Structural Estimation of Higher Order Risk Attitudes

by

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Abstract. We design an experiment to elicit prudence and temperance, two higher order risk attitudes which imply skewness seeking and kurtosis aversion, respectively. We structurally estimate a non-parametric or discrete utility function which enables one to distinguish prudence and temperance from the usual notion of risk aversion associated with variance aversion. We find that the intensities of prudence and temperance vary within an individual over the income range used in our experiment. The popular risk apportionment approach, which focuses on measuring the prevalence of prudence and temperance without intensities, may mask the presence of mixed higher order risk attitudes over income.

Keywords: Higher Order Risk Preferences, Structural Econometrics, Unobserved Heterogeneity, Laboratory Experiments.

JEL codes: C51, D81, D90, G40.

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Table of Contents

1. Introduction

Decision theoretic metrics of higher order risk attitudes are mostly grounded in Expected Utility Theory (EUT), which attributes prudence to positive third derivatives of the utility function and temperance to negative fourth derivatives. In comparison to risk aversion induced by negative second derivatives, little is known empirically about the EUT-based metrics of prudence and temperance. Structural estimation of higher order risk attitudes has been held back by inflexible curvature properties of widely used utility functions that do not allow one to identify risk aversion, prudence and temperance from one another.[1] To investigate higher order risk attitudes without explicit specification of a utility function, most studies have turned to specialized experimental tasks, called risk apportionment tasks, that focus on detecting positive and negative signs of third and fourth derivatives.[2] This approach, however, does not allow one to identify the magnitudes of those derivatives, restricting the scope of empirical analysis to the prevalence of prudence and temperance at the expense of their intensities.

We introduce a novel econometric strategy and experimental design that can be used in structural estimation of higher order risk attitudes. To trace utility curvature in a maximally flexible manner we adopt a discrete, or non-parametric, utility function inspired by Hey and Orme [1994] and Wilcox [2011]. Instead of using one or two parameters to trace utility over income, the discrete utility function assigns distinct parameters to measure the utility of each income level. We can then estimate finite differences in utility to obtain discrete analogues to higher order derivatives of continuous utility functions. This flexibility enables us to separately identify EUT-based metrics of

[1] For example, the exponential or constant absolute risk aversion (CARA) utility function implies that risk-averse EUT decision makers are prudent and temperate by construction. The Expo-Power utility function, a composite function that combines the exponential utility function with the power or constant relative risk aversion (CRRA) utility function, is known for its ability to capture both non-constant ARA and non-constant RRA. Nevertheless, when it comes to prudence and temperance, the Expo-Power utility function exhibits the restrictive curvature properties of the exponential component if both the exponential and power components are concave, or the income level in question is sufficiently large.

[2] The initial vision of Eeckhoudt and Schlesinger [2006] was that risk apportionment tasks could be applied as a theory-free method to define and elicit higher order risk attitudes. The subsequent literature, however, has not offered non-EUT notions of prudence and temperance which are compatible with risk apportionment tasks. A recent study by Eeckhoudt, Laeven and Schlesinger [2020; p.3] concedes that outside EUT, these decision tasks may have no specific meaning in relation to higher order risk attitudes.

risk aversion, prudence and temperance. To elicit magnitudes of higher order risk attitudes in addition to signs, we extend the risk apportionment task in Eeckhoudt and Schlesinger [2006] by varying the probability distributions of background and apportionable risks while holding the set of prizes constant. Our statistical model controls for interpersonal heterogeneity in risk attitudes by integrating a random coefficient specification of unobserved population heterogeneity, and it accounts for behavioral errors by combining EUT with Wilcox's [2011] stochastic choice model.

Since prudence favors increasing skewness of probability distributions and temperance favors decreasing kurtosis (Ebert [2013]), they are intimately linked to models of financial decision making that address higher order moments of asset returns. For example, Kane [1982] investigates the role of skewness seeking behavior in portfolio analysis and finds that investors may choose non-diversified portfolios when diversification has negative effects on the skewness of portfolio returns. In a theoretical analysis of the principal-agent problem, Chaigneau [2015] finds that prudence may explain the wide use of stock options in executive compensation, since prudent agents prefer incentive structures that are convex in stochastic performance measures. In response to an increase in background income risk, prudent business managers may reduce perishable inventory (Eeckhoudt, Gollier and Schlesinger [1995]), and prudent households may increase precautionary savings, with the more temperate among them allocating higher fractions of their new savings to risk-free assets (Kimball [1990][1992]). The recent theoretical and empirical interest in higher order risk attitudes coincides with empirical analyses of financial markets which suggest that higher order moments of asset returns are reflected in asset prices (Chabi-Yo [2012]; Holzmeister *et al.* [2020]), leading to the underperformance of assets with lottery-like characteristics (Eraker and Ready [2015]; Bali, Brown, Murray and Tang [2017]).

We analyze data from an experiment with 123 subjects, where we elicit higher order risk attitudes using an incentive compatible design with monetary rewards to encourage effort. Our econometric approach is structural in the sense that we directly estimate latent preference parameters that characterize utility curvature, and use the results to draw inferences about risk attitudes. We model the preference parameters as individual-specific draws from a multivariate statistical distribution, which represents interpersonal preference heterogeneity in the subject population. The estimated population distribution is then used to draw inferences at the aggregate and the individual level. At the aggregate level, we evaluate discrete analogues to indices of absolute risk aversion, prudence and temperance, and test whether the average decision maker displays each type of risk attitude over specific income intervals. At the individual level, we derive population shares of decision makers who display each type of risk attitude, and identify the most common type of risk attitude over those income intervals.

In general, we find that the average decision maker is risk averse over the income interval in the experiment; prudent at the two ends of the income range; and neutral to third order risk (*i.e.*, neither prudent nor imprudent) at intermediate income levels. We *do not* find empirical support for decreasing absolute risk aversion or decreasing absolute prudence over income, which are common assumptions in pricing kernel models of investor preferences (*e.g*, Dittmar [2002]). Instead, we observe non-monotone variation in absolute risk aversion and absolute prudence. There is, however, empirical support for decreasing absolute temperance over income: the average decision maker is temperate at low income levels and intemperate at relatively high income levels.

We obtain qualitatively similar findings at the individual level. The results suggest that risk averse individuals represent a majority of the subject population at all income levels. The estimated population share of prudent decision makers is U-shaped over income, with a majority of the subject population being prudent at either end of the income interval in the experiment, and an equal split of prudent and imprudent decision makers in the intermediate range. Finally, the population share of temperate decision makers decreases over income: a majority of the population are temperate at the lower end of the income interval and intemperate at the upper end.

We present a new approach to quantify EUT-based metrics of higher order risk attitudes by estimating a flexible utility function that enables one to separately identify risk aversion, prudence and temperance. In the existing literature, prudence is typically measured by evaluating choice frequencies in third order risk apportionment tasks, and temperance by looking at choice frequencies in their fourth order extensions.[3] The variation in higher order risk attitudes over income in our analysis suggests that these sample frequency measures are not as theory-free as one might think. Even within the EUT framework, these measures may mask variations in prudence and temperance over alternative income levels which make up each type of risk apportionment task. Indeed, if we apply the logic of the sample frequency approach to our structural estimates, we will summarily conclude that half of the subject population are prudent and a majority are temperate. As observed by Deck and Schlesinger [2014] and Noussair, Trautmann and van de Kuilen [2014], individuals often make different choices across a series of third (fourth) order tasks with different prize sets. Our results provide a structural explanation for this behavior. Since higher order risk attitudes may vary within an individual over different income levels, the same individual may make different choices depending on the income interval in the risk apportionment task.

Given the scope of potential confounds in economic analyses of financial market data, experimental methods are well placed to make contributions to structural estimation of higher order risk attitudes. Only two studies have explored this potential. Noussair, Trautmann and van de Kuilen [2014] estimate popular parametric forms of utility under EUT, namely power and Expo-Power functions, from individual choices in risk aversion and higher order risk apportionment tasks. Since the magnitudes of higher order derivatives in the utility functions are not identified by the risk apportionment tasks, the structural models in their study are primarily identified by the risk aversion tasks, and they find similar utility curvature as typically seen in the empirical literature on risk aversion. Ebert and Wiesen [2014] introduce distinct variants of the risk apportionment tasks to identify the monetary premium that makes an imprudent (intemperate) choice attractive to prudent (temperate) individuals, and find that the prudence premium is larger than the temperance premium. They show that Cumulative Prospect Theory (Tversky and Kahneman [1992]) may predict this feature of their raw data, although no metrics of higher order risk attitudes have been developed

[3] For example, see Deck and Schlesinger [2010][2014][2018]; Ebert and Wiesen [2011]; Ebert [2015]; Breaban, van de Kuilen and Noussair [2016]; Krieger and Mayrhofer [2017]; Brunette and Jacob [2019]; Becker, Trautmann and van de Kuilen [2020]; Bleichrodt and van Bruggen [2020]; Fairley and Sanfey [2020], and Haering, Heinrich and Meyrhofer [2020].

under that theory, whereas EUT fails. They do not estimate structural models under EUT but demonstrate numerically that popular utility functions such as power, exponential, and Expo-Power cannot make this prediction regardless of the underlying parameter values. We contribute to this literature by introducing a flexible structural model which can be applied to quantify theoretically established metrics of higher order risk attitudes, and by presenting a new experimental design that facilitates the estimation of that model.

2. Experimental Design

We modify the binary choice tasks proposed by Eeckhoudt and Schlesinger [2006] in a direction that enables structural estimation of higher order risk attitudes. Most experimental studies use third and fourth order risk apportionment tasks to elicit prudence and temperance (Trautmann and van de Kuilen [2018]) by counting the number of choices on each option. We extend their experimental design by varying the probability distributions in the pairwise lotteries to elicit magnitudes of higher order risk attitudes. Henceforth, we use "prudence task" as a generic term to describe all variants of the third order task in our experiment, and "temperance task" to describe all variants of the fourth order tasks.

The upper panel of Figure 1 illustrates the algebraic structure of our prudence task. Each of the two options is constructed by combining two simple lotteries. The first-stage lottery PR_1 represents background risk and pays 500 kroner with probability p or 300 kroner with probability $1-p$. In short, $PR_1 = \{(500, p), (300, 1-p)\}$. The second-stage lottery PR_2 represents apportionable risk and pays 100 kroner with probability q or an equivalent loss of 100 kroner with probability $1-q$, *i.e.* $PR_2 = \{(100, q), (-100, 1-q)\}$. The left option adds the apportionable risk PR_2 to the high payoff (500 kroner) in PR_1, and the right option adds PR_2 to the low payoff (300 kroner) in PR_1. The third order risk apportionment task refers to the special case where $p = q = 0.5$.[4] Our experiment has

[4] This special case is known as the symmetric third order risk apportionment task. The more general third order risk apportionment task requires $p = 0.5$ but allows q to take any value as long as the expected value of PR_2 is equal to zero. Following Deck and Schlesinger [2010][2014], most experimental studies have used the symmetric third order task alongside a symmetric fourth order risk apportionment task.

each subject answer a series of prudence tasks with different values of p and q. To avoid imposing the reduction of compound lotteries axiom as an auxiliary behavioral assumption, we present each subject with reduced form lotteries instead of compound lotteries.

The algebraic structure of our temperance task is illustrated in the lower panel of Figure 1. The two options are now constructed by combining one first-stage and two second-stage lotteries. The first-stage lottery is a sure payment of 400 kroner, $T_1 = \{(400, p), (400, 1-p)\}$, and the two second-stage lotteries have prizes with equivalent gains and losses, $T_2 = \{(200, q), (-200, 1-q)\}$ and $T_3 = \{(100, z), (-100, 1-z)\}$. The left option allocates T_2 and T_3 to two separate states of T_1, one to the state with probability p and the other to the state with probability $1-p$. The right option allocates both second-stage lotteries to the state that occurs with probability $1-p$. The fourth order risk apportionment task refers to the special case with $p = q = z = 0.5$.[5] We present each subject with a series of temperance tasks that vary the composition of p, q and z, and display all lotteries in reduced form.[6]

Most studies on higher order risk attitudes have the same subject answer a series of third order and fourth order risk apportionment tasks with different monetary outcomes. Prudence is then measured by the raw count of left and right choices that subjects make in the third order tasks, and temperance is measured by the raw count of their choices in the fourth order tasks. These measures are motivated by asking what choices the subject will make in the absence of behavioral errors. Prudent decision makers are then predicted to choose the left option over the right option in the third order risk apportionment task in Figure 1, as they prefer combining good (the high payoff) with bad (the extra risk PR_2) to combining bad (low payoff) with bad (extra risk). Similarly, temperate decision makers are predicted to choose the left option over the right option, as they

[5] This special case describes a symmetric fourth order risk apportionment task. The more general fourth order risk apportionment task requires $p = 0.5$, but allows q and z to take any set of values as long as each second-stage lottery has an expected value of zero.

[6] Deck and Schlesinger [2014] argue that reduced form lotteries may obfuscate the logic behind higher order risk apportionment tasks. In later work, they find similar general results for lotteries presented in reduced and compound form, but relatively small correlation in responses between the two formats (Deck and Schlesinger [2018]).

prefer combining good (the sure payoff) with bad (an extra risk) to combining bad with bad (adding one risk on top of another).

Since we are interested in estimating latent risk attitudes, our design departs from this common approach by having the same subject complete a series of prudence and temperance tasks that vary the probabilities p, q, and z, while holding the set of prizes constant. To explain the intuition behind the design, consider an EUT decision maker whose utility of income M is given by a power utility function, $u(M; r) = [M^{(1-r)} - 1]/(1-r)$, where r is the coefficient of relative risk aversion (RRA). Let $\Delta EU(r)$ denote the difference in expected utility between the two options, namely the expected utility of the right option minus that of the left option. Then $\Delta EU(r) < 0$ if the decision maker finds the left option more attractive than the right option. Under EUT, prudence is equivalent to a uniformly positive third derivative of the utility function, and temperance to a uniformly negative fourth derivative. The power function displays a positive third derivative if $r > 0$ or $r < -1$, and a negative fourth derivative if either condition is met and $r > -2$.[7]

Figure 2 displays the difference in expected utility as a function of relative risk aversion, $\Delta EU(r)$, for a small subset of our prudence and temperance tasks. The upper panel shows that the decision maker chooses the left option in the third order risk apportionment task ($p = q = 0.5$) when r is smaller than -1 or greater than 0. Letting the decision maker complete more third order risk apportionment tasks with different prize sets will not help one identify the r parameter any further. Suppose next that the decision maker chooses the left option in another task with similar prizes but different probabilities, namely $p = 0.5$ and $q = 0.4$. This choice then reveals that the r parameter satisfies $r > 0$ rather than $r < -1$. Suppose further that the decision maker chooses the right option in yet another task with $p = 0.6$ and $q = 0.4$, then one can bound the r parameter even further, more specifically $0.51 > r > 0$. By having each subject complete a series of prudence tasks

[7] Thus, given the power utility function, a negative second derivative, *i.e.*, $r > 0$, implies a positive third derivative and a negative fourth derivative. The same type of restriction holds for the exponential utility function, $v(M; \theta) = [1 - \exp(-\theta M)]/\theta$. Hence, neither function allows one to identify risk aversion, prudence and temperance separately. The Expo-Power utility function, $w(M; \theta, r) = v(u(M; r); \theta)$ is also restrictive when both u(.) and v(.) have negative second derivatives, or v(.) has a negative second derivative and M is sufficiently large.

with variation in p and q, we elicit information that can be used to draw quantitative inferences about the r parameter in the present example, and utility curvature in general. The bottom panel of Figure 2 similarly illustrates the intuition behind our temperance tasks, by comparing the fourth order risk apportionment task (p = q = z = 0.5) to two adjacent temperance tasks, one that changes p to 0.4 and the other that changes p to 0.4 and z to 0.6.

To focus on elicitation of higher order risk attitudes under EUT without invoking the reduction of compound lottery axiom, we present each lottery in reduced form instead of the equivalent compound form. Each prudence task spans an income interval between 200 and 600 kroner in increments of 100 kroner, and the left (PR_L) and right (PR_R) options are reduced to the following simple lotteries

$$PR_L = \{(600, p\cdot q), (400, p\cdot(1-q)), (300, (1-p))\} \text{ and}$$

$$PR_R = \{(500, p), (400, (1-p)\cdot q), (200, (1-p)\cdot(1-q))\}.$$

Each temperance task spans an income interval between 100 and 700 kroner, also in increments of 100 kroner, and the left (TP_L) and right (TP_R) options are reduced to

$$TP_L = \{(600, p\cdot q), (200, p\cdot(1-q)), (500, (1-p)\cdot z), (300, (1-p)\cdot(1-z))\} \text{ and}$$

$$TP_R = \{(400, p), (700, (1-p)\cdot q\cdot z), (500, (1-p)\cdot q\cdot(1-z)),$$

$$(300, (1-p)\cdot(1-q)\cdot z), (100, (1-p)\cdot(1-q)\cdot(1-z))\}.$$

Overall, our experiment includes 81 prudence tasks and 156 temperance tasks. To obtain the 81 prudence tasks, we independently vary the two probabilities (p and q) from 0.1 to 0.9 in increments of 0.1, and retain all of the resulting $9^2 = 81$ configurations. By varying the three probabilities (p, q and z) of the temperance task in similar fashion, we obtain a total of $9^3 = 729$ configurations, and select 156 configurations from this pool by retaining those cases where every reduced probability has at most two decimal places.

We document the 81 + 156 decision tasks in Appendix C, and report the mean, standard deviation, skewness and kurtosis of each option in those tasks. Across all decision tasks, regardless of which subset of those four moments one focuses on, there is considerable variation in the moment(s) of one option compared to the moment(s) of the other.[8] Suppose that one is interested in applying an *ad hoc* extension of the mean-variance utility model that includes skewness and kurtosis as additional characteristics. Using the overall set of 237 decision tasks in the experiment, one can identify normalized coefficients on all four moments in that linear index model: the four moments are not perfectly collinear and the within-task difference of each moment is not constant. In comparison, the third and fourth moments do not vary between the two options in the popular multiple price list design of Holt and Laury [2002], and one cannot identify the coefficients on skewness and kurtosis with those decision tasks. If one instead considers the third and fourth order risk apportionment tasks of Eeckhoudt and Schlesinger [2006], one cannot identify the coefficients on mean and variance. Since prudence and temperance imply skewness seeking and kurtosis aversion, much as risk aversion implies variance aversion, the possibility of identifying the extended mean-variance utility model reaffirms that our experimental design is well-suited to structural analysis of higher order risk attitudes.

Each subject completed 200 decision tasks comprising two different sets of 100 decision tasks. In either set, the 100 decision tasks were randomly selected from our overall pool of 81 prudence tasks and 156 temperance tasks and presented in random order. In one set, we presented each option in a pie chart that displays the probability of each outcome as a pie slice. In the other set, we presented each option in a column chart that displays the probability of each outcome as a vertical bar.[9] Appendix B documents the sample choice screen for each chart type. Each subject was paid according to their choice in one randomly selected decision task.[10]

[8] For instance, in some tasks the left option has greater skewness and kurtosis; in other tasks, it has greater skewness and smaller kurtosis; and in another set of tasks it has smaller skewness and kurtosis.

[9] Among the papers that present higher order risk tasks in reduced form, Deck and Schlesinger [2018] and Bougherara, Friesen and Nauges [2021] use pie charts to illustrate the probability distributions of the lotteries, whereas Åstebro, Mata and Santos-Pinto [2015] use column charts.

[10] At the beginning of the experiment, the subjects were told: "You will receive payment for one of your decisions in Part 1 or Part 2. When you have made all your decisions in both parts, we will select one part for payment. We will select Part 1 or Part 2 by rolling a 10-sided die. If the number on the die is 1-5 then you will receive payment for one of your decisions in Part 1, and if the number is 6-10 then you will receive payment for one of your decisions in Part 2. A second draw with two 10-sided dice will select one of the 100 decisions in Part 1 or 2 for payment. And a third draw with two 10-sided dice determines the payment in your choice of the Left or Right option in the selected decision."

We varied the order of the two chart types between subjects. Roughly half of the subjects completed the pie chart tasks first, and the other half completed the column chart tasks first. We also adopted a between-subject design with variation in information on the mean and standard deviation of each option. One treatment provided no information on either moment; a second treatment displayed the mean of each option but not the standard deviation; and a third treatment provided information on both moments.[11] The overall design thus consists of 2×3 treatments between subjects, and each subject was randomly assigned to one of those treatments.

The experiments were conducted at Copenhagen Business School in November and December 2019. Our sample consists of 24,600 observations from 123 subjects who attended one of six sessions that were scheduled at different dates.[12] Each subject received a flat amount of 200 kroner for their participation and an additional amount from one of their 200 choices in the experiment; with an average payment of 587 kroner per subject. At the time of the experiment, 100 kroner traded for roughly 14.75 US dollars. Payments to subjects were made by automatic bank transfer and reported as personal income by Copenhagen Business School to the Danish tax authorities (SKAT).

3. Structural Estimation of Higher Order Risk Attitudes

We first consider a structural econometric model of higher order risk attitudes under EUT without unobserved preference heterogeneity. We then discuss identification and measurement of higher order risk attitudes, and introduce a random coefficient specification that addresses unobserved preference heterogeneity across subjects. Finally, we specify a Rank-Dependent Utility (RDU) model that extends the EUT model by adding probability weighting in individual choice behavior.

[11] Appendix B reproduces the instructions given to subjects in the experiment. In the second and third treatments, we used the more colloquial tem "average" to describe the mean of each option. In the third treatment, we also explained that "[...] the standard deviation measures the dispersion of prizes relative to the average value."

[12] The subjects' age varied between 18 and 61 years, with an average age of 22.8, and 33% of them were female.

A. Baseline EUT Specification

Each decision task in our experiment presented a choice between two options, where each option was a probability distribution over a subset of the universal prize set M ={100, 200, 300, 400, 500, 600, 700} measured in Danish kroner. There were three outcomes in each option in the prudence tasks, and four or five outcomes in the temperance tasks. Let $m_{ij} \in M$ denote the j^{th} outcome of option $i \in \{A, B\}$ and let p_{ij} be the objective probability of that outcome. EUT predicts that the subjects choose the option with the highest expected utility, where the expected utility of option i is

$$EU_i = \sum_j p_{ij} \times u(m_{ij}) \tag{1}$$

and $u(m_{ij})$ is utility of outcome m_{ij}, which we will estimate using a discrete, or non-parametric, utility function (Hey and Orme [1994], Wilcox [2011]). Let y denote a binary indicator that is equal to 1 if option B is chosen, and 0 if A is chosen. EUT then predicts $y = \mathbf{I}[(EU_B - EU_A) > 0]$, where $\mathbf{I}[.]$ is an indicator function.

To account for behavioral errors, we combine EUT with a stochastic choice model. We assume that $y = \mathbf{I}[(EU_B - EU_A) + \upsilon \times \boldsymbol{\varepsilon} > 0]$, where $\boldsymbol{\varepsilon}$ is a zero-mean disturbance term that is normally distributed with standard deviation μ, and υ is a skedastic function. We adopt the Contextual Utility specification by Wilcox [2011; §5] which sets υ to the subjective range of stimuli, $u(m_{max}) - u(m_{min})$, where m_{max} is the largest prize, and m_{min} is the smallest prize, in the decision task.[13] The probability of choosing option B is then $\Phi(\nabla EU)$, where $\Phi(.)$ is the standard normal distribution function and the index ∇EU is

$$\nabla EU = [EU_B - EU_A)/\upsilon]/\mu. \tag{2}$$

The likelihood function for each choice observation then takes the form

$$\Pr(\boldsymbol{\alpha}, \mu) = \Phi(\nabla EU)^y \times (1 - \Phi(\nabla EU))^{(1-y)}, \tag{3}$$

[13] Wilcox [2011; pp.96-99] cites the psychological literature on “stimulus categorization errors” to motivate this form of skedastic function. In his empirical application, he finds that the Contextual Utility model outperforms three prominent stochastic choice models, namely the Fechner model, the Luce model, and the Random Preference model, in terms of both in-sample fit and out-of-sample prediction.

where $\boldsymbol{\alpha}$ is the set of utility parameters that will be specified shortly. As the noise parameter μ tends to 0, this stochastic EUT model converges to the deterministic EUT model without behavioral errors. Conversely, as μ grows arbitrarily large, it converges to an uninformative model which predicts a 50:50 chance of choosing either option regardless of the underlying difference in expected utility.

