Separating Real Incentives and Accountability

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Abstract

Accountability—the expectation on the side of the decision maker that she may have to justify her decisions in front of somebody else—has been found by psychologists to strongly influence decision making processes. The awareness of this issue remains however limited amongst economists, who tend to focus on the motivational effects of financial incentives. Accountability and incentives may however provide different motivations for decision makers, and disentangling their effects is thus important for understanding real-world situations in which both are present. We separate accountability and incentives, and find different effects. Accountability is found to reduce preference reversals between frames, for which incentives have no effect. Incentives on the other hand are found to reduce risk seeking for losses, where accountability has no effect. In a choice task between simple and compound events, accountability increases the preference for the normatively superior simple event, while incentives have a weaker effect going in the opposite direction. Implications for designing optimal contracts, and in general for the design of better institutions, are discussed.

JEL classification: C91, D71, D81, Z13

Key words: Real v. hypothetical incentives; experimental economics; accountability; internal validity; simple and compound events; external validity; anchoring and adjustment; framing effects.

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1. Motivation

Experimental economists have demonstrated the importance of real incentives for inducing cognitive effort in experimental tasks (Davis & Holt, 1993; Harless & Camerer, 1994; Harrison, 2007; Smith & Walker, 1993), although the concrete effect of incentives in different situations is sometimes still debated (Camerer & Hogarth, 1999; Hertwig & Ortmann, 2001; Loewenstein, 1999). Social influences on decisions are gaining ground in economics where other-regarding preferences or trust-games are concerned (e.g. Alpizar, Carlsson, & Johanson-Stenman, 2008; Gächter & Fehr, 1999; Hoffman, McKabe, & Smith, 1996; List *et al.*, 2004). Such social influences have on the other hand received very little attention from experimental economists where individual decisions are concerned. Accountability—the expectation by a decision maker of having to justify her decisions in front of others—has however been found to influence numerous decision making processes, including individual decisions (Lerner & Tetlock, 1999).

We propose to test the notion that accountability and financial incentives may provide different motivations to decision makers where individual decision making is concerned, hence resulting in differential effects on decisions. Incentives are generally used with the explicit purpose of inducing economic rationality, consisting in the motivation for subjects to maximize their payoff. Accountability on the other hand may well activate concerns of social desirability, or self-presentation concerns. In this sense, accountability may push decisions in a different direction relative to incentives whenever the choice that maximizes payoffs does not appear to be the most justifiable one. A typical example is ambiguity aversion, where the the known-probability option presents a clear informational advantage over the unknown-probability alternative (Frisch & Baron, 1988). Anticipating a potential need to justify one's decision may then well make the risky option seem more desirable even when that implies sacrificing some payoff (Trautmann, Vieider, & Wakker, 2008).

We thus argue that economics as a discipline could benefit from a more widespread awareness of the effects of accountability. The purpose of jointly studying accountability and incentives is twofold. Incentives have long occupied a central position in economics, as formalized in principal-agent relationships and contract theory. It is however poorly understood how monetary incentives interact with social constraints

(Laffont & Martimort, 2002; p. 2), and hence how the latter could be exploited in the construction of better contracts. A better understanding of social and monetary incentive mechanisms—both separately and in conjunction—seems thus desirable in order to gain deeper insights into the functioning of complex real-world exchanges. Furthermore, from a wider decision-theoretic perspective, accountability and incentives may also be seen as a means to identifying the micro-sociological and micro-economic boundary conditions on judgmental biases of various sorts.

We separate accountability and incentive variations in typical individual decision making tasks. Studying choices between sure amounts and prospects framed as either gains or losses, we find accountability to reduce preference reversals between frames, whereas incentives do not affect the incidence of preference reversals. Incentives are however found to reduce risk seeking for losses, while accountability is not found to have any effects on risk attitude either in the loss or in the gain domain. In a choice task between simple and conjunctive prospects (Bar-Hillel, 1973), we find accountability to increase the frequency of choice for the normatively superior simple prospects. Incentives on the other hand result in more frequent choices of the conjunctive prospects. When both accountability and incentives are present, no significant effect is observed relative to the control treatment because the two effects cancel out. While the particular results obtained are specific to the tasks employed, these two examples illustrate the general desirability of disentangling real incentives and accountability.

The paper proceeds as follows. Section 2 discusses accountability and its effects. Section 3 presents the experiment and discusses results for the different tasks employed. Overall results and their implications are discussed in section 4. Section 5 concludes the paper.

