗	→	→		→	→
9						→	→			→
10						↗ ∼	→			

↗ . . . Lorenz curve of the distribution of the respective line intersects the Lorenz curve of the distribution of the respective column from below.

→ . . . Lorenz curve of the distribution of the respective line dominates the Lorenz curve of the distribution of the respective column.

∼ . . . both Lorenz curves nearly coincide for the lowest 13%.

Nota bene: Intersections of Lorenz curves up to 2% taken from the bottom or the top of the domain were ignored.

Figure 4: Lorenz Relations of Stimulus Distributions

Italy										
Main Statistics	Negatively Skewed			Positively Skewed				Unimodal	Rectangular	Bimodal
	1	2	3	4	5	6	7	8	9	10
Mean	1807.34	1807.49	1807.70	1806.05	1807.50	1807.39	1807.91	1807.60	1807.60	1802.54
SD	651.02	332.53	350.37	329.50	350.37	932.15	1112.54	410.83	595.61	799.50
Skewness	-0.1236	-1.1742	-1.0366	1.2100	1.0366	1.0356	1.1857	0.0000	0.0000	0.0048
Kurtosis	-1.5302	0.6859	0.4199	0.9023	0.4199	0.4188	0.7290	-0.1537	-1.2061	-1.7530
Minimum	774.69	774.69	774.69	1497.72	1415.09	774.69	774.69	774.69	826.33	774.69
Maximum	2582.28	2117.47	2200.11	2840.51	2840.51	4555.15	5309.18	2840.51	2788.86	2840.51
Range	1807.60	1342.79	1425.42	1342.79	1425.42	3780.46	4534.49	2065.83	1962.53	2065.83
GINI Coef.	0.2042	0.0981	0.1063	0.0971	0.1063	0.2836	0.3277	0.1292	0.1919	0.2510
Spain										
Main Statistics	Negatively Skewed			Positively Skewed				Unimodal	Rectangular	Bimodal
	1	2	3	4	5	6	7	8	9	10
Mean	1745.69	1745.84	1746.04	1744.44	1745.68	1745.93	1746.24	1745.94	1745.68	1741.05
SD	628.81	321.19	338.41	318.26	338.08	900.45	1074.59	396.82	575.21	772.22
Skewness	-0.1236	-1.1742	-1.0366	1.2100	1.0344	1.0356	1.1857	0.0000	0.0000	0.0048
Kurtosis	-1.5302	0.6859	0.4199	0.9023	0.4157	0.4181	0.7290	-0.1537	-1.2061	-1.7530
Minimum	748.26	748.26	748.26	1446.63	1366.82	748.34	748.26	748.26	798.02	748.26
Maximum	2494.20	2045.24	2125.06	2743.62	2743.62	4400.24	5128.07	2743.62	2693.37	2743.62
Range	1745.94	1296.98	1376.80	1296.98	1376.80	3651.90	4379.82	1995.36	1895.35	1995.36
GINI Coef.	0.2042	0.0981	0.1004	0.0797	0.0884	0.2354	0.3693	0.1128	0.1745	0.2343

Table 1: Main Statistics of Distributions.

Distributions		Average Calibrated Ratings				Average Valuations in €			
		Lotteries		Distributions		Lotteries (CE)		Distributions (EDE)	
		Italy	Spain	Italy	Spain	Italy	Spain	Italy	Spain
Negatively Skewed	1	8.12	7.82	7.14	7.70	1589.99	1704.58	1532.86	1730.24
	2	6.53	7.11	6.54	7.30	1673.44	1645.35	1706.41	1741.24
	3	5.54	6.45	6.29	6.74	1682.54	1665.48	1801.64	1764.96
	Average	6.73	7.13	6.66	7.24	1648.66	1671.80	1680.30	1745.48
Positively Skewed	4	4.99	4.70	6.23	5.61	1802.44	1757.28	1846.43	1841.86
	5	4.24	4.29	6.08	4.92	1808.59	1653.86	1853.54	1803.58
	6	4.37	4.42	3.65	3.32	1981.59	1836.57	2051.21	2039.45
	7	5.30	4.94	3.34	2.92	2096.53	2049.09	2129.63	2211.98
	Average	4.72	4.59	4.83	4.19	1922.29	1824.2	1970.20	1974.22
Unimodal	8	5.57	5.12	6.62	6.26	1769.40	1718.61	1853.71	1842.63
Rectangular	9	4.25	4.11	4.28	5.97	1850.54	1768.01	2014.40	1931.13
Bimodal	10	4.89	4.84	3.17	4.20	1759.23	1736.42	1913.46	1827.18

Table 2: Average Calibrated Ratings and Valuations.