Since we have repeated observations on each individual, we subscript the choice-level likelihood function in (3) as $P_{nt}(\boldsymbol{\alpha}, \mu)$ to emphasize that it describes the choice by individual $n \in \{1, 2, \cdots, N\}$ in decision task $t \in \{1, 2, \cdots, T\}$, where $N = 123$ and $T = 200$ in our sample. Conditional on $\boldsymbol{\alpha}$ and μ, the joint likelihood of all observations on individual n is

$$CL_n(\boldsymbol{\alpha}, \mu) = \prod_t P_{nt}(\boldsymbol{\alpha}, \mu). \quad (4)$$

To address unobserved preference heterogeneity, we specify $\boldsymbol{\alpha}$ as a vector of random coefficients, $\boldsymbol{\alpha}_n$, which are jointly distributed across decision makers in the population, and estimate the joint distribution.[14] Before introducing this extension, however, we will use the present example with homogeneous preferences to illustrate the main logic behind our approach to identification of higher order risk attitudes.

B. Measures of Risk Aversion, Prudence and Temperance

Under EUT, the decision maker's risk attitudes are characterized by the derivatives of the utility function. The decision maker is said to be risk averse if the second derivative is *negative*; prudent if the third derivative is *positive*; and temperate if the fourth derivative is *negative*. Despite the clear theoretical distinctions, structural estimation of prudence and temperance has been impeded by the lack of flexible utility functions that allow one to distinguish prudence and temperance from risk aversion. Popular utility functions use one or two parameters to trace utility curvature over income. As a result, the sign of the third or fourth derivative is often determined by the sign of the

[14] The pooled maximum likelihood estimator that maximizes the sample log-likelihood function, $\sum_n \ln(CL_n(\boldsymbol{\alpha}, \mu))$, neglects heterogeneity in risk attitudes: This approach assumes that the utility vector $\boldsymbol{\alpha}$ is the same for all individuals. An individual-level estimator that separately maximizes the log-likelihood function for each individual, $\ln(CL_n(\boldsymbol{\alpha}, \mu))$, precludes formal statistical inferences about the population from which the subjects are drawn.

second derivative, and sometimes predetermined. Given a power utility function, for example, risk aversion implies prudence and temperance by construction. If one uses an exponential function instead, then risk averse and risk seeking decision makers are prudent; risk aversion implies temperance; and risk seeking implies intemperance. The Expo-Power function, a composite functional form which combines the two namesake functions, is more flexible and may display both non-constant relative risk aversion and non-constant absolute risk aversion over income (Holt and Laury [2002]). However, in relation to higher order risk attitudes, it exhibits the rigid curvature properties of the exponential component for sufficiently high levels of income, or if both the power and exponential components are concave.

We address the identification problem by adopting a discrete utility function with a separate parameter, $u_m \equiv u(m)$, to measure the utility of each outcome $m \in M = \{100, 200, 300, 400, 500, 600, 700\}$. Since utility is unique up to a positive affine transformation, we normalize u_{100} to zero and u_{700} to unity, and define the vector $\boldsymbol{\alpha}$ as a set of the five remaining parameters: $\boldsymbol{\alpha} = \{u_{200}, u_{300}, u_{400}, u_{500}, u_{600}\}$.[15] We maintain the assumption of monotone preferences, *i.e.*, $u_{100} = 0 < u_{200} < \cdots < u_{600} < u_{700} = 1$, and do not impose further constraints on the parameters. We are not aware of previous attempts to use a discrete utility function in structural estimation of higher order risk attitudes.[16] Denuit and Eeckhoudt [2010; §2] theoretically characterize higher order risk attitudes in relation to a discrete utility function, but do not engage in empirical analysis. To test EUT against alternative

[15] Suppose that $u_{100} = c_{100}$ where c_{100} is a non-zero constant; subtracting c_{100} from every utility level retains the value of ∇EU in (2), and does not change the value of the likelihood function in (3). Suppose instead that we multiply every utility level by a positive scalar c_{700}, thereby setting $u_{700} = c_{700}$; this has the same effect on ∇EU as multiplying the noise parameter μ by $(1 / c_{700})$, meaning that one cannot identify c_{700} separately from μ.

[16] Schneider and Sutter [2020] use the trade-off (also known as staircase) method to elicit certainty equivalent intervals for symmetric lotteries with two (50:50 chance) outcomes. Rather than estimating the discrete utility function, they select specific *points* in the elicited *intervals* and map those points to utility scores algebraically. They then evaluate higher order derivatives of a spline regression function fitted to those utility scores. From an analytical perspective, this algebraic mapping becomes incorrect if the subject makes behavioral errors in any of decision tasks or if the handpicked point in any interval does not coincide with the precise value of the subject's certainty equivalent. From an experimental perspective, the elicitation method is not incentive compatible, as acknowledged by the authors (Schneider and Sutter [2020; p.10]), and may lead to substantial bias in elicited certainty equivalent intervals since preceding choices are used to construct subsequent decision tasks. Another problem is that all lotteries in their design have zero skewness and excess kurtosis of minus two, and the decision tasks are not informative about the subject's evaluation of higher order moments in probability distributions.

theories of choice under risk without making strong assumptions about the utility function, Hey and Orme [1994] and Wilcox [2011] exploit the non-parametric nature of discrete utility functions, but do not analyze higher order risk attitudes.

Our key insight is that one can evaluate risk attitudes by using finite utility differences of order d to construct discrete analogues to derivatives of order d. In our analysis, marginal utility of income is given by the first difference $\Delta^1 u_m = (u_m - u_{(m-100)})$, and the decision maker is said to be risk averse if the second difference $\Delta^2 u_m = (\Delta^1 u_m - \Delta^1 u_{(m-100)})$ is negative.[17] Similarly, the decision maker is said to be prudent if the third difference $\Delta^3 u_m = (\Delta^2 u_m - \Delta^2 u_{(m-100)})$ is positive, and temperate if the fourth difference $\Delta^4 u_m = (\Delta^3 u_m - \Delta^3 u_{(m-100)})$ is negative. Since we specify a utility parameter for each income level, the second and higher order differences, $\Delta^2 u_m$, $\Delta^3 u_m$ and $\Delta^4 u_m$, can display any sign and magnitude regardless of the signs and magnitudes of the other two measures. In other words, the discrete measures of risk aversion, prudence, and temperance in our structural EUT model can be distinguished from one another.[18]

We also evaluate indices of risk attitudes which are invariant to arbitrary normalization of utility. Let $v^{[d]}(m)$ denote the dth derivative of a utility function. The Arrow-Pratt index of absolute risk aversion, $-v^{[2]}(m)/v^{[1]}(m)$, displays the desired invariance property. One can similarly define an index of absolute prudence, $v^{[3]}(m)/v^{[1]}(m)$, and an index of absolute temperance, $-v^{[4]}(m)/v^{[1]}(m)$.[19] Denuit and Eeckhoudt [2010; §4] show that the absolute risk premium generated by unfavorable skewness (kurtosis) is roughly proportional to the index of absolute prudence (temperance), in the

[17] If the dth derivative of a utility function is uniformly positive (negative) over some income interval, the dth difference is also positive (negative) over the same interval.

[18] For example, consider the second, third and fourth differences at m = 500. By substituting lower order differences, we obtain $\Delta^2 u_{500} = (u_{500} + u_{300}) - 2u_{400}$; $\Delta^3 u_{500} = (u_{500} + 3u_{300}) - (3u_{400} + u_{200})$; and $\Delta^4 u_{500} = (u_{500} + 6u_{300} + u_{100}) - (4u_{400} + 4u_{200})$. Each difference is therefore a linear combination of utility level parameters, and the weight on each utility level parameter varies non-proportionately across those linear combinations. Since we do not place any constraint on how large one utility level is relative to another, the non-proportionate variations in the weights allow each difference to have its own sign.

[19] Kimball [1990] proposes $PR = -v^{[3]}(m)/v^{[2]}(m)$ as a measure of prudence, which is sometimes called the Arrow-Pratt index of prudence. This index is too restrictive for our analysis with preference heterogeneity because it requires that all decision makers are risk averse, $v^{[2]}(m) < 0$, for PR to preserve the sign of the third derivative. For example, Anne is more prudent than Bob in the Arrow-Pratt sense if Anne's value of $-v^{[3]}(m)/v^{[2]}(m)$ is larger than Bob's for all m. Unless everyone is risk averse, one may erroneously conclude that Anne is *less* prudent than Bob when Anne is risk seeking and prudent ($v^{[2]}(m) > 0$ and $v^{[3]}(m) > 0$) whereas Bob is risk averse and *imprudent* ($v^{[2]}(m) < 0$ and $v^{[3]}(m) < 0$).

same way as the absolute risk premium generated by unfavorable variance is roughly proportional to the Arrow-Pratt index of absolute risk aversion.

The index of absolute risk aversion is positive for risk averse decision makers and takes larger values for those who are more risk averse. Similarly, the index of absolute prudence (temperance) is positive for prudent (temperate) decision makers, taking larger values for those who are more prudent (temperate). We use the finite differences in utility to construct a discrete analogue to each index of absolute risk attitude. That is,

$$ARA_m = -\Delta^2 u_m/[(\Delta^1 u_m + \Delta^1 u_{(m-100)})/2] \text{ for risk aversion;}$$

$$APR_m = \Delta^3 u_m/[(\Delta^1 u_m + \Delta^1 u_{(m-100)} + \Delta^1 u_{(m-200)})/3] \text{ for prudence; and}$$

$$ATM_m = -\Delta^4 u_m/[(\Delta^1 u_m + \Delta^1 u_{(m-100)} + \Delta^1 u_{(m-200)} + \Delta^1 u_{(m-300)})/4] \text{ for temperance,}$$

where the denominator [.] in each index measures average marginal utility over the relevant income interval.

C. Unobserved Heterogeneity

We next extend the statistical model to address interpersonal preference heterogeneity by adopting a random coefficient specification. Let $\boldsymbol{\alpha}_n = \{u_{200n}, u_{300n}, u_{400n}, u_{500n}, u_{600n}\}$ denote the set of parameters that describe individual n's utility levels when $u_{100n} = 0$ and $u_{700n} = 1$. We consider $\boldsymbol{\alpha}_n$ as a draw from a multivariate probability distribution of utility levels across individuals in the target population. Monotone preferences require that every draw from the population distribution of $\boldsymbol{\alpha}_n$ must satisfy $u_{100n} = 0 < u_{200n} < \cdots < u_{600n} < u_{700n} = 1$.

Let $\Delta^1\boldsymbol{\alpha}_n = \{\Delta^1 u_{200n}, \Delta^1 u_{300n}, \Delta^1 u_{400n}, \Delta^1 u_{500n}, \Delta^1 u_{600n}\}$ denote the vector of individual n's marginal utility levels. We specify the population distribution of $\boldsymbol{\alpha}_n$ indirectly by assuming that $\Delta^1\boldsymbol{\alpha}_n$ follows a "logistic-normal" distribution (Aitchison and Shen [1980]).[20] Each marginal utility in $\Delta^1\boldsymbol{\alpha}_n$ is algebraically equivalent to a multinomial logit probability that uses multivariate normal random variables as alternative-specific indices. Specifically, the marginal utility of outcome m is

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[20] The logit-normal distribution, which is known for its ability to approximate a wide range of shapes in statistical distributions (*e.g.,* uniformity, unimodality, bimodality, and left and right skewness), is a univariate special case of this logistic-normal distribution.

$$\Delta^1 u_{mn} = \exp(z_{mn}) / [1 + \exp(z_{200n}) + \exp(z_{300n}) + \exp(z_{400n}) + \exp(z_{500n}) + \exp(z_{600n})], \quad (5)$$

where $\boldsymbol{\zeta}_n = \{z_{200n}, z_{300n}, z_{400n}, z_{500n}, z_{600n}\}$ is a draw from a multivariate normal distribution with mean $E[\boldsymbol{\zeta}_n]$ and covariance matrix $V[\boldsymbol{\zeta}_n]$. We do not impose any constraints on $V[\boldsymbol{\zeta}_n]$ to allow the marginal utilities, and hence their higher order differences, to display as flexible a pattern of correlation as a logistic-normal distribution can accommodate. The utility of outcome m is derived by adding up the marginal utilities

$$u_{mn} = \sum_{s \in S(m)} \Delta^1 u_{sn} \quad (6)$$

where S(m) is a set of outcomes which are equal to or less than m: S(200) = {200}, S(300) = {200, 300}, S(400) = {200, 300, 400}, and so forth. Since $\Delta^1 u_{mn} > 0$ for each m, this specification generates monotone preferences by construction. Furthermore, since u_{600n} is algebraically equivalent to a multinomial logit probability of *not* choosing one of six alternatives, it is guaranteed to be smaller than $u_{700n} = 1$.

To incorporate unobserved preference heterogeneity, the joint likelihood of individual n's choices can be specified as

$$L_n(\boldsymbol{\theta}, \mu) = \int CL_n(\boldsymbol{\alpha}_n, \mu) h(\boldsymbol{\alpha}_n; \boldsymbol{\theta}) d\boldsymbol{\alpha}_n \quad (7)$$

where $CL_n(\boldsymbol{\alpha}_n, \mu)$ refers to the product in (4) and $h(\boldsymbol{\alpha}_n; \boldsymbol{\theta})$ is the density of $\boldsymbol{\alpha}_n$ expressed as a function of $\boldsymbol{\theta} = (E[\boldsymbol{\zeta}_n], V[\boldsymbol{\zeta}_n])$. The integral in (7) is the expected value of $CL_n(\boldsymbol{\alpha}_n, \mu)$ over the assumed population distribution of $\boldsymbol{\alpha}_n$. It does not have an analytic solution but can be approximated using simulation methods (Train [2009; p.144-145]). We compute maximum simulated likelihood estimates of the preference parameters $\boldsymbol{\theta}$ and the behavioral noise parameter μ by maximizing a simulated analogue to the sample log-likelihood function $\sum_n \ln(L_n(\boldsymbol{\theta}, \mu))$, where index n iterates over all subjects. Since each $L_n(\boldsymbol{\theta}, \mu)$ is a multivariate integral, $\ln(L_n(\boldsymbol{\theta}, \mu))$ does not break down into the sum of marginal log-likelihood functions at the choice level. Our structural model thus accounts for panel correlation across repeated observations on the same individual, in analogue fashion as random effects probit and logit models.

D. Rank-Dependent Utility

Our structural model can easily be adapted to alternative decision theories of choice under risk, such as Quiggin's Rank-Dependent Utility (RDU) [1982]. Available theory, however, does not offer guidance on how the magnitudes of higher order risk attitudes should be defined and measured under RDU, or other alternatives to EUT. We will focus on estimated prevalence rates of prudence and temperance under RDU, and compare those to similar measures under EUT. In particular, we test the hypothesis that a significant majority of decision makers are prudent (temperate) by estimating the fraction of subjects who select the left option in the third (fourth) order risk apportionment tasks.

RDU attributes risk attitudes to utility curvature *and* probability weighting that captures the decision maker's optimism or pessimism about the probability distributions of outcomes. Consider the evaluation of option $i \in \{A, B\}$ and suppose that the outcomes m_{ij} are ordered from worst to best such that $m_{i1} < m_{i2} < \cdots < m_{iJ}$. RDU then replaces the objective probabilities p_{ij} with rank-dependent decision weights w_{ij} in the following way

$$RDEU_i = \sum_j w_{ij} \times u(m_{ij}), \text{ with} \tag{8}$$

$$w_{ij} = \omega(p_{ij}) \text{ for } j = J \text{ and}$$

$$w_{ij} = \omega(p_{ij} + \cdots + p_{iJ}) - \omega(p_{i(j+1)} + \cdots + p_{iJ}) \text{ for } j \in \{1, 2, \cdots, (J-1)\},$$

where $\omega(.)$ denotes the PWF. The decision weight on outcome m_{ij} is thus the difference between the weighted probability of attaining at least m_{ij} and the weighted probability of attaining a better outcome than m_{ij}. The logic behind our econometric specification extends directly to RDU, once we replace EU_i in (1) with $RDEU_i$ in (8). Of course, this requires us to choose a functional form of $\omega(p)$ and estimate the additional parameters.[21] We adopt Prelec's [1998] specification

$$\omega(p) = \exp\{-\eta(-\ln p)^{\varphi}\}, \tag{9}$$

[21] One may see the decision weight derived from each possible combination of weighted probabilities as a distinct parameter and specify a discrete probability weighting function in the same vein as a discrete utility function (Wilcox [2015]). The large number of possible combinations makes this approach impractical; for our prudence tasks alone, one must estimate 138 decision weights.

where $\eta > 0$ and $\varphi > 0$ to ensure that RDU satisfies stochastic dominance.[22] Let $\boldsymbol{\zeta}_n$ denote the vector of primitive normal variates for the logistic-normal marginal utilities in (5). We model the PWF parameters η and φ as random coefficients η_n and φ_n, by specifying the population distribution of $\boldsymbol{\zeta}_n$, $\ln(\eta_n)$, and $\ln(\varphi_n)$ as multivariate normal.

The two-parameter PWF in (9) is well-known for its ability to accommodate a variety of shapes, and thus risk attitudes, depending on the values of η and φ. First, consider the case of $\eta = \varphi = 1$. The PWF then becomes an identity function, $\omega(p) = p$ and RDU simplifies to EUT. Second, suppose $\varphi = 1$ but $\eta \neq 1$ so the PWF becomes a power function, $\omega(p) = p^{\eta}$. If $\eta < 1$, the PWF overweights all interior probabilities (*i.e.*, $\omega(p) > p$), which enhances optimism and risk seeking; if $\eta > 1$, it underweights all interior probabilities (*i.e.*, $\omega(p) < p$), enhancing pessimism and risk aversion. Third, consider the case of $\eta = 1$ but $\varphi \neq 1$. If $\varphi < 1$, the PWF exhibits an inverse-S shape which overweights *small* probabilities and underweights *large* probabilities; if $\varphi > 1$, it exhibits an S shape that reverses the order of overweighting and underweighting. Small and large probabilities in this instance are defined relative to the fixed point $p^* = 0.368$, which solves $\omega(p^*) = p^*$. Finally, suppose that both η and φ deviate from unity. It remains the case that the shape of the PWF is either inverse-S ($\varphi < 1$) or regular S ($\varphi > 1$), but small and large probabilities are now defined relative to $p^* = \exp\{-(1/\eta)^{1/(\varphi-1)}\}$. An increase in η enhances pessimism by widening the interval of probabilities that are underweighted: the value of p^* decreases in η if $\varphi < 1$, and increases in η if $\varphi > 1$.

4. Results

We estimate the joint population distribution of the discrete utility parameters and draw inferences about risk aversion, prudence and temperance. At the aggregate level, we estimate signs and magnitudes of higher order risk attitudes and test whether the subject population on average is

[22] Åstebro, Mata and Santos-Pinto [2015] evaluate skewness preferences under RDU and employ the same two-parameter PWF alongside a power utility function. They ask each subject to make a series of choices between skewed and symmetric lotteries, and associate skewness seeking behavior with overweighting of small probabilities. Bougherara, Friesen and Nauges [2021] provide a similar analysis based on choices between skewed lotteries and sure payments, by employing a power utility function alongside a one-parameter PWF used by Tversky and Kahneman [1992].

risk averse, prudent and temperate. At the individual level, we evaluate the population shares of individuals with these types of latent risk preferences. Our statistical procedure addresses the panel dimension of the data set at both modeling and inferential stages: the random coefficient specification induces panel correlation across repeated observations on the same individual, and we adjust all standard errors and test statistics for clustering at the individual level.

To facilitate interpretation of the results, we report derived parameters instead of primitive normal parameters. For example, in relation to equation (5), we focus on marginal utility levels $\Delta^1\boldsymbol{\alpha}_n$ instead of primitive normal variates $\boldsymbol{\zeta}_n$. Since the population distribution of $\Delta^1\boldsymbol{\alpha}_n$ is logistic-normal, there are no analytic solutions to its population mean and higher order moments. We simulate those moments by using 10,000 draws from the estimated joint density of the primitive normal variates. Then we apply 10,000 repetitions of the parametric bootstrapping procedure by Krinsky and Robb [1986] to compute standard errors and confidence intervals for the simulated moments.

A. Higher Order Differences in Utility

We first consider population means of the estimated utility levels under EUT and their finite differences.[23] We find diminishing marginal utility, which suggests that the decision makers on average are risk averse over the income interval in our experiment. We normalize u_{100n} to zero and find that the estimated population mean of utility at 200 kroner, $E[u_{200n}]$, is 0.322. Each 100 kroner increase in income subsequently produces smaller increments in utility: $E[u_{300n}] = 0.504$, $E[u_{400n}] = 0.662$, $E[u_{500n}] = 0.799$ and $E[u_{600n}] = 0.910$, with u_{700n} normalized to unity for all n. These point estimates are significantly different from 0 and 1, and the associated 95% confidence intervals do not overlap with one another.[24] A more direct way to see the pattern of diminishing marginal utility is to evaluate first differences in utility, $\Delta^1 u_{mn} = u_{mn} - u_{(m-100)n}$ for $m \in \{200, 300, \cdots, 700\}$. The top-left panel of Figure 3 displays the estimated mean and 95% confidence interval for each m. The

[23] Table A1 in Appendix A reports detailed estimation results.

[24] The population medians, $Med[u_{mn}]$, are estimated to be similar to the population means. This similarity is an empirical finding rather than an implication of our distributional assumption: In contrast to a normal distribution which is symmetric by assumption, a logistic-normal distribution can display any sign of skewness.

results show that $E[\Delta^1 u_{200n}] = 0.322 > E[\Delta^1 u_{300n}] = 0.181 > \cdots > E[\Delta^1 u_{700}] = 0.090$, and each point estimate is significantly greater than 0 (*p*-values < 0.001).

To evaluate risk aversion statistically, we can test whether the population mean of each second difference is different from zero. That is, we can evaluate the significance of $E[\Delta^2 u_{mn}] = E[\Delta^1 u_{mn} - \Delta^1 u_{(m-100)n}]$ for $m \in \{300, 400, 500, 600, 700\}$. If the second derivative of a continuous utility function is uniformly negative over an interval between $(m-200)$ and m, the second difference $\Delta^2 u_{mn}$ is also negative over that interval.[25] The top-right panel of Figure 3 shows that the point estimates of $E[\Delta^2 u_{mn}]$ are negative and vary between -0.141 for $m = 300$ and -0.021 for $m = 700$. All point estimates are significantly different from zero at the 5% significance level, except the estimated value of $E[\Delta^2 u_{700n}]$ which is significant at the 10% level. We also observe that the second difference in utility is increasing in income for $m \leq 400$ and approximately constant at higher income levels.[26] Of course, these results refer to raw second differences rather than indices of absolute risk aversion, and a similar caveat applies to our evaluation of third and fourth differences.