2. Accountability

A substantial literature in social psychology shows that *accountability*—the expectation by a decision maker that she may have to justify her choices in front of others—can substantially affect human decision making processes (Lerner & Tetlock, 1999). People who are accountable in front of an audience with unknown views generally consider more options in greater depth, thereby anticipating possible criticisms others might raise

against one's choice, a phenomenon that has been called *pre-emptive self-criticism* (Tetlock, 1983; Tetlock & Kim, 1987). Subjects who are held accountable for their decision making process can thus be expected to be motivated to present themselves as good decision makers.

Accountability to an audience whose views are unknown has been found to lead to less biased decisions in cases where the normatively correct decision was either known by the subjects, or could be arrived at by higher cognitive effort (Simonson & Nye, 1992). Accountability has thus been found among other things to improve coherence between gain and loss frames (Miller & Fagley, 1991; Takemura, 1993; Takemura, 1994), to decrease loss aversion (Vieider, 2009), and to reduce overconfidence (Arkes *et al.*, 1987). When on the other hand no solution is easily arrived at, people tend to choose the option that appears more easily justifiable (Simonson, 1989). This may be explained by the fact that people often rely on reasons when making choices (Shafir, Simonson, & Tversky, 1993). In such cases, accountability has been shown to impair decisions e.g. for ambiguity aversion (Curley, Yates, & Abrams, 1986; Trautmann, Vieider, & Wakker, 2008). Partially contradictory findings have been obtained about the effect of accountability on the sunk cost fallacy (Bobocel & Meyer, 1994; Simonson & Nye, 1992), though such contradictory findings may at least in part be due to experimental implementation issues (Friedman *et al.*, 2007).

Whilst accountability issues are mostly ignored in the economics literature, there are a few notable exceptions where other-regarding preferences are concerned. Most strikingly, double-blind procedures (Hoffman, McKabe, & Smith, 1994) explore cases in which subjects are granted anonymity, and from which any form of accountability is thus explicitly excluded. For instance, Hoffman, McKabe, & Smith (1996) find that offers in the dictator game are progressively diminished by granting subjects increasing degrees of social isolation. List *et al.* (2004) find that accountability increases the amount of votes for a contribution to a public good by about the same amount as changing the decision from hypothetical to real decreases them. Many other studies exist that vary the degree of observability of decisions to some extend (e.g. Alpizar, Carlsson, & Johanson-Stenman, 2008; Gächter & Fehr, 1999; Laury, Walker, & Williams, 1995). A clear understanding of the effects of accountability is however often hindered by the different names and

experimental implementations that are used for the accountability manipulation. The terms used for similar implementations of social pressure are indeed so different that it is often difficult to connect findings from closely related work (Vieider & Tetlock, 2010).

There are some important distinctions in accountability manipulations. One important factor is whether the opinion of the potentially evaluative audience about a particular problem is known or unknown. Indeed, when such an opinion is known, subjects will tend to conform to that opinion, at least as long as the cost of such conformity is seen as low. In studies about other-regarding preferences mentioned above, interesting effects do often derive from a conflict between social desirability and self-interest. For instance in the dictator game, it seems clear that one can appear more generous by offering a larger part of the pie to the receiver, but this results in an equivalent reduction of one's own payoff. Furthermore, accountability can be either implicit or explicit, and the agent may be accountable either to the experimenter, an expert, or peers. Also, unaccountable subjects may be granted different levels of anonymity, and accountable subjects may be requested to justify their choices in writing, or personally to somebody else. Since the literature about different manipulations of accountability in psychology is very extensive, we refer the interested reader to recent overview papers for a more detailed discussion (Frink & Klimowski, 1998; Lerner & Tetlock, 1999; Vieider & Tetlock, 2010).

3. Experiments

3.1 General Structure

Subjects: 166 subjects were recruited from a list of volunteers at Erasmus University Rotterdam. The average age of the subjects was 21.8 years, and 58% were male. All subjects were paid a flat fee of €15 ($23) for their participation. No additional earning possibilities were mentioned in the recruitment process in order to avoid a possible selection bias into the real-incentive treatments.

Treatments: The design is 2x2, with accountability and incentives varied in an orthogonal fashion. Subjects were divided as indicated in table 1:

	Hypothetical	**R**eal Incentives
Unaccountable	Treatment UH (43)	Treatment UR (42)
Accountable	Treatment AH (43)	Treatment AR (38)

Table 1: Experimental Design
Treatments are designated by first letters of manipulations—UH: Unaccountable Hypothetical; AH: Accountable Hypothetical, etc. Numbers of subjects are indicated in parentheses.

Accountability Manipulation: The accountability manipulation used here holds subjects explicitly accountable for their decision making process. In the *unaccountable* treatment, subjects were told that their answers were confidential and could not be traced back to them. They were told that after the experiment they should put their completed questionnaire in a cardboard box by the exit of the room upon which they would be paid the flat fee of €15 for their participation. They would then either be dismissed or told to return to their seats, depending on the incentive manipulation (see below). Also, all sessions were held with groups of approximately 15 subjects, so as to reassure subjects that their answers could not be traced back to them.