		Distributions with lower valuation									
		1	2	3	4	5	6	7	8	9	10
Distributions with higher rating	1			DI	LI	LI	LI DI DS	LI LS DI DS	LI	LI DI DS	DI
	2				LS DS		LI DI DS	LS DI DS	DS	LI DI DS	DI
	3					LI	LI DI DS	LS DI DS		DI	DI
	4						DI DS	DI DS			
	5						DI DS	DI DS			
	6										
	7										
	8						LI DI DS	DI DS		DI	
	9							DS			
	10						DS	DS		DS	

Table 3: Preference Reversal significant at 5 % (Wilcoxon test).

Distributions	1	2	3	4	5	6	7	8	9	10	∑	%
1		24**	22**	22**	22**	24**	21**	25**	25**	25**	210	18.9
2	4**		17*	15	19*	21**	14*	15**	24**	19**	148	13.3
3	3**	7*		15*	21**	21*	15*	13	22**	14	131	11.8
4	3**	8	5*		9	15	14	7*	11	9	81	7.3
5	2**	6*	7**	12		14	14	8**	13	6*	81	7.3
6	3**	6**	7**	12	12		16	8	14	8	86	7.7
7	2**	7*	6*	11	11	12		6*	8	5	68	6.1
8	0**	3**	8	16*	22**	20	14*		20**	18*	121	10.9
9	2**	4**	8**	10	13	15	12	7**		8	79	7.1
10	6**	5**	7	12	16*	18	18	8*	18		108	9.7
∑	25	70	86	125	145	160	138	97	155	112	1114	100.0
%	2.2	6.3	7.7	11.2	13.0	14.4	12.4	8.7	13.9	10.1	100.0	47.6

$n = 2340$

**significant at the 1% level.

*significant at the 5% level.

Table 4: Preference Reversals for Lotteries (Italy).

Distributions	1	2	3	4	5	6	7	8	9	10	∑	%
1		14	20	18**	17**	25**	25**	19**	22**	23**	183	15.1
2	14		22**	23**	19*	21**	19**	22**	24**	20*	184	15.2
3	7	8**		19*	16	17*	18*	15*	23**	20*	143	11.8
4	3**	7**	8*		14	16	12	15	21*	16	112	9.2
5	3**	9*	11	20		18*	15	12	17	15	120	9.9
6	5**	6**	7*	13	8*		16	9	9	11	84	6.9
7	3**	5**	7*	16	14	17		9	9	8	88	7.2
8	4**	6**	6*	16	16	17	16		20**	16	117	9.6
9	1**	3**	4**	12**	8	12	14	7**		10	71	5.8
10	5**	9*	8*	16	14	17	15	13	15		112	9.2
∑	45	67	93	153	126	160	150	121	160	139	1214	100.0
%	3.7	5.5	7.7	12.6	10.4	13.2	12.4	10.0	13.2	11.4	100.0	52.9

$n = 2295$

** significant at the 1% level.

* significant at the 5% level.

Table 5: Preference Reversals for Lotteries (Spain).

Distributions	1	2	3	4	5	6	7	8	9	10	$\sum$	%
1		30**	30**	22**	21**	31**	32**	27**	33**	40**	266	18.5
2	11**		24**	17**	14	26**	30**	18*	33**	34**	207	14.4
3	6**	9**		12	16	26**	29**	13	25**	33**	169	11.8
4	8**	9*	13		24	26**	28**	14	19**	24**	165	11.5
5	7**	7	14	17		24**	25**	15	20**	24**	153	10.6
6	4**	5**	4**	6**	7**		16	5**	11	14	72	5.0
7	2**	5**	4**	9**	7**	12		6**	10	14	69	4.8
8	8**	8*	14	15	15	26**	27**		27**	32**	172	12.0
9	0**	4**	8**	5**	7**	17	18	5**		25**	89	6.2
10	1**	7**	6**	5**	5**	16	21	4**	10**		75	5.2
$\sum$	47	84	117	108	116	204	226	107	188	240	1437	100.0
%	3.3	5.8	8.1	7.5	8.1	14.2	15.7	7.4	13.1	16.7	100.0	57.0

n= 2520

** significant at the 1% level.

* significant at the 5% level.

Table 6: Preference Reversals for Income Distributions (Italy).