For the time being, we study prudence by testing whether the population mean of third difference in utility, $E[\Delta^3 u_{mn}] = E[\Delta^2 u_{mn} - \Delta^2 u_{(m-100)n}]$ for $m \in \{400, 500, 600, 700\}$, is different from zero. The bottom-left panel of Figure 3 shows that decision makers on average are prudent at $m = 400$ but neutral to third order risk (*i.e.*, neither prudent nor imprudent) at subsequent levels of m: $E[\Delta^3 u_{400n}]$ is equal to 0.119 and significantly different from zero (*p*-value < 0.001), but the estimated values of $E[\Delta^3 u_{500n}]$, $E[\Delta^3 u_{600n}]$ and $E[\Delta^3 u_{700n}]$ are practically and statistically indistinguishable from zero (*p*-values > 0.760). We thus find that the third difference in utility is decreasing in income for $m \leq 500$, and approximately zero for $m \geq 500$.[27]

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[25] We can make similar associations between continuous and discrete utility functions for third and fourth derivatives and differences in utility.

[26] The estimated medians are also negative and significantly smaller than zero at the 5% significance level, except $Med[\Delta^2 u_{700n}]$ with *p*-value = 0.071. Thus, we find that a majority of decision makers are risk averse at each income interval in the experiment. The median second differences are not meant to be associated with risk aversion of the "median decision maker," whose utility level is equal to $Med[u_{mn}]$ for each m: Since Med[.] is a non-linear operator, the median second difference is not equal to the second difference of median utilities, *i.e.*, $Med[\Delta^2 u_{mn}] \neq \Delta^2 Med[u_{mn}]$. The mean E[.] is a linear operator, and $\Delta^2 E[u_{mn}]$ is therefore identical to $E[\Delta^2 u_{mn}]$ that we report. The same remarks apply to the third and fourth differences.

[27] The estimated median is U shaped over m, where $Med[\Delta^3 u_{mn}]$ is decreasing for $m \leq 600$ and increasing for $m \geq 600$. These results suggest that a significant majority of the decision makers are prudent

Finally, we evaluate temperance with reference to the bottom-right panel of Figure 3. The parameter of interest is the population mean of the fourth difference, $\Delta^4 u_{mn} = \Delta^3 u_{mn} - \Delta^3 u_{(m-100)n}$ for $m \in \{500, 600, 700\}$. We observe that decision makers on average are temperate at m = 500 but neutral to fourth order risk (*i.e.*, neither temperate nor intemperate) for m > 500: $E[\Delta^4 u_{500n}]$ is equal to −0.119 (*p*-value = 0.003), but $E[\Delta^4 u_{600n}]$ and $E[\Delta^4 u_{700n}]$ are close to zero and statistically insignificant (*p*-values > 0.749). Put another way, the fourth difference in utility is increasing in income for m ≤ 600 and approximately zero for m ≥ 600.[28]

B. Absolute Risk Aversion, Prudence and Temperance

The results so far pertain to population means of second and higher order utility differences. We now turn to an aggregate-level analysis of the indices of absolute risk attitudes. As explained in section 3, we construct a discrete analogue to each index by employing the ratio of a second or higher order utility difference to the within-individual average marginal utility over the relevant income interval. For example, the index of absolute risk aversion for individual n is given by $ARA_{mn} = -\Delta^2 u_{mn} / [(\Delta^1 u_{mn} + \Delta^1 u_{(mn-100)})/2]$.[29] We will present our results graphically, and the underlying point estimates are documented in Table A2 in Appendix A.

The estimated indices of absolute risk aversion suggest that the decision makers on average are risk averse over all income intervals. The top-left panel of Figure 4 plots the estimated population mean of absolute risk aversion, $E[ARA_m]$, for each $m \in \{300, 400, \cdots, 700\}$. The estimated population means are positive and vary between 0.097 (for m = 400) and 0.469 (for m = 600), with no pattern of globally increasing or decreasing absolute risk aversion over income. The

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for $m \in \{400, 700\}$, but the population is equally divided between prudent and imprudent decision makers for $m \in \{500, 600\}$.

[28] The population median of fourth difference in utility, $Med[\Delta^4 u_{mn}]$, is estimated to be increasing across income intervals. The results suggest that the temperate make up a majority of the population at m = 500; the temperate and the intemperate have equal shares of the population at m = 600; and the intemperate make up a majority at m = 700.

[29] Since the expectation of a ratio is different from the ratio of expectations, it follows that $E[ARA_{mn}] \neq E[-\Delta^2 u_{mn}] / E[(\Delta^1 u_{mn} + \Delta^1 u_{(mn-100)})/2]$. It is thus possible to draw different inferences about the average decision maker's risk attitudes if one looks at indices of absolute risk attitudes instead of utility differences.

estimated values are significantly different from zero at the 5% significance level, except $E[ARA_{700}]$ = 0.349 which is significant at the 10% level.

The estimated indices of absolute prudence display a U-shaped profile over income. The top-right panel of Figure 4 reports the estimated population mean of absolute prudence, $E[APR_m]$, for $m \in \{400, 500, 600, 700\}$. We find that the average decision maker is prudent at $m \in \{400, 700\}$ but neutral to third order risk at $m \in \{500, 600\}$: $E[APR_{400}] = 0.525$ and $E[APR_{700}] = 0.383$ with p-values < 0.002, whereas $E[APR_{500}] = 0.015$ and $E[APR_{600}] = -0.131$ are insignificant (p-values ≥ 0.100).

Finally, the estimated indices of absolute temperance are decreasing over income. The bottom-left panel of Figure 4 displays the estimated population mean of absolute temperance, $E[ATM_m]$, for each $m \in \{500, 600, 700\}$. The estimated population mean is 0.671 (p-value < 0.001) for m = 500; 0.098 (p-value = 0.484) for m = 600; and −0.394 (p-value = 0.027) for m = 700. Hence, the average decision maker is temperate at m = 500; neutral to fourth order risk at m = 600; and intemperate at m = 700.

To put the magnitudes of the estimated indices in perspective, we compare the results to an alternative EUT specification that employs a popular, albeit inflexible, utility function. We structurally estimate a power utility function, $u(m; r) = [m^{(1-r)} - 1]/(1-r)$, by specifying r as a normally distributed random coefficient and retaining the Contextual Utility error specification. To compare the results to Figure 4, we evaluate discrete indices of absolute risk attitudes over income at the estimated r values.

The estimated population mean of the r parameter is equal to 0.99 (p-value < 0.001). For the average decision maker, the index of absolute risk aversion is monotonically decreasing in income and it declines from 0.519 for m = 300 to 0.167 for m = 700. The grand mean of the average decision maker's absolute risk aversion across all income levels, defined as $\sum_{m \in M'} ARA_m/5$ where $M' = \{300, 400, \cdots, 700\}$, is equal to 0.295, and the grand mean for the average decision maker in our discrete utility specification is 0.289. While a simple comparison of grand means leads to similar conclusions about the overall level of absolute risk aversion, the inflexible power function masks non-monotone changes in absolute risk aversion over income, which we have been able to uncover by taking a non-parametric approach to the utility function. It follows that the power utility function leads to biased inferences about absolute risk aversion relevant to each $m \in M'$.

The index of absolute prudence is also monotonically decreasing in income for the average decision maker, falling from 0.363 at m = 400 to 0.067 at m = 700. The grand mean of absolute prudence for $M'' \in \{400, 500, \cdots, 700\}$, $\sum_{m\in M''} E[APR_m]/4$, is equal to 0.176, which is slightly below the estimated grand mean of 0.198 in our discrete utility specification. Thus, using the inflexible power utility function does not alter our conclusions about the overall level of absolute prudence. However, the similarity in grand means masks the U-shaped variation in absolute prudence over income that we found with the discrete utility function. It again follows that the power utility function, which implies decreasing absolute prudence, leads to biased inferences at each $m \in M''$.

Finally, the index of absolute temperance for the average decision maker is monotonically decreasing in income, as it has been for the average decision maker in our discrete utility specification. The grand mean of absolute temperance in the power specification, $\sum_{m\in M'''} E[ATM_m]/3$ for $M''' \in \{500, 600, 700\}$, is equal to 0.148, in comparison to 0.125 in our discrete utility specification. While the two sets of results are similar in terms of both the pattern of variation and the grand mean, it remains the case that the power utility function leads to biased inferences for each $m \in M'''$: the index of absolute temperance declines from 0.286 (m = 500) to 0.051 (m = 700) with the power function, whereas it declines from 0.671 to −0.394 with the discrete utility function.

C. Individual-level Risk Attitudes

We next consider an individual-level analysis of risk aversion, prudence and temperance by evaluating population shares of decision makers with these types of risk attitudes.[30] Since we have estimated the population distributions of all utility parameters, we can derive the population shares by computing the following marginal probabilities at each income level m: $\Pr(\Delta^2 u_{mn} < 0)$ for risk aversion, $\Pr(\Delta^3 u_{mn} > 0)$ for prudence, and $\Pr(\Delta^4 u_{mn} < 0)$ for temperance. We can also derive joint

[30] These evaluations are individualistic since each population share can be seen as the number of decision makers who display the type of risk attitude in question relative to the population size.

probabilities, such as $\Pr(\Delta^2 u_{mn} < 0$ for all $m \in \{300, 400, \cdots, 700\})$, to evaluate the share of decision makers with a particular type of risk attitude over the entire income interval in the experiment.[31] Since marginal utility is positive, the estimated population shares are identical to those we obtain by applying the same procedure to the indices of absolute risk attitudes. Table A3 in Appendix A reports the detailed results, which we graphically summarize in Figure 5.

The top-left panel of Figure 5 shows that a majority of decision makers are risk averse at each income level m. The estimated population shares vary from $\Pr(\Delta^2 u_{400n} < 0) = 0.570$ to $\Pr(\Delta^2 u_{600n} < 0) = 0.714$, with no particular upward or downward trend. The point estimates are significantly greater than 0.5 at the 5% significance level, except $\Pr(\Delta^2 u_{400n} < 0)$ which is significant at the 10% level. Moving to joint probabilities, the share of decision makers who are risk averse (risk seeking) at *all* m is equal to 0.147 (0.003). The most common type of decision maker is risk averse over some but not all income levels and represents 85.1% of the population.

In the top-right panel of Figure 5, we find that the estimated share of prudent decision makers is U-shaped over income. A significant majority of decision makers are prudent at $m \in \{400, 700\}$, with $\Pr(\Delta^3 u_{400n} > 0) = 0.721$ and $\Pr(\Delta^3 u_{700n} > 0) = 0.648$, but we cannot reject the hypothesis that the population is equally divided between prudent and imprudent decision makers at $m \in \{500, 600\}$, with $\Pr(\Delta^3 u_{500n} > 0) = 0.516$ and $\Pr(\Delta^3 u_{600n} > 0) = 0.419$. The vast majority of decision makers (98.5%) are prudent over some but not all income intervals, and those who are consistently prudent (imprudent) represent only 1.5% (less than 0.1%) of the population.

Finally, the bottom-left panel of Figure 5 shows that the estimated share of temperate decision makers is monotonically declining over income. The majority of decision makers are temperate at m = 500; neither temperate nor intemperate at m = 600; and intemperate at m = 700. Specifically, $\Pr(\Delta^4 u_{500n} < 0) = 0.710$, $\Pr(\Delta^4 u_{600n} < 0) = 0.534$, and $\Pr(\Delta^4 u_{700n} < 0) = 0.349$, where the estimated population share for m = 600 is not significantly different from 0.5 (*p*-value = 0.534). The

[31] Table A3 in Appendix A reports the detailed results. The joint probabilities are not equal to the products of marginal probabilities. The model includes an unrestricted covariance matrix for the primitive multivariate normal distribution, $V[\boldsymbol{\zeta}_n]$ in (5), and we reject the joint hypothesis that the 10 covariance parameters are equal to zero (*p*-value < 0.001).

most common type of decision maker is temperate over some but not all income intervals, and they represent 91.4% of the population, while those who are consistently temperate (intemperate) over all income intervals represent 6.0% (2.7%) of the population.

Overall, the results suggest that most decision makers have mixed higher order risk attitudes over income.[32] An alternative way of evaluating higher order risk attitudes is to consider the share of decision makers who make prudent (temperate) choices in symmetric third (fourth) order risk apportionment tasks similar to those proposed by Eeckhoudt and Schlesinger [2006], *i.e.* when p = q = z = 0.5 in Figure 1.[33] Given the estimated population distribution of individual-specific utility parameters, our model predicts that 49.9% of the population will make prudent choices and 64.5% will make temperate choices. The predicted prevalence of prudence is not significantly different from 50% (*p*-value = 0.977), but the predicted prevalence of temperance is significantly greater than 50% (*p*-value < 0.001). Our results suggest that these prevalence metrics should be viewed with caution because they ignore mixed risk attitudes over the income levels used in constructing the risk apportionment tasks.

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[32] Our notion of mixed risk attitudes focuses on variation in risk aversion, prudence and temperance *over income*. This differs from alternative notions of mixed risk attitudes that relate to particular combinations of second and higher order risk attitudes. Within the confines of EUT, Caballé and Pomansky [1996] define mixed risk averters as being risk averse, prudent and temperate, while Crainich, Eeckhoudt and Trannoy [2013] define mixed risk lovers as being risk seeking, prudent and intemperate.

[33] The third order risk apportionment task corresponds to our "PR41" task in Table C1. The left option in this task pays {(600, 0.25), (400, 0.25), (300, 0.50)} and the right option pays {(500, 0.50), (400, 0.25), (200, 0.25)}. The raw sample proportion of prudent choices is equal to 0.438, which is not significantly different from 0.5 (*p*-value = 0.246).

Our set of 156 temperance tasks does not include the fourth order risk apportionment task, as we have deliberately selected decision tasks where the probability of each outcome has at most two decimal places: The fourth order task assumes p = q = z = 0.5, resulting in the left option that would pay {(600, 0.25), (500, 0.25), (300, 0.25), (200, 0.25)} and the right option that would pay {(700, 0.125), (500, 0.125), (400, 0.50), (300, 0.125), (100, 0.125)}. However, we include two decision tasks which are very similar to the fourth order task: The "TP78" task with p = q = 0.5 & z=0.4 and the "TP79" task with p = q = 0.5 & z=0.6 in Table C3. Once we equate left choices in those two tasks with temperate choices, the raw sample proportion of temperate choices in the two tasks is equal to 0.554, which is not significantly different from 0.5 (*p*-value = 0.122).

D. Treatment Effects

Our experiment had the same subject complete a set of decision tasks which used column charts to represent probability distributions, and another set which used pie charts. We capture these treatment effects by allowing the mean vector of the primitive multivariate normal distribution of marginal utility, $E[\boldsymbol{\zeta}_n]$ in (5), to vary with a binary indicator of the chart type. Population means of absolute risk aversion, prudence and temperance are then derived for each treatment. Table A4 in Appendix A reports the detailed results.

While the treatment effects are jointly significant,[34] we do not find that the index of absolute risk aversion is uniformly greater in one display treatment compared to the other. For example, at m = 400, the index of risk aversion is significantly higher for the pie chart treatment than the column chart treatment (*p*-value = 0.004) but at m = 600, it is significantly lower for the pie chart treatment (*p*-value = 0.001). Similarly, the index of absolute prudence is significantly higher for the pie chart treatment at m = 500 (*p*-value = 0.007) but significantly lower for the same treatment at m = 700 (*p*-value = 0.050). We do not find a significant treatment effect on the index of absolute temperance for any m (*p*-values > 0.108).

Turning to the restrictive metric of prudence that focuses on predicted responses to the third order risk apportionment task, we find higher prevalence of prudence in the pie chart treatment compared to the column chart treatment. In the pie chart treatment the predicted share of prudence decision makers is 0.604 and significantly greater than 0.5 (*p*-value = 0.009), whereas in the column chart treatment the predicted share is 0.406 and significantly smaller than 0.5 (*p*-value = 0.024). Thus, our findings on this metric suggest that a majority of decision makers are prudent in the pie chart treatment and imprudent in the column chart treatment, leading to an equal split between the two groups in the pooled analysis.

[34] For each index of absolute risk attitude, we reject the joint hypothesis of no treatment effect at all income levels: the $\chi^2(5)$ statistic for absolute risk aversion, the $\chi^2(4)$ statistic for absolute prudence, and the $\chi^2(3)$ statistic for absolute temperance have *p*-values smaller than 0.01. We also reject the hypothesis that all 12 pairwise comparisons of absolute risk attitudes are equal (*p*-value < 0.001).

There is no significant treatment effect on predicted responses to the fourth order risk apportionment task. Our model predicts a greater share of temperate decision makers in the pie chart treatment compared to the column chart treatment, namely 0.659 against 0.607. Both estimates are significantly greater than 0.5 (p-values < 0.001), but the estimated difference is not significant at the 5% level (p-value = 0.073). Hence, in terms of this restrictive metric of temperance, we find that a significant majority of decision makers are temperate regardless of the graphical representations of probability distributions.

We also varied the provision of information on the expected value and standard deviation of each option on a between-subject basis. One treatment gave no information on either moment; a second treatment displayed the expected value of each option; and a third treatment provided information on both the expected value and the standard deviation of each option. We capture the effects of these information treatments by allowing the mean vector $E[\boldsymbol{\zeta}_n]$ in (5) to vary with relevant treatment dummies. Table A5 in Appendix A reports the estimated indices of absolute risk attitudes for each information treatment.

We find limited effects of the information treatments. For all three treatments, the mean indices of absolute risk attitudes show similar variation over income as what we have found in Figure 4.[35] Looking at predicted responses to the third order risk apportionment task, we cannot reject the null hypothesis that the prevalence of prudence is 50% for each treatment group (p-values > 0.108). When we look at predicted responses to the fourth order task, however, we do find a smaller share of temperate decision makers in the treatment with provision of expected values (0.550) compared to the treatment with no information (0.644) and provision of both moments (0.669). The first of these estimates is not significantly different from 0.5 (p-value = 0.128), whereas the other two estimates are significantly greater than 0.5 (p-values > 0.039).

[35] Hermann and Musshoff [2019] consider dichotomous and polychotomous choice tasks with and without information on expected values of lotteries and find no significant treatment effects on the coefficient of relative risk aversion under EUT.

E. Risk Attitudes under RDU

RDU generalizes EUT by adding probability weighting as a complementary source of risk attitude to utility curvature. We adopt a two-parameter PWF which is characterized by the shape parameter φ_n and the convexity parameter η_n in (9). Table A6 in Appendix A reports our structural RDU estimates. The population mean of φ_n is estimated to be 1.000 and the population median 0.938, and neither estimate is significantly different from unity at the 5% level. By contrast, both the estimated mean (1.558) and median (1.328) of η_n are significantly greater than unity at the 1% level. Taken together, the two sets of point estimates suggest that the typical shape of the PWF in the subject population is globally convex, which implies that all interior probabilities of the best outcome are underweighted.[36]

To evaluate the combined effects of utility curvature and probability weighting on higher order risk attitudes, we use the RDU estimates to predict the share of decision makers who make prudent choices in the third order risk apportionment task, and temperate choices in the fourth order task. The predicted prevalence of prudence is 0.475 and that of temperance is 0.642; as with EUT, we cannot reject the hypothesis that the population is equally divided between the prudent and the imprudent, but we find that a significant majority of decision makers are temperate. An advantage of our structural econometric approach is that it enables us to explore the extent to which these combined effects are influenced by the utility function as opposed to the PWF. If we remove the effects of probability weighting by assuming that the utility function is distributed as per the RDU estimates but the PWF is linear for all decision makers, the prevalence of prudence changes to 0.406 and that of temperance to 0.689. If we assume the converse, *i.e.*, the utility function is linear for all but the PWF is distributed as estimated, the prevalence of prudence changes to 0.633 and that of temperance to 0.492. Thus, in predicting what choices RDU decision makers would make in the third and fourth order risk apportionment tasks, utility curvature appears to exert a greater influence than probability weighting.

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[36] Of course, this is not to say that every decision maker's PWF is globally convex. Our model accounts for interpersonal heterogeneity in the PWF: The population standard deviation of φ_n is estimated to be 0.371, and that of η_n to be 0.956. Both estimates are significantly greater than zero at the 1% level.

5. Conclusion

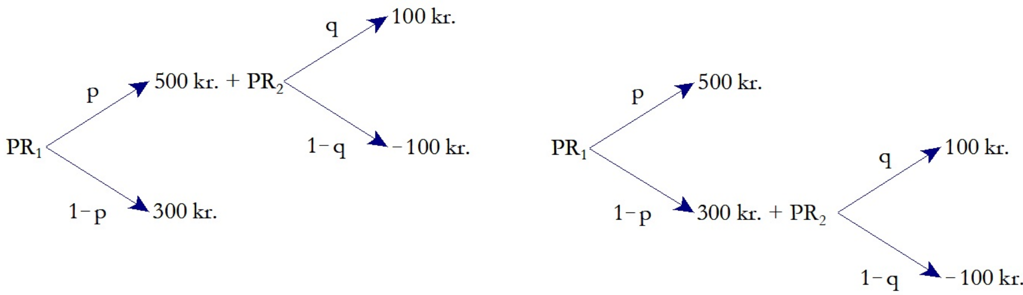
We elicit higher order risk attitudes using a novel experimental design with real monetary incentives, and find considerable variation in risk aversion, prudence, and temperance over income. A unique aspect of our econometric analysis is the non-parametric approach to the utility function, which allows us to identify these three types of risk attitudes separately. Our structural model recognizes interpersonal preference heterogeneity in the subject population, and enables us to provide a coherent analysis that uses the same set of estimates to study risk attitudes at both the aggregate level and the individual level. At the aggregate level, we find that the average decision maker is risk averse at all income levels spanned by our incentives; prudent at the two ends of the income range; and neutral to the third order risk (*i.e.*, neither prudent nor imprudent) at the intermediate levels. The intensities of their risk attitudes, as measured by the index of absolute risk aversion or temperance, show non-monotone variations over income. The average decision maker's fourth order risk attitude is more mixed: Their index of absolute temperance is monotone decreasing in income, moving from the region of temperance to that of intemperance as income increases. At the individual level, we obtain qualitatively similar findings. A majority of decision makers are risk averse at each income level; a majority are prudent at both ends of the income range but there is an equal split between prudent and imprudent decision makers at the intermediate levels; and a majority are temperate at a low income level but intemperate at a high income level.

Higher order risk attitudes are typically measured by the observed frequencies of prudent and temperate choices in risk apportionment tasks. Our findings on the mixed patterns of higher order risk attitudes over income provide a structural explanation for why those frequencies have been found sensitive to monetary prizes used in the decision tasks, and suggest that the underlying measurement approach, which considers prudence and temperance as fixed individual traits, is not as theory-free as one might think. The testable implications of higher order risk attitudes are often derived in a similar vein by asking what prudent and temperate individuals would do in response to changes in economic constraints. Our results suggest that comparative statics analyses that address within-individual heterogeneity in higher order risk attitudes and empirical tests thereof will provide interesting avenues for future research.