In the *accountable* treatment subjects were told that upon completion of the task they would be asked to take their questionnaire with them to another room, where an experimenter would ask them about the reasons of their choices. After the interview, subjects were paid the flat fee of €15 for their participation. They would then either be dismissed or told to return to their seats, depending on the incentive manipulation (see below). This procedure was announced before any decisions were taken, and they were the only difference from the unaccountable condition.

Following conventions in the literature, and to be sure that subjects understood the instructions, a manipulation check was included at the end of the experimental questionnaire. Subjects in the high accountability treatments had a higher expectation than unaccountable subjects that they would have to justify their decisions ($Z=3.396$, $p=0.0007$[*]), showing the effectiveness of the manipulation.

Incentive manipulation: In hypothetical treatments subjects were paid the flat fee and dismissed once they had completed the questionnaire (and the interview in the accountable treatment). They were clearly told that choices were hypothetical, and the

[*]Two-sided non-parametric tests are used throughout, unless specified otherwise.

instructions for each task exhorted them to *imagine* they were to play the tasks for real money. In the real incentives treatments it was made clear that some subjects would be extracted to play for real money, and the procedures by which the extraction was to take place was carefully described (see appendix A for exact instructions) . After having been paid their participation fee (and after having been interviewed in the accountable treatment) they were told to return to their seats.

Monetary incentives were implemented using a random incentive mechanism (Abdellaoui, Baillon, Wakker, 2007; Harrison, Lau, & Williams, 2002; Holt & Laury, 2002; Myagkov & Plott, 1997). Its equivalence to a single and payoff relevant decision task has been empirically tested and confirmed (Cubitt, Starmer, & Sugden, 1998; Hey & Lee, 2005; Lee, 2008; Starmer & Sugden, 1991; though see Holt 1986, for a contrary view). One out of five subjects was selected for real play, and then one of the tasks was randomly selected for real play. This manipulation did allow us to implement anonymity when desired, which would otherwise have been impossible in this context. Some papers explicitly tested whether it matters if for each subject one choice is played for real or if this is done only for some randomly selected subjects and found no difference (Armantier, 2006; Harrison, Lau, & Rutström, 2007). Beyond the matter of the equivalence of random incentives to certain incentives, our method is validated by the fact that we do indeed find effects of incentives.

In order to be able to manipulate accountability, a careful procedure was implemented to assure subjects of their anonymity and to convince them that winnings could not be traced to them. This procedure was devised to avoid any type of accountability in the real incentive unaccountable treatment. Also, the procedure was kept intact for the real incentives accountable treatment in order not to introduce any confounds. Subjects detached a randomly generated four digit number from their questionnaires at the beginning of the experiment. Three numbers for each group of 15 were then randomly selected by the experimenter and the questionnaires with the corresponding numbers were recovered from the pile, so that winners would remain anonymous. The experimenter then played out the selected choice in front of the whole group. Prizes were finally put in envelopes with the corresponding number and handed to a secretary on a different floor, who was unrelated to both the subjects and the

experimenter. Subjects could then pick up their winnings in a sealed envelope by presenting their number as soon as the experiment was over.

Tasks: Different tasks were selected to test the separate effects of accountability and incentives. We decided to use individual decision making tasks, since the direction of effects are not as clear as for other-regarding preferences, were accountability and incentives may usually be expected to produce opposite effects. In this sense, the tasks employed should be considered a stricter test of the potential importance of understanding the separate effects of accountability and incentives than tasks involving other-regarding preferences would be. The particular tasks employed are described next.

3.2 The Framing Effect

Introduction

Different formulations of normatively identical decision problems have consistently been found to influence choice patterns in a variety of situations, most famously amongst them the Asian disease problem (Tversky & Kahneman, 1981). In the Asian disease problem, subjects are asked to prepare for the outbreak of a new Asian influenza from which 600 people are expected to die. In the gain formulation, they can choose between a) saving 200 people for sure, and b) a probability of 1/3 of saving all 600 people, or else nobody. In the loss formulation a normatively equivalent choice is presented to them, only the two options are now presented as losses: a) 400 people will die for sure, and b) a 2/3 probability that all 600 people will die, or else nobody. While in the gain formulation the typical majority choice is the sure option *a*, in the loss formulation a majority of subjects typically chooses option *b.* This leads to the general pattern of risk aversion for gains and risk seeking for losses (Kühberger, Schulte-Mecklenberg, & Perner , 1999).