Distributions	1	2	3	4	5	6	7	8	9	10	$\sum$	%
1		16	20**	24**	25**	27**	31**	24**	22**	28**	217	16.8
2	11		22**	20*	19*	29**	32**	22**	21**	26**	202	15.6
3	7**	7**		16	14	30**	31**	21*	18*	18**	162	12.5
4	8**	8*	11		16	26**	31**	10	12	13	135	10.4
5	8**	9*	11	12		27*	26**	8	11	16	128	9.9
6	5**	5**	6**	9**	12*		20**	4**	5**	6**	72	5.6
7	3**	2**	2**	3**	5**	7**		2**	1**	3**	28	2.2
8	6**	7**	10*	12	9	26**	32**		16	20**	138	10.7
9	2**	6**	6*	10	10	23**	28**	9		15	109	8.4
10	7**	3**	5**	11	10	24**	25**	7**	11		103	8.0
$\sum$	57	63	93	117	120	219	256	107	117	145	1294	100.0
%	4.4	4.9	7.2	9.0	9.3	16.9	19.8	8.3	9.0	11.2	100.0	57.5

$n = 2250$

**significant at the 1% level.

*significant at the 5% level.

Table 7: Preference Reversals for Income Distributions (Spain).

		Lotteries		Income Distributions	
		Italy	Spain	Italy	Spain
Lotteries	Italy		0.870** 0.802**	0.825** 0.802**	0.838** 0.815**
	Spain	0.936** 0.912**		0.882** 0.827**	0.883** 0.851**
Income Distributions	Italy	0.702* 0.626*	0.759* 0.646*		0.918** 0.988**
	Spain	0.699* 0.802**	0.720* 0.719*	0.801** 0.845**	

** Significant at the 1% level.
* Significant at the 5% level.
Above: Pearson Correlation Coefficients.
Below: Spearman's Rank Correlation Coefficients.
Above diagonal: Right margins of Tables 4–7.
Below diagonal: Bottom margins of Tables 4–7.

Table 8: Correlation Coefficients of Preference Reversal.

Mode		Ratings		Valuations	
		Italy	Spain	Italy	Spain
Lotteries		92.3	100.0	0.0	23.1
	→	62.5	68.7	15.6	12.5
	All cases	71.1	77.8	11.1	15.6
Income Distributions		76.9	100.0	7.7	23.1
	→	81.3	87.5	7.7	15.6
	All cases	80.0	91.1	8.9	15.6

Table 9: Conformity of Mean Behavior with Lorenz Relations in Percentages.

Mode		Rating		Valuation	
		Italy	Spain	Italy	Spain
Lotteries		63.6	66.8	38.2	48.4
	→	51.3	54.1	41.0	42.0
	All cases	54.9	57.8	40.2	43.9
Income Distributions		48.9	62.2	34.9	41.1
	→	65.7	64.9	38.8	36.1
	All cases	60.8	64.1	37.7	37.6

Table 10: Conformity of Individual Behavior with Lorenz Relations in Percentages.

Shape of Distributions		Lotteries		Income Distributions	
		Italy	Spain	Italy	Spain
Negatively Skewed	1	36.5	51.0	28.6	50.0
	2	57.7	52.9	46.4	68.0
	3	32.7	47.1	46.4	58.0
	Average	42.3	50.33	40.5	58.7
Positively Skewed	4	57.7	49.0	71.4	64.0
	5	57.7	27.5	62.5	54.0
	6	57.7	54.9	67.9	68.0
	7	53.8	54.9	53.6	76.0
	Average	56.2	46.6	63.9	65.5
Unimodal	8	61.5	49.0	83.9	62.0
Rectangular	9	59.6	52.9	67.8	68.0
Bimodal	10	50.0	54.9	62.5	70.0

Table 11: Violations of the Transfer Principle (Inequality Aversion) and Risk Aversion ($EDE \geq m; CE \geq m$) in Percentages [individual data].

	Constant	SD	SK	△ SK	KU	△ KU
Rating Lotteries	5.557**	–	−0.821**	–	–	–
Rating Distributions	7.826**	−0.004119**	–	−0.626**	–	−0.443**
CE (in €)	1547.827**	0.410**	–	–	61.690**	–
EDE (in €)	1647.726**	0.383**	40.415*	–	52.556**	–

n (lotteries) = 1030, n (distributions) = 1060.

**significant at the 1% level.

*significant at the 5% level.

Table 12: Coefficient Estimates of the Parameters of Lotteries and Distributions.