Figure 1: Algebraic Structure of Decision Tasks

A. Prudence Tasks

Left Option **Right Option**



B. Temperance Tasks

Left Option **Right Option**

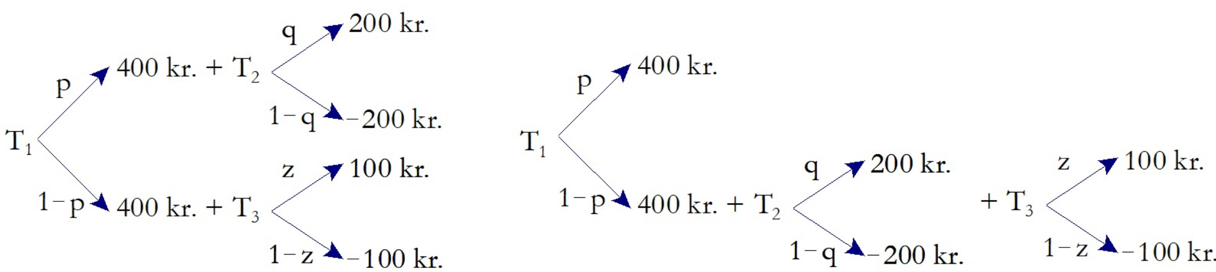
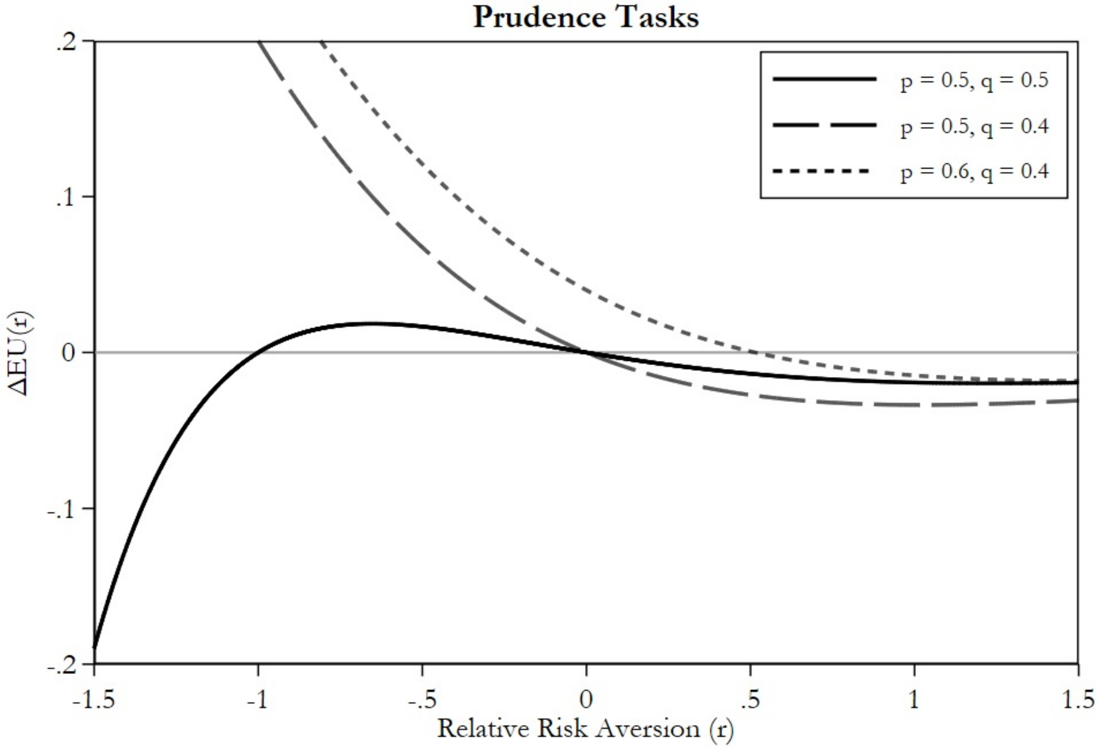


Figure 2: Difference in Expected Utility

Power Utility Function



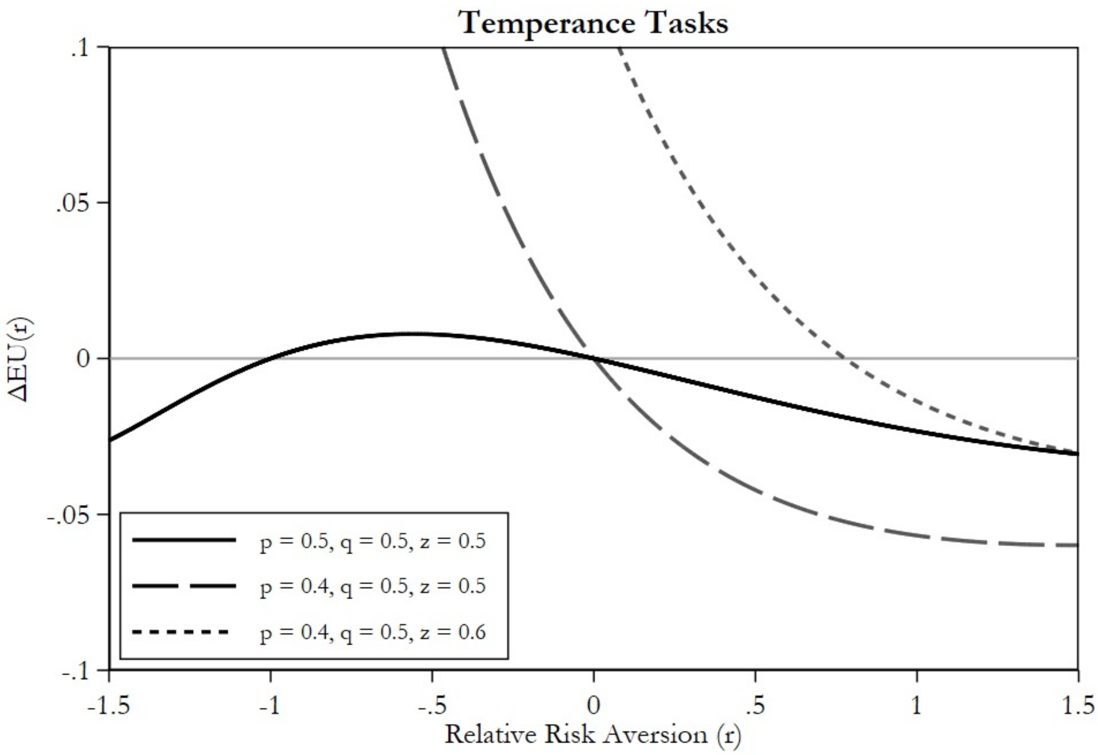


Figure 3: Finite Difference in Utility

Estimated Population Mean

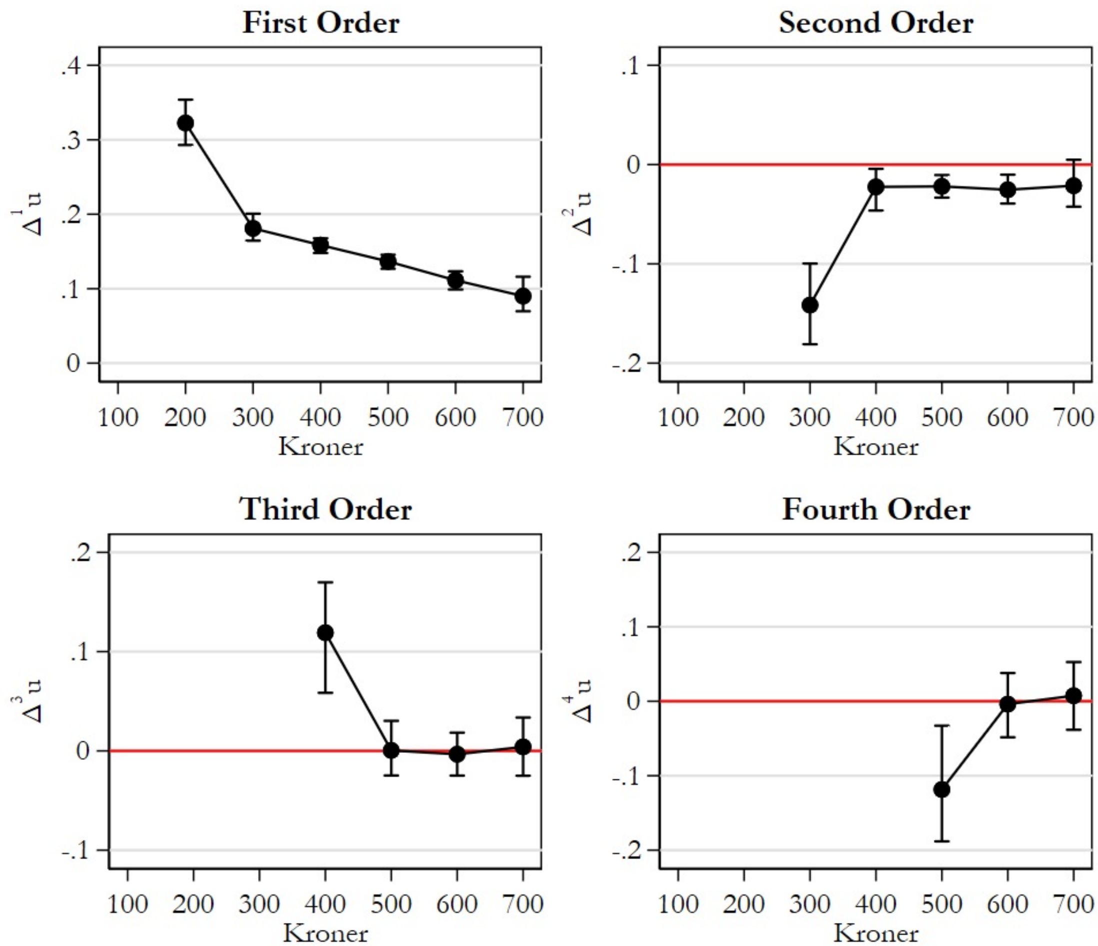


Figure 4: Index of Absolute Risk Attitude

Estimated Population Mean

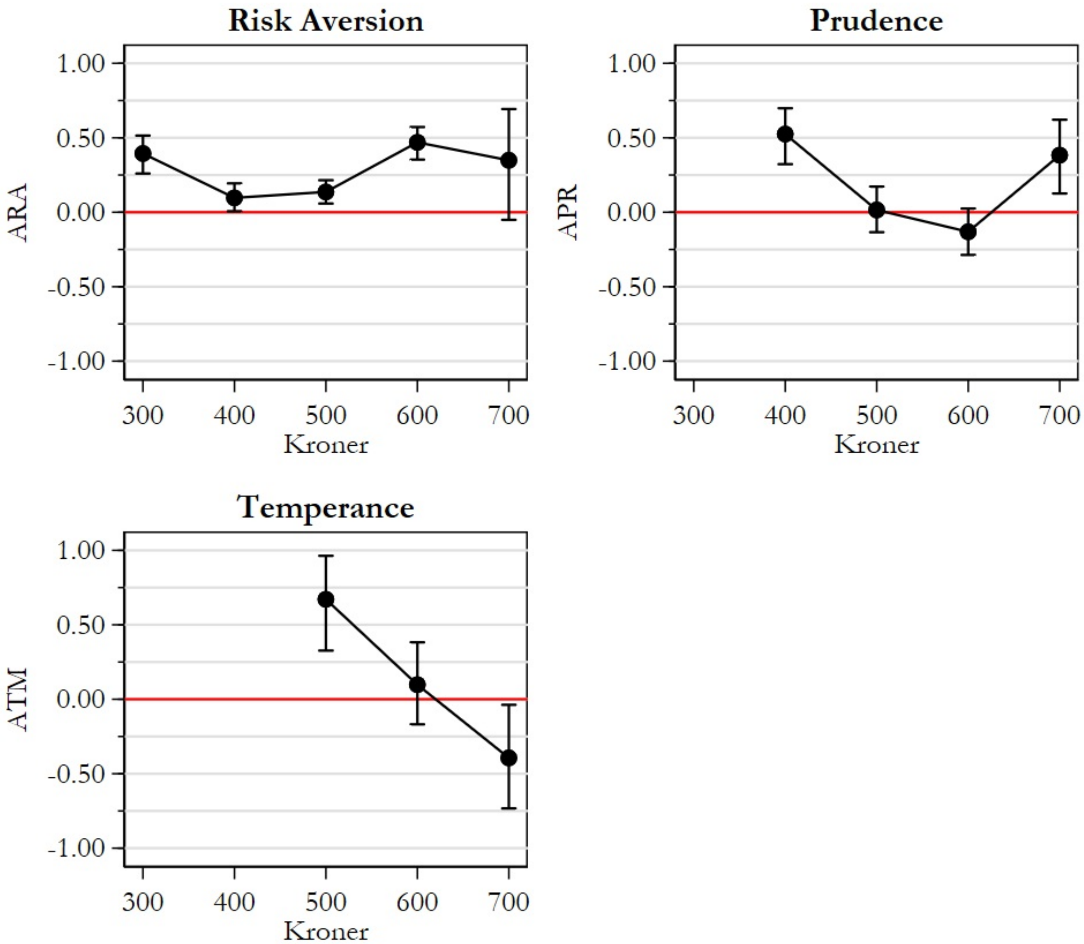
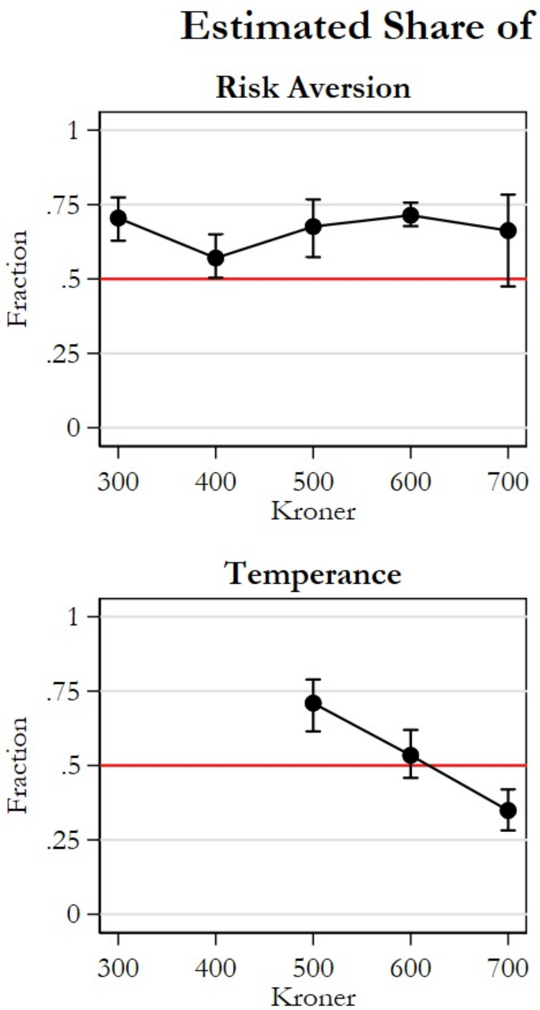


Figure 5: Population Share by Risk Attitude



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Appendix A: Estimated Parameters under EUT and RDU

Table A1. Estimated Parameters under EUT

Parameter	Estimate	St. Error	*p*-value	95% Confidence Interval	
			Population means, medians and standard deviations of utility		
$E[u_{200}]$	0.322	0.016	<0.001	0.293	0.354
$E[u_{300}]$	0.504	0.015	<0.001	0.476	0.534
$E[u_{400}]$	0.662	0.015	<0.001	0.632	0.692
$E[u_{500}]$	0.799	0.015	<0.001	0.768	0.826
$E[u_{600}]$	0.910	0.012	<0.001	0.884	0.930
$Med[u_{200}]$	0.291	0.018	<0.001	0.258	0.327
$Med[u_{300}]$	0.507	0.018	<0.001	0.472	0.543
$Med[u_{400}]$	0.690	0.018	<0.001	0.655	0.724
$Med[u_{500}]$	0.850	0.017	<0.001	0.813	0.881
$Med[u_{600}]$	0.948	0.014	<0.001	0.916	0.969
$SD[u_{200}]$	0.196	0.013	<0.001	0.171	0.223
$SD[u_{300}]$	0.209	0.012	<0.001	0.186	0.234
$SD[u_{400}]$	0.183	0.012	<0.001	0.158	0.207
$SD[u_{500}]$	0.173	0.012	<0.001	0.148	0.193
$SD[u_{600}]$	0.105	0.009	<0.001	0.087	0.121
			Population means, medians and standard deviations of first differences in utility		
$E[\Delta^1 u_{200}]$	0.322	0.016	<0.001	0.293	0.354
$E[\Delta^1 u_{300}]$	0.181	0.009	<0.001	0.164	0.201
$E[\Delta^1 u_{400}]$	0.159	0.005	<0.001	0.148	0.168
$E[\Delta^1 u_{500}]$	0.137	0.005	<0.001	0.127	0.146
$E[\Delta^1 u_{600}]$	0.111	0.006	<0.001	0.099	0.123
$E[\Delta^1 u_{700}]$	0.090	0.012	<0.001	0.070	0.116
$Med[\Delta^1 u_{200}]$	0.291	0.018	<0.001	0.258	0.327
$Med[\Delta^1 u_{300}]$	0.170	0.008	<0.001	0.155	0.186
$Med[\Delta^1 u_{400}]$	0.154	0.005	<0.001	0.143	0.164
$Med[\Delta^1 u_{500}]$	0.132	0.005	<0.001	0.123	0.141
$Med[\Delta^1 u_{600}]$	0.078	0.006	<0.001	0.065	0.090
$Med[\Delta^1 u_{700}]$	0.052	0.014	<0.001	0.031	0.084
$SD[\Delta^1 u_{200}]$	0.196	0.013	<0.001	0.171	0.223
$SD[\Delta^1 u_{300}]$	0.086	0.015	<0.001	0.064	0.122
$SD[\Delta^1 u_{400}]$	0.066	0.005	<0.001	0.057	0.076
$SD[\Delta^1 u_{500}]$	0.054	0.004	<0.001	0.047	0.063
$SD[\Delta^1 u_{600}]$	0.106	0.011	<0.001	0.084	0.127
$SD[\Delta^1 u_{700}]$	0.105	0.009	<0.001	0.087	0.121

Population means, medians and standard deviations of second differences in utility

$E[\Delta^2 u_{300}]$	-0.141	0.021	<0.001	-0.181	-0.100
$E[\Delta^2 u_{400}]$	-0.022	0.011	0.035	-0.046	-0.004
$E[\Delta^2 u_{500}]$	-0.022	0.006	<0.001	-0.033	-0.011
$E[\Delta^2 u_{600}]$	-0.025	0.007	0.001	-0.039	-0.010
$E[\Delta^2 u_{700}]$	-0.021	0.012	0.079	-0.042	0.005
$Med[\Delta^2 u_{300}]$	-0.098	0.020	<0.001	-0.138	-0.060
$Med[\Delta^2 u_{400}]$	-0.016	0.008	0.046	-0.032	-0.001
$Med[\Delta^2 u_{500}]$	-0.018	0.005	0.001	-0.028	-0.007
$Med[\Delta^2 u_{600}]$	-0.048	0.006	<0.001	-0.060	-0.036
$Med[\Delta^2 u_{700}]$	-0.016	0.009	0.071	-0.031	0.002
$SD[\Delta^2 u_{300}]$	0.220	0.019	<0.001	0.186	0.259
$SD[\Delta^2 u_{400}]$	0.096	0.016	<0.001	0.075	0.136
$SD[\Delta^2 u_{500}]$	0.049	0.004	<0.001	0.041	0.058
$SD[\Delta^2 u_{600}]$	0.114	0.013	<0.001	0.089	0.139
$SD[\Delta^2 u_{700}]$	0.121	0.011	<0.001	0.099	0.143

Population means, medians and standard deviations of third differences in utility

$E[\Delta^3 u_{400}]$	0.119	0.029	<0.001	0.058	0.170
$E[\Delta^3 u_{500}]$	<0.001	0.014	0.972	-0.025	0.030
$E[\Delta^3 u_{600}]$	-0.003	0.011	0.760	-0.025	0.018
$E[\Delta^3 u_{700}]$	0.004	0.015	0.783	-0.025	0.034
$Med[\Delta^3 u_{400}]$	0.109	0.019	<0.001	0.072	0.148
$Med[\Delta^3 u_{500}]$	0.005	0.012	0.680	-0.018	0.029
$Med[\Delta^3 u_{600}]$	-0.018	0.009	0.056	-0.035	0.001
$Med[\Delta^3 u_{700}]$	0.045	0.012	<0.001	0.021	0.069
$SD[\Delta^3 u_{400}]$	0.235	0.025	<0.001	0.197	0.296
$SD[\Delta^3 u_{500}]$	0.120	0.016	<0.001	0.097	0.158
$SD[\Delta^3 u_{600}]$	0.119	0.014	<0.001	0.092	0.147
$SD[\Delta^3 u_{700}]$	0.203	0.023	<0.001	0.158	0.249

Population means, medians and standard deviations of fourth differences in utility

$E[\Delta^4 u_{500}]$	-0.119	0.040	0.003	-0.188	-0.033
$E[\Delta^4 u_{600}]$	-0.004	0.022	0.861	-0.048	0.038
$E[\Delta^4 u_{700}]$	0.007	0.023	0.749	-0.038	0.053
$Med[\Delta^4 u_{500}]$	-0.145	0.029	<0.001	-0.202	-0.087
$Med[\Delta^4 u_{600}]$	-0.016	0.021	0.428	-0.062	0.020
$Med[\Delta^4 u_{700}]$	0.070	0.020	<0.001	0.032	0.109
$SD[\Delta^4 u_{500}]$	0.290	0.041	<0.001	0.238	0.398
$SD[\Delta^4 u_{600}]$	0.204	0.025	<0.001	0.160	0.257
$SD[\Delta^4 u_{700}]$	0.298	0.038	<0.001	0.224	0.373

		Correlation coefficients			
$R[u_{200}, u_{300}]$	0.911	0.030	<0.001	0.835	0.951
$R[u_{200}, u_{400}]$	0.803	0.036	<0.001	0.722	0.865
$R[u_{200}, u_{500}]$	0.659	0.044	<0.001	0.565	0.739
$R[u_{200}, u_{600}]$	0.638	0.042	<0.001	0.554	0.717
$R[u_{300}, u_{400}]$	0.952	0.010	<0.001	0.929	0.968
$R[u_{300}, u_{500}]$	0.850	0.029	<0.001	0.780	0.895
$R[u_{300}, u_{600}]$	0.720	0.043	<0.001	0.623	0.795
$R[u_{400}, u_{500}]$	0.955	0.009	<0.001	0.932	0.968
$R[u_{400}, u_{600}]$	0.762	0.028	<0.001	0.704	0.814
$R[u_{500}, u_{600}]$	0.817	0.028	<0.001	0.760	0.868

Log simulated likelihood = -12,786.342; Number of observations = 24,505

Table A2. Absolute Risk Aversion, Prudence and Temperance under EUT

Parameter	Estimate	St. Error	*p*-value	95% Confidence Interval	
			A. Risk Aversion		
$E[ARA_{300}]$	0.394	0.065	<0.001	0.260	0.515
$E[ARA_{400}]$	0.097	0.048	0.044	0.007	0.194
$E[ARA_{500}]$	0.136	0.041	0.001	0.059	0.215
$E[ARA_{600}]$	0.469	0.057	<0.001	0.353	0.572
$E[ARA_{700}]$	0.349	0.192	0.069	-0.051	0.693
$Med[ARA_{300}]$	0.462	0.073	<0.001	0.306	0.594
$Med[ARA_{400}]$	0.104	0.052	0.046	0.007	0.210
$Med[ARA_{500}]$	0.140	0.042	0.001	0.060	0.221
$Med[ARA_{600}]$	0.561	0.077	<0.001	0.407	0.708
$Med[ARA_{700}]$	0.426	0.239	0.075	-0.059	0.866
			B. Prudence		
$E[APR_{400}]$	0.525	0.096	<0.001	0.323	0.698
$E[APR_{500}]$	0.015	0.078	0.844	-0.134	0.172
$E[APR_{600}]$	-0.131	0.080	0.100	-0.287	0.024
$E[APR_{700}]$	0.383	0.125	0.002	0.126	0.621
$Med[APR_{400}]$	0.599	0.098	<0.001	0.396	0.781
$Med[APR_{500}]$	0.033	0.082	0.684	-0.123	0.200
$Med[APR_{600}]$	-0.167	0.087	0.055	-0.333	0.005
$Med[APR_{700}]$	0.620	0.161	<0.001	0.289	0.922
			C. Temperance		
$E[ATM_{500}]$	0.671	0.162	<0.001	0.327	0.963
$E[ATM_{600}]$	0.098	0.140	0.484	-0.169	0.382
$E[ATM_{700}]$	-0.394	0.178	0.027	-0.733	-0.037
$Med[ATM_{500}]$	0.201	0.039	<0.001	0.120	0.275
$Med[ATM_{600}]$	0.031	0.038	0.419	−0.036	0.115
$Med[ATM_{700}]$	−0.194	0.052	<0.001	−0.293	−0.088
$Med[ATM_{500}]$	0.804	0.158	<0.001	0.481	1.102
$Med[ATM_{600}]$	0.124	0.153	0.419	-0.145	0.459
$Med[ATM_{700}]$	-0.777	0.208	<0.001	-1.171	-0.351

Table A3. Population Shares of Higher Order Risk Preferences under EUT

Parameter	Estimate	St. Error	*p*-value	95% Confidence Interval	
			A. Risk Aversion		
sRA_{300}	0.705	0.037	<0.001	0.628	0.774
sRA_{400}	0.570	0.037	<0.001	0.504	0.650
sRA_{500}	0.676	0.050	<0.001	0.573	0.767
sRA_{600}	0.714	0.020	<0.001	0.677	0.756
sRA_{700}	0.663	0.080	<0.001	0.475	0.783
sRA_{ALL}	0.147	0.037	<0.001	0.060	0.206
sRA_{SOME}	0.851	0.037	<0.001	0.791	0.938
sRA_{NEVER}	0.003	0.002	0.244	0.000	0.009
			B. Prudence		
sPR_{400}	0.721	0.039	<0.001	0.638	0.792
sPR_{500}	0.516	0.042	<0.001	0.434	0.602
sPR_{600}	0.419	0.042	<0.001	0.339	0.503
sPR_{700}	0.648	0.033	<0.001	0.579	0.710
sPR_{ALL}	0.015	0.005	0.006	0.007	0.028
sPR_{SOME}	0.985	0.005	<0.001	0.971	0.992
sPR_{NEVER}	<0.001	0.001	0.589	<0.001	0.003
			C. Temperance		
sTM_{500}	0.710	0.044	<0.001	0.615	0.789
sTM_{600}	0.534	0.041	<0.001	0.458	0.620
sTM_{700}	0.349	0.035	<0.001	0.282	0.419
sTM_{ALL}	0.060	0.012	<0.001	0.037	0.083
sTM_{SOME}	0.914	0.016	<0.001	0.880	0.944
sTM_{NEVER}	0.027	0.008	0.001	0.014	0.044

Notes: sRA_m, sPR_m and sTM_m refer to marginal probabilities $Pr(\Delta^2 u_{mn} < 0)$, $Pr(\Delta^3 u_{mn} > 0)$ and $Pr(\Delta^4 u_{mn} < 0)$, respectively. sRA_{ALL} and sRA_{NEVER} refer to joint probabilities $Pr(\Delta^2 u_{mn} < 0$ for every m) and $Pr(\Delta^2 u_{mn} > 0$ for every m), respectively. sRA_{SOME} is equal to $(1 - sRA_{ALL} - sRA_{NEVER})$. Joint probabilities for prudence and temperance are similarly defined.

Table A4. Absolute Measures of Risk Preferences Across Chart Displays

Parameter	Estimate	St. Error	*p*-value	95% Confidence Interval	
			A. Risk Aversion		
$E[ARA_{300\_col}]$	0.395	0.078	<0.001	0.247	0.552
$E[ARA_{400\_col}]$	0.017	0.064	0.789	-0.102	0.149
$E[ARA_{500\_col}]$	0.194	0.049	<0.001	0.098	0.289
$E[ARA_{600\_col}]$	0.582	0.071	<0.001	0.447	0.725
$E[ARA_{700\_col}]$	0.288	0.200	0.149	-0.119	0.662
$E[ARA_{300\_pie}]$	0.392	0.081	0.000	0.242	0.555
$E[ARA_{400\_pie}]$	0.161	0.054	0.003	0.062	0.272
$E[ARA_{500\_pie}]$	0.087	0.049	0.073	-0.008	0.185
$E[ARA_{600\_pie}]$	0.328	0.064	0.000	0.208	0.462
$E[ARA_{700\_pie}]$	0.334	0.199	0.093	-0.074	0.696
			B. Prudence		
$E[APR_{400\_col}]$	0.588	0.128	<0.001	0.324	0.827
$E[APR_{500\_col}]$	-0.130	0.103	0.207	-0.321	0.082
$E[APR_{600\_col}]$	-0.147	0.104	0.159	-0.361	0.045
$E[APR_{700\_col}]$	0.563	0.164	0.001	0.256	0.897
$E[APR_{400\_pie}]$	0.474	0.126	0.000	0.216	0.716
$E[APR_{500\_pie}]$	0.131	0.089	0.141	-0.035	0.315
$E[APR_{600\_pie}]$	-0.072	0.092	0.435	-0.263	0.095
$E[APR_{700\_pie}]$	0.180	0.165	0.276	-0.123	0.529
			C. Temperance		
$E[ATM_{500\_col}]$	0.862	0.225	<0.001	0.378	1.265
$E[ATM_{600\_col}]$	-0.038	0.187	0.837	-0.384	0.341
$E[ATM_{700\_col}]$	-0.548	0.238	0.021	-1.046	-0.112
$E[ATM_{500\_pie}]$	0.523	0.208	0.012	0.079	0.897
$E[ATM_{600\_pie}]$	0.159	0.159	0.315	-0.127	0.493
$E[ATM_{700\_pie}]$	-0.154	0.226	0.497	-0.637	0.256

Table A5. Absolute Measures of Risk Preferences Across Information Treatments

Parameter	Estimate	St. Error	*p*-value	95% Confidence Interval	
			A. Risk Aversion		
$E[ARA_{300\_no}]$	0.397	0.179	0.026	0.067	0.764
$E[ARA_{400\_no}]$	0.187	0.321	0.560	-0.421	0.825
$E[ARA_{500\_no}]$	0.157	0.203	0.439	-0.260	0.530
$E[ARA_{600\_no}]$	0.472	0.151	0.002	0.161	0.749
$E[ARA_{700\_no}]$	0.644	0.380	0.090	-0.346	1.107
$E[ARA_{300\_avg}]$	0.309	0.080	<0.001	0.161	0.476
$E[ARA_{400\_avg}]$	0.028	0.066	0.675	-0.124	0.137
$E[ARA_{500\_avg}]$	0.208	0.095	0.028	0.013	0.388
$E[ARA_{600\_avg}]$	0.530	0.067	<0.001	0.384	0.644
$E[ARA_{700\_avg}]$	0.235	0.351	0.504	-0.599	0.726
$E[ARA_{300\_avg\_sd}]$	0.281	0.107	0.009	0.093	0.513
$E[ARA_{400\_avg\_sd}]$	0.259	0.075	0.001	0.086	0.380
$E[ARA_{500\_avg\_sd}]$	-0.001	0.181	0.997	-0.342	0.354
$E[ARA_{600\_avg\_sd}]$	0.576	0.099	<0.001	0.360	0.751
$E[ARA_{700\_avg\_sd}]$	0.750	0.542	0.166	-0.707	1.350
			B. Prudence		
$E[APR_{400\_no}]$	0.485	0.468	0.300	-0.512	1.314
$E[APR_{500\_no}]$	0.103	0.587	0.860	-1.125	1.148
$E[APR_{600\_no}]$	-0.116	0.374	0.757	-0.913	0.541
$E[APR_{700\_no}]$	0.344	0.234	0.143	-0.100	0.814
$E[APR_{400\_avg}]$	0.506	0.105	<0.001	0.307	0.717
$E[APR_{500\_avg}]$	-0.130	0.130	0.319	-0.454	0.062
$E[APR_{600\_avg}]$	-0.093	0.183	0.613	-0.483	0.237
$E[APR_{700\_avg}]$	0.710	0.175	<0.001	0.373	1.063
$E[APR_{400\_avg\_sd}]$	0.283	0.139	0.042	0.024	0.574
$E[APR_{500\_avg\_sd}]$	0.320	0.198	0.107	-0.155	0.620
$E[APR_{600\_avg\_sd}]$	-0.423	0.345	0.220	-1.115	0.220
$E[APR_{700\_avg\_sd}]$	0.437	0.353	0.215	-0.175	1.233
			C. Temperance		
$E[ATM_{500\_no}]$	0.579	1.041	0.578	-1.363	2.690
$E[ATM_{600\_no}]$	0.182	0.971	0.851	-1.799	1.979
$E[ATM_{700\_no}]$	-0.385	0.596	0.519	-1.707	0.612

$E[ATM_{500\_avg}]$	0.775	0.179	<0.001	0.451	1.146
$E[ATM_{600\_avg}]$	-0.084	0.269	0.756	-0.707	0.358
$E[ATM_{700\_avg}]$	-0.735	0.337	0.029	-1.403	-0.097
$E[ATM_{500\_avg\_sd}]$	0.158	0.194	0.415	-0.180	0.588
$E[ATM_{600\_avg\_sd}]$	0.676	0.471	0.152	-0.350	1.493
$E[ATM_{700\_avg\_sd}]$	-0.839	0.718	0.243	-2.282	0.473

Table A6. Estimated Parameters under RDU

Parameter	Estimate	St. Error	*p*-value	95% Confidence Interval	
		Population means and standard deviations of utility			
$E[u_{200}]$	0.280	0.021	<0.001	0.235	0.318
$E[u_{300}]$	0.403	0.023	<0.001	0.353	0.444
$E[u_{400}]$	0.573	0.025	<0.001	0.520	0.619
$E[u_{500}]$	0.717	0.021	<0.001	0.671	0.755
$E[u_{600}]$	0.889	0.015	<0.001	0.857	0.915
$Med[u_{200}]$	0.243	0.019	<0.001	0.205	0.279
$Med[u_{300}]$	0.386	0.025	<0.001	0.336	0.433
$Med[u_{400}]$	0.575	0.029	<0.001	0.515	0.630
$Med[u_{500}]$	0.736	0.027	<0.001	0.681	0.785
$Med[u_{600}]$	0.931	0.017	<0.001	0.891	0.958
$SD[u_{200}]$	0.188	0.022	<0.001	0.139	0.225
$SD[u_{300}]$	0.192	0.021	<0.001	0.147	0.229
$SD[u_{400}]$	0.160	0.018	<0.001	0.122	0.192
$SD[u_{500}]$	0.150	0.016	<0.001	0.118	0.181
$SD[u_{600}]$	0.120	0.015	<0.001	0.088	0.146
		Population means and standard deviations of first differences in utility			
$E[\Delta^1 u_{200}]$	0.280	0.021	<0.001	0.235	0.318
$E[\Delta^1 u_{300}]$	0.123	0.007	<0.001	0.109	0.137
$E[\Delta^1 u_{400}]$	0.171	0.008	<0.001	0.156	0.186
$E[\Delta^1 u_{500}]$	0.144	0.009	<0.001	0.128	0.162
$E[\Delta^1 u_{600}]$	0.172	0.012	<0.001	0.152	0.198
$E[\Delta^1 u_{700}]$	0.111	0.015	<0.001	0.085	0.143
$Med[\Delta^1 u_{200}]$	0.243	0.019	<0.001	0.205	0.279
$Med[\Delta^1 u_{300}]$	0.105	0.007	<0.001	0.091	0.119
$Med[\Delta^1 u_{400}]$	0.174	0.006	<0.001	0.161	0.186
$Med[\Delta^1 u_{500}]$	0.147	0.007	<0.001	0.134	0.161
$Med[\Delta^1 u_{600}]$	0.156	0.014	<0.001	0.129	0.184
$Med[\Delta^1 u_{700}]$	0.069	0.017	<0.001	0.042	0.109
$SD[\Delta^1 u_{200}]$	0.188	0.022	<0.001	0.139	0.225
$SD[\Delta^1 u_{300}]$	0.077	0.008	<0.001	0.063	0.094
$SD[\Delta^1 u_{400}]$	0.052	0.008	<0.001	0.037	0.070
$SD[\Delta^1 u_{500}]$	0.033	0.006	<0.001	0.027	0.051
$SD[\Delta^1 u_{600}]$	0.094	0.011	<0.001	0.076	0.118
$SD[\Delta^1 u_{700}]$	0.120	0.015	<0.001	0.088	0.146

Population means and standard deviations of second differences in utility

$E[\Delta^2 u_{300}]$	-0.157	0.021	<0.001	-0.195	-0.112
$E[\Delta^2 u_{400}]$	0.048	0.009	<0.001	0.030	0.067
$E[\Delta^2 u_{500}]$	-0.027	0.012	0.025	-0.050	-0.003
$E[\Delta^2 u_{600}]$	0.028	0.013	0.024	0.005	0.055
$E[\Delta^2 u_{700}]$	-0.061	0.016	<0.001	-0.093	-0.029
$Med[\Delta^2 u_{300}]$	-0.116	0.016	<0.001	-0.147	-0.084
$Med[\Delta^2 u_{400}]$	0.060	0.009	<0.001	0.042	0.078
$Med[\Delta^2 u_{500}]$	-0.023	0.010	0.022	-0.042	-0.003
$Med[\Delta^2 u_{600}]$	0.008	0.013	0.545	-0.017	0.036
$Med[\Delta^2 u_{700}]$	-0.074	0.014	<0.001	-0.100	-0.046
$SD[\Delta^2 u_{300}]$	0.213	0.024	<0.001	0.162	0.255
$SD[\Delta^2 u_{300}]$	0.098	0.012	<0.001	0.076	0.124
$SD[\Delta^2 u_{300}]$	0.038	0.009	<0.001	0.027	0.060
$SD[\Delta^2 u_{300}]$	0.091	0.013	<0.001	0.071	0.124
$SD[\Delta^2 u_{300}]$	0.155	0.015	<0.001	0.126	0.185

Population means and standard deviations of third differences in utility

$E[\Delta^3 u_{400}]$	0.206	0.024	<0.001	0.154	0.250
$E[\Delta^3 u_{500}]$	-0.075	0.019	<0.001	-0.113	-0.038
$E[\Delta^3 u_{600}]$	0.055	0.020	0.007	0.016	0.096
$E[\Delta^3 u_{700}]$	-0.090	0.025	<0.001	-0.140	-0.045
$Med[\Delta^3 u_{400}]$	0.205	0.022	<0.001	0.163	0.248
$Med[\Delta^3 u_{500}]$	-0.078	0.019	<0.001	-0.113	-0.040
$Med[\Delta^3 u_{600}]$	0.038	0.019	0.038	0.003	0.076
$Med[\Delta^3 u_{700}]$	-0.070	0.024	0.004	-0.118	-0.024
$SD[\Delta^3 u_{400}]$	0.242	0.026	<0.001	0.189	0.291
$SD[\Delta^3 u_{500}]$	0.118	0.022	<0.001	0.081	0.166
$SD[\Delta^3 u_{600}]$	0.100	0.018	<0.001	0.076	0.147
$SD[\Delta^3 u_{700}]$	0.221	0.024	<0.001	0.182	0.275

Population means and standard deviations of fourth differences in utility

$E[\Delta^4 u_{500}]$	-0.281	0.040	<0.001	-0.355	-0.198
$E[\Delta^4 u_{600}]$	0.130	0.038	0.001	0.057	0.205
$E[\Delta^4 u_{700}]$	-0.145	0.042	0.001	-0.231	-0.065
$Med[\Delta^4 u_{500}]$	-0.325	0.041	<0.001	-0.402	-0.242
$Med[\Delta^4 u_{600}]$	0.121	0.039	0.002	0.043	0.198
$Med[\Delta^4 u_{700}]$	-0.097	0.040	0.017	-0.175	-0.017
$SD[\Delta^4 u_{500}]$	0.300	0.044	<0.001	0.217	0.388
$SD[\Delta^4 u_{600}]$	0.186	0.032	<0.001	0.139	0.264
$SD[\Delta^4 u_{700}]$	0.298	0.039	<0.001	0.239	0.392

		Population means and standard deviations of probability weighting function			
E[η]	1.558	0.082	<0.001	1.415	1.736
E[φ]	1.000	0.030	<0.001	0.946	1.061
Med[η]	1.328	0.081	<0.001	1.175	1.493
Med[φ]	0.938	0.031	<0.001	0.878	1.000
SD[η]	0.956	0.069	<0.001	0.845	1.114
SD[φ]	0.371	0.038	<0.001	0.308	0.459
		Correlation coefficients			
R[u_{200}, u_{300}]	0.918	0.025	<0.001	0.851	0.948
R[u_{200}, u_{400}]	0.884	0.030	<0.001	0.801	0.917
R[u_{200}, u_{500}]	0.846	0.033	<0.001	0.760	0.890
R[u_{200}, u_{600}]	0.724	0.035	<0.001	0.655	0.791
R[u_{300}, u_{400}]	0.974	0.009	<0.001	0.950	0.985
R[u_{300}, u_{500}]	0.925	0.021	<0.001	0.866	0.946
R[u_{300}, u_{600}]	0.706	0.059	<0.001	0.556	0.792
R[u_{400}, u_{500}]	0.979	0.016	<0.001	0.930	0.986
R[u_{400}, u_{600}]	0.739	0.073	<0.001	0.542	0.826
R[u_{500}, u_{600}]	0.781	0.074	<0.001	0.578	0.867
R[u_{200}, η]	-0.123	0.084	0.145	-0.277	0.054
R[u_{300}, η]	-0.109	0.082	0.183	-0.279	0.044
R[u_{400}, η]	-0.155	0.086	0.072	-0.336	-0.000
R[u_{500}, η]	-0.184	0.075	0.014	-0.350	-0.058
R[u_{600}, η]	0.008	0.084	0.920	-0.164	0.166
R[u_{200}, φ]	-0.201	0.090	0.026	-0.336	0.018
R[u_{300}, φ]	-0.051	0.071	0.472	-0.151	0.126
R[u_{400}, φ]	-0.095	0.068	0.158	-0.187	0.077
R[u_{500}, φ]	-0.151	0.088	0.085	-0.290	0.052
R[u_{600}, φ]	-0.095	0.089	0.286	-0.245	0.102
R[η, φ]	-0.002	0.054	0.967	-0.130	0.083

Log simulated likelihood = -12,503.916; Number of observations = 24,505

Appendix B: Instructions

Treatment 1: No information on lottery means and standard deviations

In each task in Part 1 and Part 2 you will be presented with two options labeled "Left" and "Right." We will present you with 100 of these tasks in each part. An example of your task is shown on the next page.

For each task you should choose the option you prefer.

The outcome of each option will be determined by the draw of a random number between 1 and 100. We will use two 10-sided dice to randomly select a number.
Each number is equally likely to occur.

Example

In the example the Left option pays 700 kroner if the random number is between 1 and 25; it pays 500 kroner if the number is between 26 and 50; it pays 300 kroner if the number is between 51 and 75, and it pays 100 kroner if the number is between 76 and 100.

The Right option pays 700 kroner if the random number is between 1 and 20; it pays 500 kroner if the number is between 21 and 50; it pays 300 kroner if the number is between 51 and 80, and it pays 100 kroner if the number is between 81 and 100.

Payment

You will receive payment for one of your decisions in Part 1 or Part 2. When you have made all your decisions in both parts, we will select one part for payment. We will select Part 1 or Part 2 by rolling a 10-sided die. If the number on the die is 1-5 then you will receive payment for one of your decisions in Part 1, and if the number is 6-10 then you will receive payment for one of your decisions in Part 2.

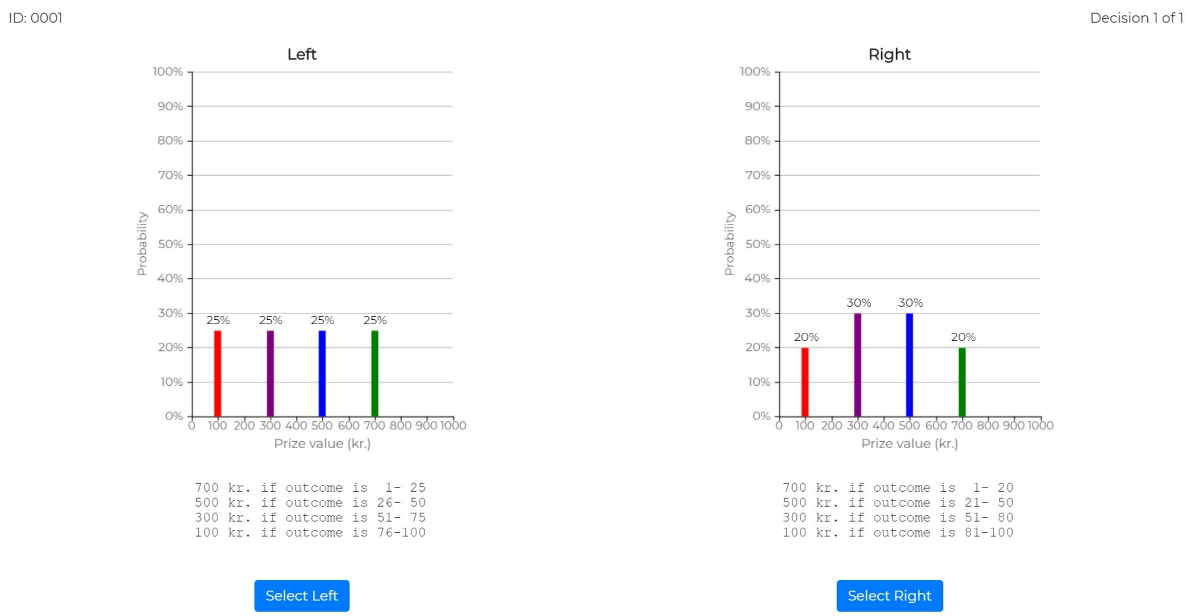
A second draw with two 10-sided dice will select one of the 100 decisions in Part 1 or 2 for payment. And a third draw with two 10-sided dice determines the payment in your choice of the Left or Right option in the selected decision.

When you make your choices you will not know which decision is selected for payment. You should therefore treat each decision as if it is actually paid out.

The money will be transferred to your personal bank account by CBS on the next payroll date, 31 December 2019.

Figure B1: Pie Charts With No Information on Lottery Means and Standard Deviations

Figure B2: Column Charts With No Information on Lottery Means and Standard Deviations



Treatment 2: Information on lottery means

In each task in Part 1 and Part 2 you will be presented with two options labeled "Left" and "Right." We will present you with 100 of these tasks in each part. An example of your task is shown on the next page.

For each task you should choose the option you prefer.

The outcome of each option will be determined by the draw of a random number between 1 and 100. We will use two 10-sided dice to randomly select a number.
Each number is equally likely to occur.

Example

In the example the Left option pays 700 kroner if the random number is between 1 and 25; it pays 500 kroner if the number is between 26 and 50; it pays 300 kroner if the number is between 51 and 75, and it pays 100 kroner if the number is between 76 and 100. The average value of the Left option is 400 kroner which is displayed above the chart.

The Right option pays 700 kroner if the random number is between 1 and 20; it pays 500 kroner if the number is between 21 and 50; it pays 300 kroner if the number is between 51 and 80, and it pays 100 kroner if the number is between 81 and 100. The average value of the Right option is 400 kroner.

Payment

You will receive payment for one of your decisions in Part 1 or Part 2. When you have made all your decisions in both parts, we will select one part for payment. We will select Part 1 or Part 2 by rolling a 10-sided die. If the number on the die is 1-5 then you will receive payment for one of your decisions in Part 1, and if the number is 6-10 then you will receive payment for one of your decisions in Part 2.

A second draw with two 10-sided dice will select one of the 100 decisions in Part 1 or 2 for payment. And a third draw with two 10-sided dice determines the payment in your choice of the Left or Right option in the selected decision.

When you make your choices you will not know which decision is selected for payment. You should therefore treat each decision as if it is actually paid out.

The money will be transferred to your personal bank account by CBS on the next payroll date, 31 December 2019.

Figure B3: Pie Charts With Information on Lottery Means

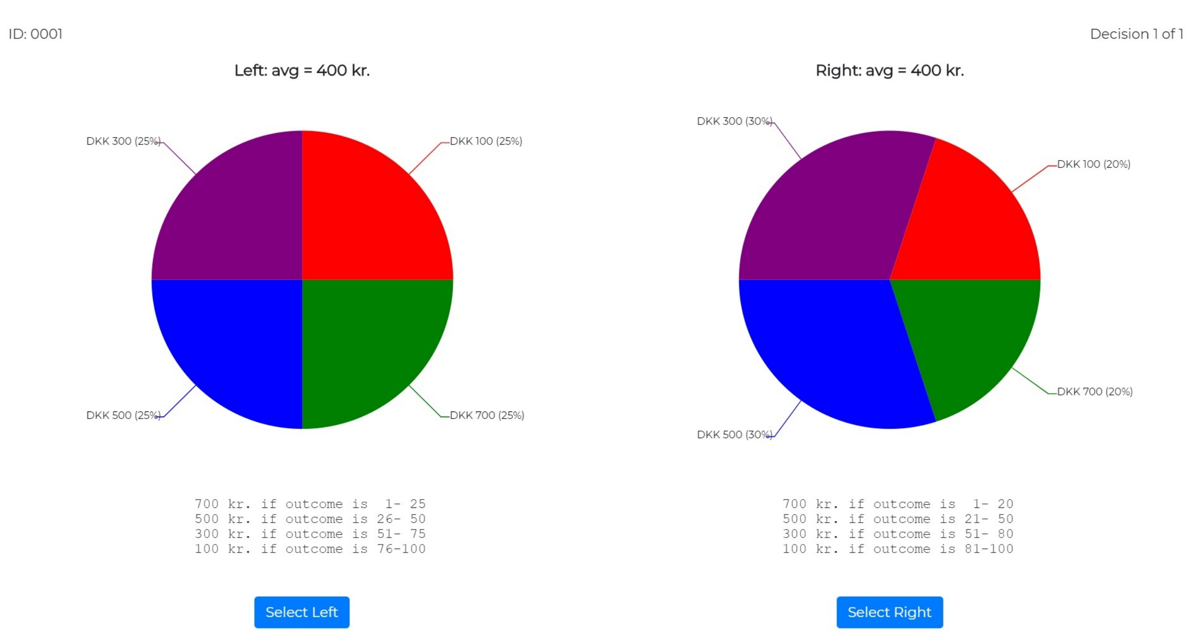
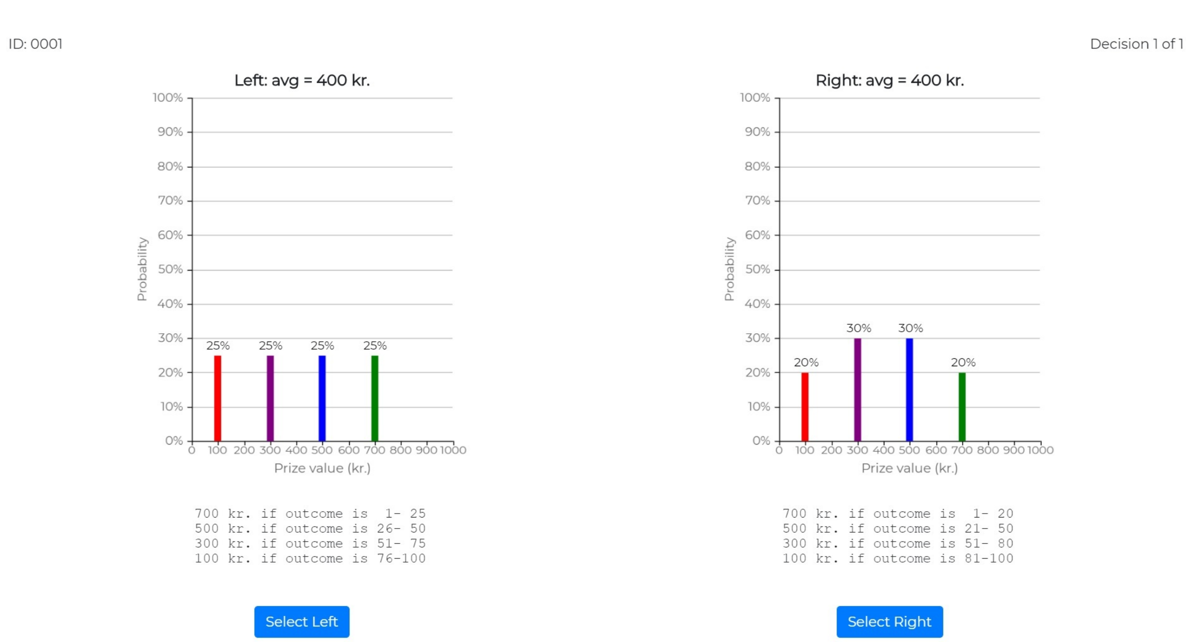


Figure B4: Column Charts With Information on Lottery Means



Treatment 3: Information on lottery means and standard deviations

In each task in Part 1 and Part 2 you will be presented with two options labeled "Left" and "Right." We will present you with 100 of these tasks in each part. An example of your task is shown on the next page.

For each task you should choose the option you prefer.

The outcome of each option will be determined by the draw of a random number between 1 and 100. We will use two 10-sided dice to randomly select a number.
Each number is equally likely to occur.

Example

In the example the Left option pays 700 kroner if the random number is between 1 and 25; it pays 500 kroner if the number is between 26 and 50; it pays 300 kroner if the number is between 51 and 75, and it pays 100 kroner if the number is between 76 and 100. The average value and standard deviation of the Left option is 400 kroner and 224 kroner, respectively, which is displayed above the chart. The standard deviation measures the dispersion of prizes relative to the average value.

The Right option pays 700 kroner if the random number is between 1 and 20; it pays 500 kroner if the number is between 21 and 50; it pays 300 kroner if the number is between 51 and 80, and it pays 100 kroner if the number is between 81 and 100. The average value and standard deviation of the Right option is 400 kroner and 205 kroner, respectively, which is displayed above the chart.

Payment

You will receive payment for one of your decisions in Part 1 or Part 2. When you have made all your decisions in both parts, we will select one part for payment. We will select Part 1 or Part 2 by rolling a 10-sided die. If the number on the die is 1-5 then you will receive payment for one of your decisions in Part 1, and if the number is 6-10 then you will receive payment for one of your decisions in Part 2.

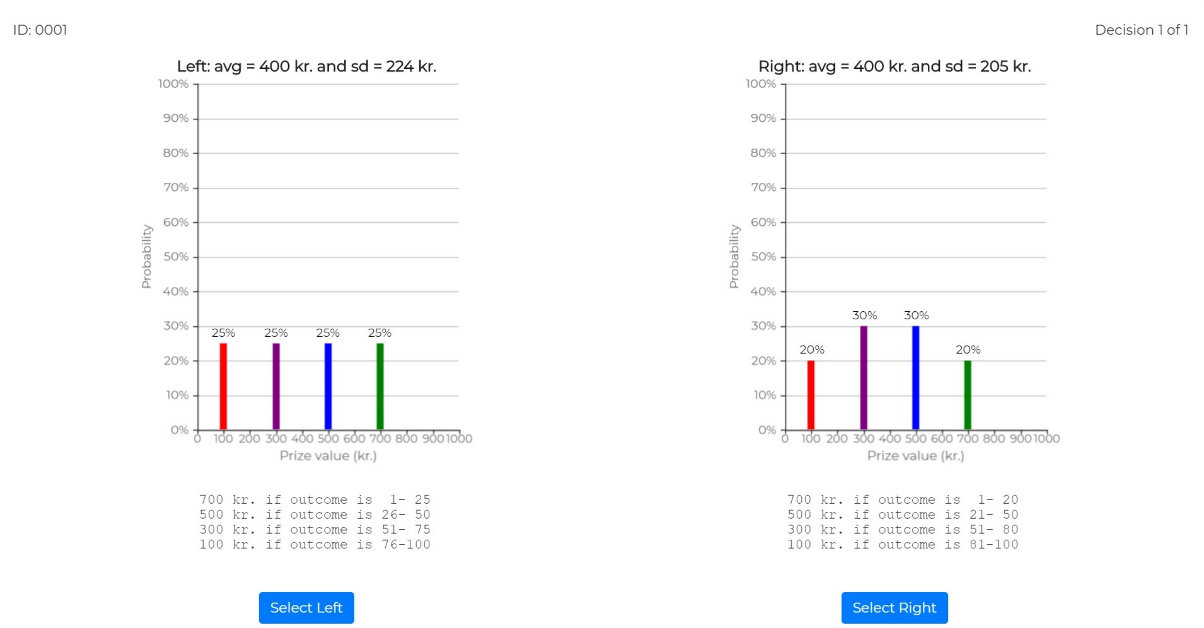
A second draw with two 10-sided dice will select one of the 100 decisions in Part 1 or 2 for payment. And a third draw with two 10-sided dice determines the payment in your choice of the Left or Right option in the selected decision.

When you make your choices you will not know which decision is selected for payment. You should therefore treat each decision as if it is actually paid out.

The money will be transferred to your personal bank account by CBS on the next payroll date, 31 December 2019.

Figure B5: Pie Charts With Information on Lottery Means and Standard Deviations

Figure B6: Column Charts With Information on Lottery Means and Standard Deviations



Appendix C: Decision Tasks

Table C1: Probability Distributions in Prudence Tasks

Prizes: Left Lottery [600, 400 and 300 kroner], Right Lottery [500, 400 and 200 kroner]

	Combinations		Left Lottery			Right Lottery		
Task	P	Q	P_{600}	P_{400}	P_{300}	P_{500}	P_{400}	P_{200}
PR1	0.10	0.10	0.01	0.09	0.90	0.10	0.09	0.81
PR2	0.10	0.20	0.02	0.08	0.90	0.10	0.18	0.72
PR3	0.10	0.30	0.03	0.07	0.90	0.10	0.27	0.63
PR4	0.10	0.40	0.04	0.06	0.90	0.10	0.36	0.54
PR5	0.10	0.50	0.05	0.05	0.90	0.10	0.45	0.45
PR6	0.10	0.60	0.06	0.04	0.90	0.10	0.54	0.36
PR7	0.10	0.70	0.07	0.03	0.90	0.10	0.63	0.27
PR8	0.10	0.80	0.08	0.02	0.90	0.10	0.72	0.18
PR9	0.10	0.90	0.09	0.01	0.90	0.10	0.81	0.09
PR10	0.20	0.10	0.02	0.18	0.80	0.20	0.08	0.72
PR11	0.20	0.20	0.04	0.16	0.80	0.20	0.16	0.64
PR12	0.20	0.30	0.06	0.14	0.80	0.20	0.24	0.56
PR13	0.20	0.40	0.08	0.12	0.80	0.20	0.32	0.48
PR14	0.20	0.50	0.10	0.10	0.80	0.20	0.40	0.40
PR15	0.20	0.60	0.12	0.08	0.80	0.20	0.48	0.32
PR16	0.20	0.70	0.14	0.06	0.80	0.20	0.56	0.24
PR17	0.20	0.80	0.16	0.04	0.80	0.20	0.64	0.16
PR18	0.20	0.90	0.18	0.02	0.80	0.20	0.72	0.08
PR19	0.30	0.10	0.03	0.27	0.70	0.30	0.07	0.63
PR20	0.30	0.20	0.06	0.24	0.70	0.30	0.14	0.56
PR21	0.30	0.30	0.09	0.21	0.70	0.30	0.21	0.49
PR22	0.30	0.40	0.12	0.18	0.70	0.30	0.28	0.42
PR23	0.30	0.50	0.15	0.15	0.70	0.30	0.35	0.35
PR24	0.30	0.60	0.18	0.12	0.70	0.30	0.42	0.28
PR25	0.30	0.70	0.21	0.09	0.70	0.30	0.49	0.21
PR26	0.30	0.80	0.24	0.06	0.70	0.30	0.56	0.14
PR27	0.30	0.90	0.27	0.03	0.70	0.30	0.63	0.07
PR28	0.40	0.10	0.04	0.36	0.60	0.40	0.06	0.54
PR29	0.40	0.20	0.08	0.32	0.60	0.40	0.12	0.48
PR30	0.40	0.30	0.12	0.28	0.60	0.40	0.18	0.42
PR31	0.40	0.40	0.16	0.24	0.60	0.40	0.24	0.36
PR32	0.40	0.50	0.20	0.20	0.60	0.40	0.30	0.30
PR33	0.40	0.60	0.24	0.16	0.60	0.40	0.36	0.24
PR34	0.40	0.70	0.28	0.12	0.60	0.40	0.42	0.18
PR35	0.40	0.80	0.32	0.08	0.60	0.40	0.48	0.12
PR36	0.40	0.90	0.36	0.04	0.60	0.40	0.54	0.06
PR37	0.50	0.10	0.05	0.45	0.50	0.50	0.05	0.45

PR38	0.50	0.20	0.10	0.40	0.50	0.50	0.10	0.40
PR39	0.50	0.30	0.15	0.35	0.50	0.50	0.15	0.35
PR40	0.50	0.40	0.20	0.30	0.50	0.50	0.20	0.30
PR41	0.50	0.50	0.25	0.25	0.50	0.50	0.25	0.25
PR42	0.50	0.60	0.30	0.20	0.50	0.50	0.30	0.20
PR43	0.50	0.70	0.35	0.15	0.50	0.50	0.35	0.15
PR44	0.50	0.80	0.40	0.10	0.50	0.50	0.40	0.10
PR45	0.50	0.90	0.45	0.05	0.50	0.50	0.45	0.05
PR46	0.60	0.10	0.06	0.54	0.40	0.60	0.04	0.36
PR47	0.60	0.20	0.12	0.48	0.40	0.60	0.08	0.32
PR48	0.60	0.30	0.18	0.42	0.40	0.60	0.12	0.28
PR49	0.60	0.40	0.24	0.36	0.40	0.60	0.16	0.24
PR50	0.60	0.50	0.30	0.30	0.40	0.60	0.20	0.20
PR51	0.60	0.60	0.36	0.24	0.40	0.60	0.24	0.16
PR52	0.60	0.70	0.42	0.18	0.40	0.60	0.28	0.12
PR53	0.60	0.80	0.48	0.12	0.40	0.60	0.32	0.08
PR54	0.60	0.90	0.54	0.06	0.40	0.60	0.36	0.04
PR55	0.70	0.10	0.07	0.63	0.30	0.70	0.03	0.27
PR56	0.70	0.20	0.14	0.56	0.30	0.70	0.06	0.24
PR57	0.70	0.30	0.21	0.49	0.30	0.70	0.09	0.21
PR58	0.70	0.40	0.28	0.42	0.30	0.70	0.12	0.18
PR59	0.70	0.50	0.35	0.35	0.30	0.70	0.15	0.15
PR60	0.70	0.60	0.42	0.28	0.30	0.70	0.18	0.12
PR61	0.70	0.70	0.49	0.21	0.30	0.70	0.21	0.09
PR62	0.70	0.80	0.56	0.14	0.30	0.70	0.24	0.06
PR63	0.70	0.90	0.63	0.07	0.30	0.70	0.27	0.03
PR64	0.80	0.10	0.08	0.72	0.20	0.80	0.02	0.18
PR65	0.80	0.20	0.16	0.64	0.20	0.80	0.04	0.16
PR66	0.80	0.30	0.24	0.56	0.20	0.80	0.06	0.14
PR67	0.80	0.40	0.32	0.48	0.20	0.80	0.08	0.12
PR68	0.80	0.50	0.40	0.40	0.20	0.80	0.10	0.10
PR69	0.80	0.60	0.48	0.32	0.20	0.80	0.12	0.08
PR70	0.80	0.70	0.56	0.24	0.20	0.80	0.14	0.06
PR71	0.80	0.80	0.64	0.16	0.20	0.80	0.16	0.04
PR72	0.80	0.90	0.72	0.08	0.20	0.80	0.18	0.02
PR73	0.90	0.10	0.09	0.81	0.10	0.90	0.01	0.09
PR74	0.90	0.20	0.18	0.72	0.10	0.90	0.02	0.08
PR75	0.90	0.30	0.27	0.63	0.10	0.90	0.03	0.07
PR76	0.90	0.40	0.36	0.54	0.10	0.90	0.04	0.06
PR77	0.90	0.50	0.45	0.45	0.10	0.90	0.05	0.05
PR78	0.90	0.60	0.54	0.36	0.10	0.90	0.06	0.04
PR79	0.90	0.70	0.63	0.27	0.10	0.90	0.07	0.03
PR80	0.90	0.80	0.72	0.18	0.10	0.90	0.08	0.02
PR81	0.90	0.90	0.81	0.09	0.10	0.90	0.09	0.01

Table C2: Moments of Prudence Tasks

	Mean			Standard deviation			Skewness			Excess kurtosis		
Task	Left	Right	Diff	Left	Right	Diff	Left	Right	Diff	Left	Right	Diff
PR1	312	248	**64**	40.69	101.47	**-60.78**	4.43	1.75	**2.68**	24.06	1.30	**22.76**
PR2	314	266	**48**	49.03	108.83	**-59.80**	4.38	1.17	**3.21**	20.92	-0.35	**21.27**
PR3	316	284	**32**	56.07	112.89	**-56.82**	4.11	0.73	**3.38**	17.10	-1.17	**18.27**
PR4	318	302	**16**	62.26	114.00	**-51.74**	3.83	0.37	**3.47**	14.02	-1.55	**15.57**
PR5	320	320	0	67.82	112.25	**-44.43**	3.58	0.03	**3.55**	11.63	-1.63	**13.26**
PR6	322	338	**-16**	72.91	107.50	**-34.59**	3.35	-0.32	**3.67**	9.74	-1.45	**11.19**
PR7	324	356	**-32**	77.61	99.32	**-21.70**	3.15	-0.69	**3.84**	8.23	-0.89	**9.12**
PR8	326	374	**-48**	82.00	86.74	**-4.74**	2.97	-1.13	**4.10**	7.00	0.37	**6.63**
PR9	328	392	**-64**	86.12	67.35	**18.77**	2.81	-1.67	**4.48**	5.97	3.61	**2.37**
PR10	324	276	48	54.99	124.19	**-69.20**	2.94	1.09	**1.85**	10.38	-0.70	**11.08**
PR11	328	292	36	66.45	126.24	**-59.78**	2.89	0.75	**2.14**	8.47	-1.26	**9.73**
PR12	332	308	24	76.00	126.24	**-50.24**	2.67	0.45	**2.23**	6.39	-1.56	**7.95**
PR13	336	324	12	84.29	124.19	**-39.91**	2.45	0.16	**2.28**	4.77	-1.67	**6.44**
PR14	340	340	0	91.65	120.00	**-28.35**	2.24	-0.11	**2.36**	3.52	-1.60	**5.13**
PR15	344	356	**-12**	98.31	113.42	**-15.11**	2.06	-0.40	**2.46**	2.56	-1.32	**3.88**
PR16	348	372	**-24**	104.38	104.00	**0.38**	1.90	-0.70	**2.60**	1.80	-0.74	**2.54**
PR17	352	388	**-36**	109.98	90.86	**19.12**	1.75	-1.04	**2.79**	1.18	0.39	**0.78**
PR18	356	404	**-48**	115.17	72.00	**43.17**	1.62	-1.35	**2.97**	0.67	2.79	**-2.12**
PR19	336	304	**32**	64.06	137.78	**-73.72**	2.24	0.62	**1.63**	5.99	-1.55	**7.54**
PR20	342	318	**24**	77.69	136.66	**-58.97**	2.19	0.38	**1.81**	4.43	-1.73	**6.16**
PR21	348	332	**16**	88.86	134.07	**-45.22**	1.98	0.15	**1.83**	2.91	-1.79	**4.69**
PR22	354	346	**8**	98.41	129.94	**-31.53**	1.78	-0.08	**1.85**	1.76	-1.73	**3.49**
PR23	360	360	0	106.77	124.10	**-17.33**	1.59	-0.31	**1.89**	0.90	-1.54	**2.45**
PR24	366	374	**-8**	114.21	116.29	**-2.08**	1.42	-0.55	**1.97**	0.25	-1.18	**1.43**
PR25	372	388	**-16**	120.90	106.09	**14.80**	1.26	-0.81	**2.08**	-0.26	-0.56	**0.30**
PR26	378	402	**-24**	126.95	92.71	**34.23**	1.12	-1.09	**2.22**	-0.66	0.53	**-1.18**
PR27	384	416	**-36**	132.45	74.46	**58.00**	0.99	-1.28	**2.28**	-0.98	2.44	**-3.42**
PR28	348	332	**16**	69.97	144.83	**-74.86**	1.82	0.22	**1.60**	3.97	-1.90	**5.87**
PR29	356	344	**12**	85.23	141.65	**-56.42**	1.75	0.04	**1.71**	2.51	-1.90	**4.40**
PR30	364	356	**8**	97.49	137.35	**-39.86**	1.55	-0.15	**1.70**	1.24	-1.82	**3.05**
PR31	372	368	**4**	107.78	131.82	**-24.02**	1.34	-0.34	**1.68**	0.33	-1.65	**1.97**
PR32	380	380	0	116.62	124.90	**-8.28**	1.15	-0.54	**1.69**	-0.33	-1.36	**1.03**
PR33	388	392	**-4**	124.32	116.34	**7.98**	0.98	-0.76	**1.74**	-0.82	-0.92	**0.10**
PR34	396	404	**-8**	131.09	105.75	**25.33**	0.82	-0.99	**1.81**	-1.19	-0.24	**-0.95**
PR35	404	416	**-12**	137.05	92.43	**44.62**	0.67	-1.23	**1.91**	-1.46	0.85	**-2.31**
PR36	412	428	**-16**	142.32	74.94	**67.38**	0.54	-1.36	**1.90**	-1.67	2.49	**-4.17**
PR37	360	360	0	73.48	146.29	**-72.80**	1.54	-0.15	**1.69**	2.95	-1.94	**4.89**
PR38	370	370	0	90.00	141.77	**-51.77**	1.45	-0.30	**1.75**	1.45	-1.82	**3.27**
PR39	380	380	0	102.96	136.38	**-33.43**	1.23	-0.46	**1.70**	0.31	-1.64	**1.95**
PR40	390	390	0	113.58	130.00	**-16.42**	1.02	-0.63	**1.65**	-0.47	-1.37	**0.91**

PR41	400	400	0	122.47	122.47	0.00	0.82	-0.82	**1.63**	-1.00	-1.00	0.00
PR42	410	410	0	130.00	113.58	**16.42**	0.63	-1.02	**1.65**	-1.37	-0.47	**-0.91**
PR43	420	420	0	136.38	102.96	**33.43**	0.46	-1.23	**1.70**	-1.64	0.31	**-1.95**
PR44	430	430	0	141.77	90.00	**51.77**	0.30	-1.45	**1.75**	-1.82	1.45	**-3.27**
PR45	440	440	0	146.29	73.48	**72.80**	0.15	-1.54	**1.69**	-1.94	2.95	**-4.89**
PR46	372	388	**-16**	74.94	142.32	**-67.38**	1.36	-0.54	**1.90**	2.49	-1.67	**4.17**
PR47	384	396	**-12**	92.43	137.05	**-44.62**	1.23	-0.67	**1.91**	0.85	-1.46	**2.31**
PR48	396	404	**-8**	105.75	131.09	**-25.33**	0.99	-0.82	**1.81**	-0.24	-1.19	**0.95**
PR49	408	412	**-4**	116.34	124.32	**-7.98**	0.76	-0.98	**1.74**	-0.92	-0.82	**-0.10**
PR50	420	420	0	124.90	116.62	**8.28**	0.54	-1.15	**1.69**	-1.36	-0.33	**-1.03**
PR51	432	428	**4**	131.82	107.78	**24.04**	0.34	-1.34	**1.68**	-1.65	0.33	**-1.97**
PR52	444	436	**8**	137.35	97.49	**39.86**	0.15	-1.55	**1.70**	-1.82	1.24	**-3.05**
PR53	456	444	**12**	141.65	85.23	**56.42**	-0.04	-1.75	**1.71**	-1.90	2.51	**-4.40**
PR54	468	452	**16**	144.83	69.97	**74.86**	-0.22	-1.82	**1.60**	-1.90	3.97	**-5.87**
PR55	384	416	**-32**	74.46	132.45	**-58.00**	1.28	-0.99	**2.28**	2.44	-0.98	**3.42**
PR56	398	422	**-24**	92.71	126.95	**-34.23**	1.09	-1.12	**2.22**	0.53	-0.66	**1.18**
PR57	412	428	**-16**	106.09	120.90	**-14.80**	0.81	-1.26	**2.08**	-0.56	-0.26	**-0.30**
PR58	426	434	**-8**	116.29	114.21	**2.08**	0.55	-1.42	**1.97**	-1.18	0.25	**-1.43**
PR59	440	440	0	124.10	106.77	**17.33**	0.31	-1.59	**1.89**	-1.54	0.90	**-2.45**
PR60	454	446	**8**	129.94	98.41	**31.53**	0.08	-1.78	**1.85**	-1.73	1.76	**-3.49**
PR61	468	452	**16**	134.07	88.86	**45.22**	-0.15	-1.98	**1.83**	-1.79	2.91	**-4.69**
PR62	482	458	**24**	136.66	77.69	**58.97**	-0.38	-2.19	**1.81**	-1.73	4.43	**-6.16**
PR63	496	464	**36**	137.78	64.06	**73.72**	-0.62	-2.24	**1.63**	-1.55	5.99	**-7.54**
PR64	396	444	**-48**	72.00	115.17	**-43.17**	1.35	-1.62	**2.97**	2.79	0.67	**2.12**
PR65	412	448	**-36**	90.86	109.98	**-19.12**	1.04	-1.75	**2.79**	0.39	1.18	**-0.78**
PR66	428	452	**-24**	104.00	104.38	**-0.38**	0.70	-1.90	**2.60**	-0.74	1.80	**-2.54**
PR67	444	456	**-12**	113.42	98.31	**15.11**	0.40	-2.06	**2.46**	-1.32	2.56	**-3.88**
PR68	460	460	0	120.00	91.65	**28.35**	0.11	-2.24	**2.36**	-1.60	3.52	**-5.13**
PR69	476	464	**12**	124.19	84.29	**39.91**	-0.16	-2.45	**2.28**	-1.67	4.77	**-6.44**
PR70	492	468	**24**	126.24	76.00	**50.24**	-0.45	-2.67	**2.23**	-1.56	6.39	**-7.95**
PR71	508	472	**36**	126.24	66.45	**59.78**	-0.75	-2.89	**2.14**	-1.26	8.47	**-9.73**
PR72	524	476	**48**	124.19	54.99	**69.20**	-1.09	-2.94	**1.85**	-0.70	10.38	**-11.08**
PR73	408	472	**-64**	67.35	86.12	**-18.77**	1.67	-2.81	**4.48**	3.61	5.97	**-2.37**
PR74	426	474	**-48**	86.74	82.00	**4.74**	1.13	-2.97	**4.10**	0.37	7.00	**-6.63**
PR75	444	476	**-32**	99.32	77.61	**21.70**	0.69	-3.15	**3.84**	-0.89	8.23	**-9.12**
PR76	462	478	**-16**	107.50	72.91	**34.59**	0.32	-3.35	**3.67**	-1.45	9.74	**-11.19**
PR77	480	480	0	112.25	67.82	**44.43**	-0.03	-3.58	**3.55**	-1.63	11.63	**-13.26**
PR78	498	482	**16**	114.00	62.26	**51.74**	-0.37	-3.83	**3.47**	-1.55	14.02	**-15.57**
PR79	516	484	**32**	112.89	56.07	**56.82**	-0.73	-4.11	**3.38**	-1.17	17.10	**-18.27**
PR80	534	486	**48**	108.83	49.03	**59.80**	-1.17	-4.38	**3.21**	-0.35	20.92	**-21.27**
PR81	552	488	**64**	101.47	40.69	**60.78**	-1.75	-4.43	**2.68**	1.30	24.06	**-22.76**

Table C3: Probability Distributions in Temperance Tasks

Prizes: Left Lottery [600, 500, 300 and 200 kroner], Right Lottery [700, 500, 400, 300 and 100 kr]

	Combinations			Left Lottery				Right Lottery				
Task	P	Q	Z	P_{600}	P_{500}	P_{300}	P_{200}	P_{700}	P_{500}	P_{400}	P_{300}	P_{100}
TP1	0.1	0.2	0.5	0.02	0.45	0.45	0.08	0.09	0.09	0.10	0.36	0.36
TP2	0.1	0.4	0.5	0.04	0.45	0.45	0.06	0.18	0.18	0.10	0.27	0.27
TP3	0.1	0.5	0.2	0.05	0.18	0.72	0.05	0.09	0.36	0.10	0.09	0.36
TP4	0.1	0.5	0.4	0.05	0.36	0.54	0.05	0.18	0.27	0.10	0.18	0.27
TP5	0.1	0.5	0.6	0.05	0.54	0.36	0.05	0.27	0.18	0.10	0.27	0.18
TP6	0.1	0.5	0.8	0.05	0.72	0.18	0.05	0.36	0.09	0.10	0.36	0.09
TP7	0.1	0.6	0.5	0.06	0.45	0.45	0.04	0.27	0.27	0.10	0.18	0.18
TP8	0.1	0.8	0.5	0.08	0.45	0.45	0.02	0.36	0.36	0.10	0.09	0.09
TP9	0.2	0.1	0.5	0.02	0.40	0.40	0.18	0.04	0.04	0.20	0.36	0.36
TP10	0.2	0.2	0.5	0.04	0.40	0.40	0.16	0.08	0.08	0.20	0.32	0.32
TP11	0.2	0.3	0.5	0.06	0.40	0.40	0.14	0.12	0.12	0.20	0.28	0.28
TP12	0.2	0.4	0.5	0.08	0.40	0.40	0.12	0.16	0.16	0.20	0.24	0.24
TP13	0.2	0.5	0.1	0.10	0.08	0.72	0.10	0.04	0.36	0.20	0.04	0.36
TP14	0.2	0.5	0.2	0.10	0.16	0.64	0.10	0.08	0.32	0.20	0.08	0.32
TP15	0.2	0.5	0.3	0.10	0.24	0.56	0.10	0.12	0.28	0.20	0.12	0.28
TP16	0.2	0.5	0.4	0.10	0.32	0.48	0.10	0.16	0.24	0.20	0.16	0.24
TP17	0.2	0.5	0.5	0.10	0.40	0.40	0.10	0.20	0.20	0.20	0.20	0.20
TP18	0.2	0.5	0.6	0.10	0.48	0.32	0.10	0.24	0.16	0.20	0.24	0.16
TP19	0.2	0.5	0.7	0.10	0.56	0.24	0.10	0.28	0.12	0.20	0.28	0.12
TP20	0.2	0.5	0.8	0.10	0.64	0.16	0.10	0.32	0.08	0.20	0.32	0.08
TP21	0.2	0.5	0.9	0.10	0.72	0.08	0.10	0.36	0.04	0.20	0.36	0.04
TP22	0.2	0.6	0.5	0.12	0.40	0.40	0.08	0.24	0.24	0.20	0.16	0.16
TP23	0.2	0.7	0.5	0.14	0.40	0.40	0.06	0.28	0.28	0.20	0.12	0.12
TP24	0.2	0.8	0.5	0.16	0.40	0.40	0.04	0.32	0.32	0.20	0.08	0.08
TP25	0.2	0.9	0.5	0.18	0.40	0.40	0.02	0.36	0.36	0.20	0.04	0.04
TP26	0.3	0.2	0.5	0.06	0.35	0.35	0.24	0.07	0.07	0.30	0.28	0.28
TP27	0.3	0.4	0.5	0.12	0.35	0.35	0.18	0.14	0.14	0.30	0.21	0.21
TP28	0.3	0.5	0.2	0.15	0.14	0.56	0.15	0.07	0.28	0.30	0.07	0.28
TP29	0.3	0.5	0.4	0.15	0.28	0.42	0.15	0.14	0.21	0.30	0.14	0.21
TP30	0.3	0.5	0.6	0.15	0.42	0.28	0.15	0.21	0.14	0.30	0.21	0.14
TP31	0.3	0.5	0.8	0.15	0.56	0.14	0.15	0.28	0.07	0.30	0.28	0.07
TP32	0.3	0.6	0.5	0.18	0.35	0.35	0.12	0.21	0.21	0.30	0.14	0.14
TP33	0.3	0.8	0.5	0.24	0.35	0.35	0.06	0.28	0.28	0.30	0.07	0.07
TP34	0.4	0.1	0.5	0.04	0.30	0.30	0.36	0.03	0.03	0.40	0.27	0.27
TP35	0.4	0.2	0.5	0.08	0.30	0.30	0.32	0.06	0.06	0.40	0.24	0.24
TP36	0.4	0.3	0.5	0.12	0.30	0.30	0.28	0.09	0.09	0.40	0.21	0.21
TP37	0.4	0.4	0.5	0.16	0.30	0.30	0.24	0.12	0.12	0.40	0.18	0.18
TP38	0.4	0.5	0.1	0.20	0.06	0.54	0.20	0.03	0.27	0.40	0.03	0.27
TP39	0.4	0.5	0.2	0.20	0.12	0.48	0.20	0.06	0.24	0.40	0.06	0.24

TP40	0.4	0.5	0.3	0.20	0.18	0.42	0.20	0.09	0.21	0.40	0.09	0.21
TP41	0.4	0.5	0.4	0.20	0.24	0.36	0.20	0.12	0.18	0.40	0.12	0.18
TP42	0.4	0.5	0.5	0.20	0.30	0.30	0.20	0.15	0.15	0.40	0.15	0.15
TP43	0.4	0.5	0.6	0.20	0.36	0.24	0.20	0.18	0.12	0.40	0.18	0.12
TP44	0.4	0.5	0.7	0.20	0.42	0.18	0.20	0.21	0.09	0.40	0.21	0.09
TP45	0.4	0.5	0.8	0.20	0.48	0.12	0.20	0.24	0.06	0.40	0.24	0.06
TP46	0.4	0.5	0.9	0.20	0.54	0.06	0.20	0.27	0.03	0.40	0.27	0.03
TP47	0.4	0.6	0.5	0.24	0.30	0.30	0.16	0.18	0.18	0.40	0.12	0.12
TP48	0.4	0.7	0.5	0.28	0.30	0.30	0.12	0.21	0.21	0.40	0.09	0.09
TP49	0.4	0.8	0.5	0.32	0.30	0.30	0.08	0.24	0.24	0.40	0.06	0.06
TP50	0.4	0.9	0.5	0.36	0.30	0.30	0.04	0.27	0.27	0.40	0.03	0.03
TP51	0.5	0.1	0.2	0.05	0.10	0.40	0.45	0.01	0.04	0.50	0.09	0.36
TP52	0.5	0.1	0.4	0.05	0.20	0.30	0.45	0.02	0.03	0.50	0.18	0.27
TP53	0.5	0.1	0.5	0.05	0.30	0.20	0.45	0.03	0.02	0.50	0.27	0.18
TP54	0.5	0.1	0.6	0.05	0.40	0.10	0.45	0.04	0.01	0.50	0.36	0.09
TP55	0.5	0.2	0.1	0.10	0.05	0.45	0.40	0.01	0.09	0.50	0.04	0.36
TP56	0.5	0.2	0.2	0.10	0.10	0.40	0.40	0.02	0.08	0.50	0.08	0.32
TP57	0.5	0.2	0.3	0.10	0.15	0.35	0.40	0.03	0.07	0.50	0.12	0.28
TP58	0.5	0.2	0.4	0.10	0.20	0.30	0.40	0.04	0.06	0.50	0.16	0.24
TP59	0.5	0.2	0.5	0.10	0.25	0.25	0.40	0.05	0.05	0.50	0.20	0.20
TP60	0.5	0.2	0.6	0.10	0.30	0.20	0.40	0.06	0.04	0.50	0.24	0.16
TP61	0.5	0.2	0.7	0.10	0.35	0.15	0.40	0.07	0.03	0.50	0.28	0.12
TP62	0.5	0.2	0.8	0.10	0.40	0.10	0.40	0.08	0.02	0.50	0.32	0.08
TP63	0.5	0.2	0.9	0.10	0.45	0.05	0.40	0.09	0.01	0.50	0.36	0.04
TP64	0.5	0.3	0.2	0.15	0.10	0.40	0.35	0.03	0.12	0.50	0.07	0.28
TP65	0.5	0.3	0.4	0.15	0.20	0.30	0.35	0.06	0.09	0.50	0.14	0.21
TP66	0.5	0.3	0.6	0.15	0.30	0.20	0.35	0.09	0.06	0.50	0.21	0.14
TP67	0.5	0.3	0.8	0.15	0.40	0.10	0.35	0.12	0.03	0.50	0.28	0.07
TP68	0.5	0.4	0.1	0.20	0.05	0.45	0.30	0.02	0.18	0.50	0.03	0.27
TP69	0.5	0.4	0.2	0.20	0.10	0.40	0.30	0.04	0.16	0.50	0.06	0.24
TP70	0.5	0.4	0.3	0.20	0.15	0.35	0.30	0.06	0.14	0.50	0.09	0.21
TP71	0.5	0.4	0.4	0.20	0.20	0.30	0.30	0.08	0.12	0.50	0.12	0.18
TP72	0.5	0.4	0.5	0.20	0.25	0.25	0.30	0.10	0.10	0.50	0.15	0.15
TP73	0.5	0.4	0.6	0.20	0.30	0.20	0.30	0.12	0.08	0.50	0.18	0.12
TP74	0.5	0.4	0.7	0.20	0.35	0.15	0.30	0.14	0.06	0.50	0.21	0.09
TP75	0.5	0.4	0.8	0.20	0.40	0.10	0.30	0.16	0.04	0.50	0.24	0.06
TP76	0.5	0.4	0.9	0.20	0.45	0.05	0.30	0.18	0.02	0.50	0.27	0.03
TP77	0.5	0.5	0.2	0.25	0.10	0.40	0.25	0.05	0.20	0.50	0.05	0.20
TP78	0.5	0.5	0.4	0.25	0.20	0.30	0.25	0.10	0.15	0.50	0.10	0.15
TP79	0.5	0.5	0.6	0.25	0.30	0.20	0.25	0.15	0.10	0.50	0.15	0.10
TP80	0.5	0.5	0.8	0.25	0.40	0.10	0.25	0.20	0.05	0.50	0.20	0.05
TP81	0.5	0.6	0.1	0.30	0.05	0.45	0.20	0.03	0.27	0.50	0.02	0.18
TP82	0.5	0.6	0.2	0.30	0.10	0.40	0.20	0.06	0.24	0.50	0.04	0.16
TP83	0.5	0.6	0.3	0.30	0.15	0.35	0.20	0.09	0.21	0.50	0.06	0.14
TP84	0.5	0.6	0.4	0.30	0.20	0.30	0.20	0.12	0.18	0.50	0.08	0.12

TP85	0.5	0.6	0.5	0.30	0.25	0.25	0.20	0.15	0.15	0.50	0.10	0.10
TP86	0.5	0.6	0.6	0.30	0.30	0.20	0.20	0.18	0.12	0.50	0.12	0.08
TP87	0.5	0.6	0.7	0.30	0.35	0.15	0.20	0.21	0.09	0.50	0.14	0.06
TP88	0.5	0.6	0.8	0.30	0.40	0.10	0.20	0.24	0.06	0.50	0.16	0.04
TP89	0.5	0.6	0.9	0.30	0.45	0.05	0.20	0.27	0.03	0.50	0.18	0.02
TP90	0.5	0.7	0.2	0.35	0.10	0.40	0.15	0.07	0.28	0.50	0.03	0.12
TP91	0.5	0.7	0.4	0.35	0.20	0.30	0.15	0.14	0.21	0.50	0.06	0.09
TP92	0.5	0.7	0.6	0.35	0.30	0.20	0.15	0.21	0.14	0.50	0.09	0.06
TP93	0.5	0.7	0.8	0.35	0.40	0.10	0.15	0.28	0.07	0.50	0.12	0.03
TP94	0.5	0.8	0.1	0.40	0.05	0.45	0.10	0.04	0.36	0.50	0.01	0.09
TP95	0.5	0.8	0.2	0.40	0.10	0.40	0.10	0.08	0.32	0.50	0.02	0.08
TP96	0.5	0.8	0.3	0.40	0.15	0.35	0.10	0.12	0.28	0.50	0.03	0.07
TP97	0.5	0.8	0.4	0.40	0.20	0.30	0.10	0.16	0.24	0.50	0.04	0.06
TP98	0.5	0.8	0.5	0.40	0.25	0.25	0.10	0.20	0.20	0.50	0.05	0.05
TP99	0.5	0.8	0.6	0.40	0.30	0.20	0.10	0.24	0.16	0.50	0.06	0.04
TP100	0.5	0.8	0.7	0.40	0.35	0.15	0.10	0.28	0.12	0.50	0.07	0.03
TP101	0.5	0.8	0.8	0.40	0.40	0.10	0.10	0.32	0.08	0.50	0.08	0.02
TP102	0.5	0.8	0.9	0.40	0.45	0.05	0.10	0.36	0.04	0.50	0.09	0.01
TP103	0.5	0.9	0.2	0.45	0.10	0.40	0.05	0.09	0.36	0.50	0.01	0.04
TP104	0.5	0.9	0.4	0.45	0.20	0.30	0.05	0.18	0.27	0.50	0.02	0.03
TP105	0.5	0.9	0.6	0.45	0.30	0.20	0.05	0.27	0.18	0.50	0.03	0.02
TP106	0.5	0.9	0.8	0.45	0.40	0.10	0.05	0.36	0.09	0.50	0.04	0.01
TP107	0.6	0.1	0.5	0.06	0.20	0.20	0.54	0.02	0.02	0.60	0.18	0.18
TP108	0.6	0.2	0.5	0.12	0.20	0.20	0.48	0.04	0.04	0.60	0.16	0.16
TP109	0.6	0.3	0.5	0.18	0.20	0.20	0.42	0.06	0.06	0.60	0.14	0.14
TP110	0.6	0.4	0.5	0.24	0.20	0.20	0.36	0.08	0.08	0.60	0.12	0.12
TP111	0.6	0.5	0.1	0.30	0.04	0.36	0.30	0.02	0.18	0.60	0.02	0.18
TP112	0.6	0.5	0.2	0.30	0.08	0.32	0.30	0.04	0.16	0.60	0.04	0.16
TP113	0.6	0.5	0.3	0.30	0.12	0.28	0.30	0.06	0.14	0.60	0.06	0.14
TP114	0.6	0.5	0.4	0.30	0.16	0.24	0.30	0.08	0.12	0.60	0.08	0.12
TP115	0.6	0.5	0.5	0.30	0.20	0.20	0.30	0.10	0.10	0.60	0.10	0.10
TP116	0.6	0.5	0.6	0.30	0.24	0.16	0.30	0.12	0.08	0.60	0.12	0.08
TP117	0.6	0.5	0.7	0.30	0.28	0.12	0.30	0.14	0.06	0.60	0.14	0.06
TP118	0.6	0.5	0.8	0.30	0.32	0.08	0.30	0.16	0.04	0.60	0.16	0.04
TP119	0.6	0.5	0.9	0.30	0.36	0.04	0.30	0.18	0.02	0.60	0.18	0.02
TP120	0.6	0.6	0.5	0.36	0.20	0.20	0.24	0.12	0.12	0.60	0.08	0.08
TP121	0.6	0.7	0.5	0.42	0.20	0.20	0.18	0.14	0.14	0.60	0.06	0.06
TP122	0.6	0.8	0.5	0.48	0.20	0.20	0.12	0.16	0.16	0.60	0.04	0.04
TP123	0.6	0.9	0.5	0.54	0.20	0.20	0.06	0.18	0.18	0.60	0.02	0.02
TP124	0.7	0.2	0.5	0.14	0.15	0.15	0.56	0.03	0.03	0.70	0.12	0.12
TP125	0.7	0.4	0.5	0.28	0.15	0.15	0.42	0.06	0.06	0.70	0.09	0.09
TP126	0.7	0.5	0.2	0.35	0.06	0.24	0.35	0.03	0.12	0.70	0.03	0.12
TP127	0.7	0.5	0.4	0.35	0.12	0.18	0.35	0.06	0.09	0.70	0.06	0.09
TP128	0.7	0.5	0.6	0.35	0.18	0.12	0.35	0.09	0.06	0.70	0.09	0.06
TP129	0.7	0.5	0.8	0.35	0.24	0.06	0.35	0.12	0.03	0.70	0.12	0.03

TP130	0.7	0.6	0.5	0.42	0.15	0.15	0.28	0.09	0.09	0.70	0.06	0.06
TP131	0.7	0.8	0.5	0.56	0.15	0.15	0.14	0.12	0.12	0.70	0.03	0.03
TP132	0.8	0.1	0.5	0.08	0.10	0.10	0.72	0.01	0.01	0.80	0.09	0.09
TP133	0.8	0.2	0.5	0.16	0.10	0.10	0.64	0.02	0.02	0.80	0.08	0.08
TP134	0.8	0.3	0.5	0.24	0.10	0.10	0.56	0.03	0.03	0.80	0.07	0.07
TP135	0.8	0.4	0.5	0.32	0.10	0.10	0.48	0.04	0.04	0.80	0.06	0.06
TP136	0.8	0.5	0.1	0.40	0.02	0.18	0.40	0.01	0.09	0.80	0.01	0.09
TP137	0.8	0.5	0.2	0.40	0.04	0.16	0.40	0.02	0.08	0.80	0.02	0.08
TP138	0.8	0.5	0.3	0.40	0.06	0.14	0.40	0.03	0.07	0.80	0.03	0.07
TP139	0.8	0.5	0.4	0.40	0.08	0.12	0.40	0.04	0.06	0.80	0.04	0.06
TP140	0.8	0.5	0.5	0.40	0.10	0.10	0.40	0.05	0.05	0.80	0.05	0.05
TP141	0.8	0.5	0.6	0.40	0.12	0.08	0.40	0.06	0.04	0.80	0.06	0.04
TP142	0.8	0.5	0.7	0.40	0.14	0.06	0.40	0.07	0.03	0.80	0.07	0.03
TP143	0.8	0.5	0.8	0.40	0.16	0.04	0.40	0.08	0.02	0.80	0.08	0.02
TP144	0.8	0.5	0.9	0.40	0.18	0.02	0.40	0.09	0.01	0.80	0.09	0.01
TP145	0.8	0.6	0.5	0.48	0.10	0.10	0.32	0.06	0.06	0.80	0.04	0.04
TP146	0.8	0.7	0.5	0.56	0.10	0.10	0.24	0.07	0.07	0.80	0.03	0.03
TP147	0.8	0.8	0.5	0.64	0.10	0.10	0.16	0.08	0.08	0.80	0.02	0.02
TP148	0.8	0.9	0.5	0.72	0.10	0.10	0.08	0.09	0.09	0.80	0.01	0.01
TP149	0.9	0.2	0.5	0.18	0.05	0.05	0.72	0.01	0.01	0.90	0.04	0.04
TP150	0.9	0.4	0.5	0.36	0.05	0.05	0.54	0.02	0.02	0.90	0.03	0.03
TP151	0.9	0.5	0.2	0.45	0.02	0.08	0.45	0.01	0.04	0.90	0.01	0.04
TP152	0.9	0.5	0.4	0.45	0.04	0.06	0.45	0.02	0.03	0.90	0.02	0.03
TP153	0.9	0.5	0.6	0.45	0.06	0.04	0.45	0.03	0.02	0.90	0.03	0.02
TP154	0.9	0.5	0.8	0.45	0.08	0.02	0.45	0.04	0.01	0.90	0.04	0.01
TP155	0.9	0.6	0.5	0.54	0.05	0.05	0.36	0.03	0.03	0.90	0.02	0.02
TP156	0.9	0.8	0.5	0.72	0.05	0.05	0.18	0.04	0.04	0.90	0.01	0.01

Table C4: Moments of Temperance Tasks

Task	Mean			Standard deviation			Skewness			Excess Kurtosis		
	Left	Right	Diff	Left	Right	Diff	Left	Right	Diff	Left	Right	Diff
TP1	388	292	**96**	113.38	182.58	**-69.20**	-0.01	0.74	**-0.75**	-1.56	-0.15	**-1.41**
TP2	396	364	**32**	113.95	209.06	**-95.11**	0.00	0.25	**-0.25**	-1.52	-1.08	**-0.45**
TP3	346	346	0	100.42	205.14	**-104.72**	1.24	-0.01	**1.24**	0.30	-1.34	**1.64**
TP4	382	382	0	112.59	211.37	**-98.78**	0.36	0.01	**0.35**	-1.37	-1.19	**-0.18**
TP5	418	418	0	112.59	211.37	**-98.78**	-0.36	-0.01	**-0.35**	-1.37	-1.19	**-0.18**
TP6	454	454	0	100.42	205.14	**-104.72**	-1.24	0.01	**-1.24**	0.30	-1.34	**1.64**
TP7	404	436	**-32**	113.95	209.06	**-95.11**	0.00	-0.25	**0.25**	-1.52	-1.08	**-0.45**
TP8	412	508	**-96**	113.38	182.58	**-69.20**	0.01	-0.74	**0.75**	-1.56	-0.15	**-1.41**
TP9	368	272	**96**	122.38	153.68	**-31.30**	0.10	0.61	**-0.50**	-1.52	0.26	**-1.78**
TP10	376	304	**72**	124.19	175.45	**-51.26**	0.09	0.56	**-0.48**	-1.48	-0.20	**-1.28**
TP11	384	336	**48**	125.48	189.48	**-64.01**	0.06	0.39	**-0.33**	-1.45	-0.62	**-0.83**
TP12	392	368	**24**	126.24	197.42	**-71.19**	0.03	0.20	**-0.17**	-1.44	-0.87	**-0.57**
TP13	336	336	0	109.11	189.48	**-80.38**	1.47	-0.17	**1.64**	1.09	-1.38	**2.47**
TP14	352	352	0	117.03	194.15	**-77.12**	1.00	-0.10	**1.10**	-0.26	-1.16	**0.89**
TP15	368	368	0	122.38	197.42	**-75.05**	0.63	-0.05	**0.68**	-0.97	-1.03	**0.06**
TP16	384	384	0	125.48	199.36	**-73.88**	0.30	-0.02	**0.32**	-1.33	-0.97	**-0.36**
TP17	400	400	0	126.49	200.00	**-73.51**	0.00	0.00	**0.00**	-1.44	-0.95	**-0.49**
TP18	416	416	0	125.48	199.36	**-73.88**	-0.30	0.02	**-0.32**	-1.33	-0.97	**-0.36**
TP19	432	432	0	122.38	197.42	**-75.05**	-0.63	0.05	**-0.68**	-0.97	-1.03	**0.06**
TP20	448	448	0	117.03	194.15	**-77.12**	-1.00	0.10	**-1.10**	-0.26	-1.16	**0.89**
TP21	464	464	0	109.11	189.48	**-80.38**	-1.47	0.17	**-1.64**	1.09	-1.38	**2.47**
TP22	408	432	**-24**	126.24	197.42	**-71.19**	-0.03	-0.20	**0.17**	-1.44	-0.87	**-0.57**
TP23	416	464	**-48**	125.48	189.48	**-64.01**	-0.06	-0.39	**0.33**	-1.45	-0.62	**-0.83**
TP24	424	496	**-72**	124.19	175.45	**-51.26**	-0.09	-0.56	**0.48**	-1.48	-0.20	**-1.28**
TP25	432	528	**-96**	122.38	153.68	**-31.30**	-0.10	-0.61	**0.50**	-1.52	0.26	**-1.78**
TP26	364	316	**48**	133.06	167.16	**-34.11**	0.22	0.38	**-0.16**	-1.45	-0.15	**-1.30**
TP27	388	372	**16**	137.32	184.98	**-47.66**	0.08	0.15	**-0.07**	-1.47	-0.60	**-0.87**
TP28	358	358	0	131.29	182.31	**-51.02**	0.81	-0.20	**1.00**	-0.74	-0.91	**0.16**
TP29	386	386	0	137.13	186.56	**-49.43**	0.25	-0.05	**0.31**	-1.40	-0.68	**-0.72**
TP30	414	414	0	137.13	186.56	**-49.43**	-0.25	0.05	**-0.31**	-1.40	-0.68	**-0.72**
TP31	442	442	0	131.29	182.31	**-51.02**	-0.81	0.20	**-1.00**	-0.74	-0.91	**0.16**
TP32	412	428	**-16**	137.32	184.98	**-47.66**	-0.08	-0.15	**0.07**	-1.47	-0.60	**-0.87**
TP33	436	484	**-48**	133.06	167.16	**-34.11**	-0.22	-0.38	**0.16**	-1.45	-0.15	**-1.30**
TP34	336	304	**32**	133.81	144.17	**-10.36**	0.48	0.05	**0.43**	-1.33	-0.03	**-1.30**
TP35	352	328	**24**	140.34	157.53	**-17.19**	0.37	0.18	**0.19**	-1.40	0.02	**-1.42**
TP36	368	352	**16**	144.83	166.42	**-21.59**	0.25	0.16	**0.09**	-1.48	-0.11	**-1.37**
TP37	384	376	**8**	147.46	171.53	**-24.08**	0.13	0.09	**0.04**	-1.54	-0.23	**-1.31**
TP38	352	352	0	140.34	166.42	**-26.08**	0.89	-0.46	**1.36**	-0.69	-0.84	**0.14**
TP39	364	364	0	143.89	169.42	**-25.53**	0.65	-0.32	**0.96**	-1.10	-0.56	**-0.55**
TP40	376	376	0	146.37	171.53	**-25.16**	0.42	-0.20	**0.62**	-1.36	-0.39	**-0.98**

TP41	388	388	0	147.84	172.79	**-24.95**	0.21	-0.09	**0.30**	-1.51	-0.30	**-1.21**
TP42	400	400	0	148.32	173.21	**-24.88**	0.00	0.00	**0.00**	-1.55	-0.27	**-1.29**
TP43	412	412	0	147.84	172.79	**-24.95**	-0.21	0.09	**-0.30**	-1.51	-0.30	**-1.21**
TP44	424	424	0	146.37	171.53	**-25.16**	-0.42	0.20	**-0.62**	-1.36	-0.39	**-0.98**
TP45	436	436	0	143.89	169.42	**-25.53**	-0.65	0.32	**-0.96**	-1.10	-0.56	**-0.55**
TP46	448	448	0	140.34	166.42	**-26.08**	-0.89	0.46	**-1.36**	-0.69	-0.84	**0.14**
TP47	416	424	**-8**	147.46	171.53	**-24.08**	-0.13	-0.09	**-0.04**	-1.54	-0.23	**-1.31**
TP48	432	448	**-16**	144.83	166.42	**-21.59**	-0.25	-0.16	**-0.09**	-1.48	-0.11	**-1.37**
TP49	448	472	**-24**	140.34	157.53	**-17.19**	-0.37	-0.18	**-0.19**	-1.40	0.02	**-1.42**
TP50	464	496	**-32**	133.81	144.17	**-10.36**	-0.48	-0.05	**-0.43**	-1.33	-0.03	**-1.30**
TP51	290	290	0	113.58	150.00	**-36.42**	1.43	-0.22	**1.65**	1.12	-1.22	**2.34**
TP52	310	310	0	130.00	141.77	**-11.77**	0.91	-0.26	**1.17**	-0.62	-0.38	**-0.24**
TP53	330	330	0	141.77	130.00	**11.77**	0.51	-0.19	**0.70**	-1.40	0.83	**-2.24**
TP54	350	350	0	150.00	113.58	**36.42**	0.18	0.25	**-0.07**	-1.76	2.78	**-4.55**
TP55	300	300	0	122.47	156.84	**-34.37**	1.47	-0.26	**1.73**	1.13	-1.30	**2.44**
TP56	310	310	0	130.00	155.24	**-25.24**	1.18	-0.23	**1.41**	0.14	-0.90	**1.03**
TP57	320	320	0	136.38	152.97	**-16.59**	0.94	-0.19	**1.12**	-0.53	-0.49	**-0.04**
TP58	330	330	0	141.77	150.00	**-8.23**	0.72	-0.13	**0.85**	-0.99	-0.07	**-0.92**
TP59	340	340	0	146.29	146.29	0.00	0.53	-0.04	**0.57**	-1.31	0.37	**-1.68**
TP60	350	350	0	150.00	141.77	**8.23**	0.36	0.08	**0.27**	-1.53	0.84	**-2.36**
TP61	360	360	0	152.97	136.38	**16.59**	0.19	0.27	**-0.09**	-1.67	1.34	**-3.00**
TP62	370	370	0	155.24	130.00	**25.24**	0.03	0.57	**-0.54**	-1.74	1.86	**-3.60**
TP63	380	380	0	156.84	122.47	**34.37**	-0.13	1.04	**-1.17**	-1.76	2.36	**-4.12**
TP64	330	330	0	141.77	157.80	**-16.02**	0.93	-0.29	**1.22**	-0.57	-0.65	**0.08**
TP65	350	350	0	150.00	155.24	**-5.24**	0.53	-0.10	**0.63**	-1.29	0.05	**-1.34**
TP66	370	370	0	155.24	150.00	**5.24**	0.19	0.16	**0.02**	-1.62	0.62	**-2.24**
TP67	390	390	0	157.80	141.77	**16.02**	-0.14	0.60	**-0.74**	-1.69	1.02	**-2.71**
TP68	340	340	0	146.29	156.84	**-10.56**	0.92	-0.51	**1.42**	-0.68	-0.76	**0.08**
TP69	350	350	0	150.00	157.80	**-7.80**	0.71	-0.37	**1.08**	-1.05	-0.38	**-0.67**
TP70	360	360	0	152.97	158.11	**-5.14**	0.52	-0.24	**0.76**	-1.32	-0.09	**-1.22**
TP71	370	370	0	155.24	157.80	**-2.56**	0.35	-0.11	**0.46**	-1.49	0.13	**-1.63**
TP72	380	380	0	156.84	156.84	0.00	0.18	0.02	**0.16**	-1.60	0.30	**-1.90**
TP73	390	390	0	157.80	155.24	**2.56**	0.01	0.17	**-0.15**	-1.65	0.41	**-2.06**
TP74	400	400	0	158.11	152.97	**5.14**	-0.15	0.34	**-0.49**	-1.64	0.45	**-2.09**
TP75	410	410	0	157.80	150.00	**7.80**	-0.32	0.54	**-0.86**	-1.57	0.40	**-1.98**
TP76	420	420	0	156.84	146.29	**10.56**	-0.49	0.80	**-1.29**	-1.44	0.23	**-1.67**
TP77	370	370	0	155.24	155.24	0.00	0.51	-0.46	**0.96**	-1.37	-0.05	**-1.32**
TP78	390	390	0	157.80	157.80	0.00	0.16	-0.14	**0.31**	-1.61	0.25	**-1.86**
TP79	410	410	0	157.80	157.80	0.00	-0.16	0.14	**-0.31**	-1.61	0.25	**-1.86**
TP80	430	430	0	155.24	155.24	0.00	-0.51	0.46	**-0.96**	-1.37	-0.05	**-1.32**
TP81	380	380	0	156.84	146.29	**10.56**	0.49	-0.80	**1.29**	-1.44	0.23	**-1.67**
TP82	390	390	0	157.80	150.00	**7.80**	0.32	-0.54	**0.86**	-1.57	0.40	**-1.98**
TP83	400	400	0	158.11	152.97	**5.14**	0.15	-0.34	**0.49**	-1.64	0.45	**-2.09**
TP84	410	410	0	157.80	155.24	**2.56**	-0.01	-0.17	**0.15**	-1.65	0.41	**-2.06**
TP85	420	420	0	156.84	156.84	0.00	-0.18	-0.02	**-0.16**	-1.60	0.30	**-1.90**

TP86	430	430	0	155.24	157.80	**-2.56**	-0.35	0.11	**-0.46**	-1.49	0.13	**-1.63**
TP87	440	440	0	152.97	158.11	**-5.14**	-0.52	0.24	**-0.76**	-1.32	-0.09	**-1.22**
TP88	450	450	0	150.00	157.80	**-7.80**	-0.71	0.37	**-1.08**	-1.05	-0.38	**-0.67**
TP89	460	460	0	146.29	156.84	**-10.56**	-0.92	0.51	**-1.42**	-0.68	-0.76	**0.08**
TP90	410	410	0	157.80	141.77	**16.02**	0.14	-0.60	**0.74**	-1.69	1.02	**-2.71**
TP91	430	430	0	155.24	150.00	**5.24**	-0.19	-0.16	**-0.02**	-1.62	0.62	**-2.24**
TP92	450	450	0	150.00	155.24	**-5.24**	-0.53	0.10	**-0.63**	-1.29	0.05	**-1.34**
TP93	470	470	0	141.77	157.80	**-16.02**	-0.93	0.29	**-1.22**	-0.57	-0.65	**0.08**
TP94	420	420	0	156.84	122.47	**34.37**	0.13	-1.04	**1.17**	-1.76	2.36	**-4.12**
TP95	430	430	0	155.24	130.00	**25.24**	-0.03	-0.57	**0.54**	-1.74	1.86	**-3.60**
TP96	440	440	0	152.97	136.38	**16.59**	-0.19	-0.27	**0.09**	-1.67	1.34	**-3.00**
TP97	450	450	0	150.00	141.77	**8.23**	-0.36	-0.08	**-0.27**	-1.53	0.84	**-2.36**
TP98	460	460	0	146.29	146.29	0.00	-0.53	0.04	**-0.57**	-1.31	0.37	**-1.68**
TP99	470	470	0	141.77	150.00	**-8.23**	-0.72	0.13	**-0.85**	-0.99	-0.07	**-0.92**
TP100	480	480	0	136.38	152.97	**-16.59**	-0.94	0.19	**-1.12**	-0.53	-0.49	**-0.04**
TP101	490	490	0	130.00	155.24	**-25.24**	-1.18	0.23	**-1.41**	0.14	-0.90	**1.03**
TP102	500	500	0	122.47	156.84	**-34.37**	-1.47	0.26	**-1.73**	1.13	-1.30	**2.44**
TP103	450	450	0	150.00	113.58	**36.42**	-0.18	-0.25	**0.07**	-1.76	2.78	**-4.55**
TP104	470	470	0	141.77	130.00	**11.77**	-0.51	0.19	**-0.70**	-1.40	0.83	**-2.24**
TP105	490	490	0	130.00	141.77	**-11.77**	-0.91	0.26	**-1.17**	-0.62	-0.38	**-0.24**
TP106	510	510	0	113.58	150.00	**-36.42**	-1.43	0.22	**-1.65**	1.12	-1.22	**2.34**
TP107	304	336	**-32**	137.05	126.11	**10.94**	0.95	-0.58	**1.53**	-0.68	0.69	**-1.37**
TP108	328	352	**-24**	151.05	133.03	**18.02**	0.70	-0.30	**1.00**	-1.15	1.01	**-2.16**
TP109	352	368	**-16**	160.30	137.75	**22.55**	0.46	-0.15	**0.61**	-1.48	1.09	**-2.57**
TP110	376	384	**-8**	165.60	140.51	**25.09**	0.23	-0.06	**0.29**	-1.67	1.10	**-2.77**
TP111	368	368	0	164.24	137.75	**26.49**	0.52	-0.88	**1.40**	-1.45	0.41	**-1.86**
TP112	376	376	0	165.60	139.37	**26.23**	0.39	-0.63	**1.02**	-1.57	0.73	**-2.31**
TP113	384	384	0	166.57	140.51	**26.05**	0.25	-0.41	**0.66**	-1.66	0.94	**-2.60**
TP114	392	392	0	167.14	141.19	**25.95**	0.13	-0.20	**0.33**	-1.71	1.06	**-2.77**
TP115	400	400	0	167.33	141.42	**25.91**	0.00	0.00	**0.00**	-1.72	1.10	**-2.82**
TP116	408	408	0	167.14	141.19	**25.95**	-0.13	0.20	**-0.33**	-1.71	1.06	**-2.77**
TP117	416	416	0	166.57	140.51	**26.05**	-0.25	0.41	**-0.66**	-1.66	0.94	**-2.60**
TP118	424	424	0	165.60	139.37	**26.23**	-0.39	0.63	**-1.02**	-1.57	0.73	**-2.31**
TP119	432	432	0	164.24	137.75	**26.49**	-0.52	0.88	**-1.40**	-1.45	0.41	**-1.86**
TP120	424	416	**8**	165.60	140.51	**25.09**	-0.23	0.06	**-0.29**	-1.67	1.10	**-2.77**
TP121	448	432	**16**	160.30	137.75	**22.55**	-0.46	0.15	**-0.61**	-1.48	1.09	**-2.57**
TP122	472	448	**24**	151.05	133.03	**18.02**	-0.70	0.30	**-1.00**	-1.15	1.01	**-2.16**
TP123	496	464	**32**	137.05	126.11	**10.94**	-0.95	0.58	**-1.53**	-0.68	0.69	**-1.37**
TP124	316	364	**-48**	154.74	117.06	**37.67**	0.88	-0.62	**1.50**	-0.93	2.21	**-3.15**
TP125	372	388	**-16**	173.83	121.89	**51.94**	0.27	-0.17	**0.44**	-1.72	2.45	**-4.17**
TP126	382	382	0	175.15	121.14	**54.00**	0.28	-0.87	**1.14**	-1.73	2.06	**-3.79**
TP127	394	394	0	175.97	122.33	**53.64**	0.09	-0.28	**0.37**	-1.80	2.42	**-4.22**
TP128	406	406	0	175.97	122.33	**53.64**	-0.09	0.28	**-0.37**	-1.80	2.42	**-4.22**
TP129	418	418	0	175.15	121.14	**54.00**	-0.28	0.87	**-1.14**	-1.73	2.06	**-3.79**
TP130	428	412	**16**	173.83	121.89	**51.94**	-0.27	0.17	**-0.44**	-1.72	2.45	**-4.17**

TP131	484	436	**48**	154.74	117.06	**37.67**	-0.88	0.62	**-1.50**	-0.93	2.21	**-3.15**
TP132	272	368	**-96**	132.73	94.74	**37.98**	1.60	-1.58	**3.18**	0.92	4.34	**-3.43**
TP133	304	376	**-72**	157.43	97.08	**60.35**	1.07	-1.08	**2.15**	-0.64	4.80	**-5.43**
TP134	336	384	**-48**	172.93	98.71	**74.22**	0.67	-0.67	**1.34**	-1.40	5.04	**-6.44**
TP135	368	392	**-24**	181.59	99.68	**81.91**	0.32	-0.32	**0.64**	-1.77	5.16	**-6.93**
TP136	384	384	0	183.70	98.71	**84.98**	0.24	-1.67	**1.91**	-1.82	4.39	**-6.22**
TP137	388	388	0	184.00	99.28	**84.72**	0.18	-1.23	**1.41**	-1.85	4.76	**-6.60**
TP138	392	392	0	184.22	99.68	**84.54**	0.12	-0.81	**0.93**	-1.86	5.01	**-6.87**
TP139	396	396	0	184.35	99.92	**84.43**	0.06	-0.40	**0.46**	-1.87	5.15	**-7.02**
TP140	400	400	0	184.39	100.00	**84.39**	0.00	0.00	**0.00**	-1.88	5.20	**-7.08**
TP141	404	404	0	184.35	99.92	**84.43**	-0.06	0.40	**-0.46**	-1.87	5.15	**-7.02**
TP142	408	408	0	184.22	99.68	**84.54**	-0.12	0.81	**-0.93**	-1.86	5.01	**-6.87**
TP143	412	412	0	184.00	99.28	**84.72**	-0.18	1.23	**-1.41**	-1.85	4.76	**-6.60**
TP144	416	416	0	183.70	98.71	**84.98**	-0.24	1.67	**-1.91**	-1.82	4.39	**-6.22**
TP145	432	408	**24**	181.59	99.68	**81.91**	-0.32	0.32	**-0.64**	-1.77	5.16	**-6.93**
TP146	464	416	**48**	172.93	98.71	**74.22**	-0.67	0.67	**-1.34**	-1.40	5.04	**-6.44**
TP147	496	424	**72**	157.43	97.08	**60.35**	-1.07	1.08	**-2.15**	-0.64	4.80	**-5.43**
TP148	528	432	**96**	132.73	94.74	**37.98**	-1.60	1.58	**-3.18**	0.92	4.34	**-3.43**
TP149	292	388	**-96**	159.17	69.69	**89.49**	1.28	-1.96	**3.24**	-0.25	12.86	**-13.11**
TP150	364	396	**-32**	188.96	70.60	**118.36**	0.37	-0.63	**0.99**	-1.80	13.34	**-15.15**
TP151	394	394	0	192.26	70.46	**121.80**	0.09	-1.97	**2.06**	-1.93	12.92	**-14.86**
TP152	398	398	0	192.34	70.68	**121.66**	0.03	-0.65	**0.68**	-1.94	13.35	**-15.29**
TP153	402	402	0	192.34	70.68	**121.66**	-0.03	0.65	**-0.68**	-1.94	13.35	**-15.29**
TP154	406	406	0	192.26	70.46	**121.80**	-0.09	1.97	**-2.06**	-1.93	12.92	**-14.86**
TP155	436	404	**32**	188.96	70.60	**118.36**	-0.37	0.63	**-0.99**	-1.80	13.34	**-15.15**
TP156	508	412	**96**	159.17	69.69	**89.49**	-1.28	1.96	**-3.24**	-0.25	12.86	**-13.11**