The Asian disease problem as described above has the obvious disadvantage that it cannot be incentivized. Also, numerous criticisms have been raised against this formulation of the problem, for instance that it implies uncertainty in the gain formulation of what may happen to the 200 people who are not saved for sure, or in the loss formulation to the 200 who will not die (Bohm & Lind, 1992). For these reasons, we employ a monetary formulation of the problem that avoids these pitfalls. Lottery

formulations of the framing problem have indeed been shown in the literature to also have strong effects (Kühberger, 1998). Details of the formulation are provided below.

The framing task seems to constitute a promising task in which to show differential effects of incentives and accountability. Indeed, incentives are likely to focus attention on each decision frame in isolation, since payoffs will be determined by playing out that specific task. There seems on the other hand no reason for incentives to affect coherence between the two frames, since such coherence (or indeed its absence) will not make any difference for resulting payoffs. Coherence on the other hand seems to be a desirable feature of decision making processes in general, and anticipating a need to justify one's decision in front of somebody else may thus well activate a desire for coherence in order to appear as a sound decision maker. Furthermore, framing effects occupy an important place in the decision making literature, and additional evidence on the potentially differential debiasing potential of accountability and incentives seems valuable.

Method and Hypotheses

Task. A within subjects design is employed. Both gain and loss formulations were presented on the same page so as to encourage comparison of the two. Monetary prospects were employed to make the provision of incentives possible. Subjects could win €25 in expected value conditional on being selected for real play. The following choice pairs were proposed:

Positive Frame:	You are now given a cash gift of €20. Those €20 are yours to dispose of. Additionally, you are given a choice between obtaining €5 for sure or playing a prospect with a 25% probability of winning €20 and a 75% probability of winning nothing.
Negative Frame:	You are now given a cash gift of €40. Additionally, you are given a choice between giving up €15 for sure or playing a prospect with a 75% probability of losing €20 and a 25% probability of losing nothing.

Hypotheses. Accountability is generally found motivate subjects to defend their reputation as good decision makers. We thus hypothesize that in this case such a motivation leads to a search of coherence between the two frames, thus reducing the

incidence of preference reversals. As to financial incentives, we hypothesize that they will have no impact on preference reversals, since there is no reason to suppose that they might lead to more or less coherence between the two tasks, which should rather be considered in isolation. Combining thus the two hypotheses above leads to a prediction that the presence of both accountability and incentives should lead to a reduction of reversals which can however be attributed to the effect of accountability alone.

Results

Accountability reduced the incidence of preference reversals, and this holds true for both typical (sure amount in gain frame, prospect in loss frame) and opposite (prospect in gain frame, sure amount in loss frame) preference reversals (see table 2). The difference between the number of preference reversals committed by accountable and unaccountable subjects overall is significant ($Z=2.04$, $p=0.041$). The effect size found (Pearson's $r=0.16$[1]) is similar to other effect sizes found for accountability on within subject framing effects (Takemura, 1993). Incentives on the other hand do not influence the incidence of preference reversals overall ($Z=0.344$, $p=0.732$).

	Hypothetical	**R**eal Incentives
Unaccountable	24 (56%) [18,6]	22 (52%) [15,7]
Accountable	17 (40%) [14,3]	14 (37%) [6,8]

Table 2: Incentive and Accountability Influences on the Framing Effect
Numbers reported refer to overall number of preference reversals. Percentages refer to the percentage of subjects committing preference reversals. Numbers in square brackets represent typical reversals (sure amount in gain frame, prospect in loss frame), and opposite reversals (prospect in gain frame, sure amount in loss frame) according to the scheme: [typical/opposite].

An interesting insight is gained by considering the gain and loss frame separately and treating them as between subject data, which allows to observe the effects of accountability and incentives on risk attitudes. Overall, subjects were indifferent between the sure amount and the prospect in the gain frame ($p=0.938$, two-sided binomial test), but displayed a strong preference for the prospect in the loss frame ($p=0.0000$, two-sided

[1] Pearson's r is used as a measure of effect size throughout the paper. Effect sizes have the advantage to permit immediate comparison between findings from different studies independently of sample sizes or test statistics used, and thus facilitate comparison and integration of findings from different studies (Rosenthal, 1991).

binomial test). For gains there is no main effect of either accountability (Z= –0.616, p=0.54) or incentives (Z=0.708, p=0.44). In the loss frame on the other hand, incentives have a strong effect (Z=3.607, p=0.0003; r=0.28). The effect of incentives goes in the direction of reducing risk seeking for losses. Indeed, while under hypothetical conditions risk seeking predominates (p=0.0000, two-sided binomial test), with real incentives risk neutrality cannot be rejected (p=0.7376, two-sided binomial test). There is no main effect of accountability in the loss frame (Z=1.203, p=0.23). However there is an interaction effect, inasmuch as accountability reduces risk seeking under real incentives, an effect that is marginally significant (Z=1.760, p=0.078).

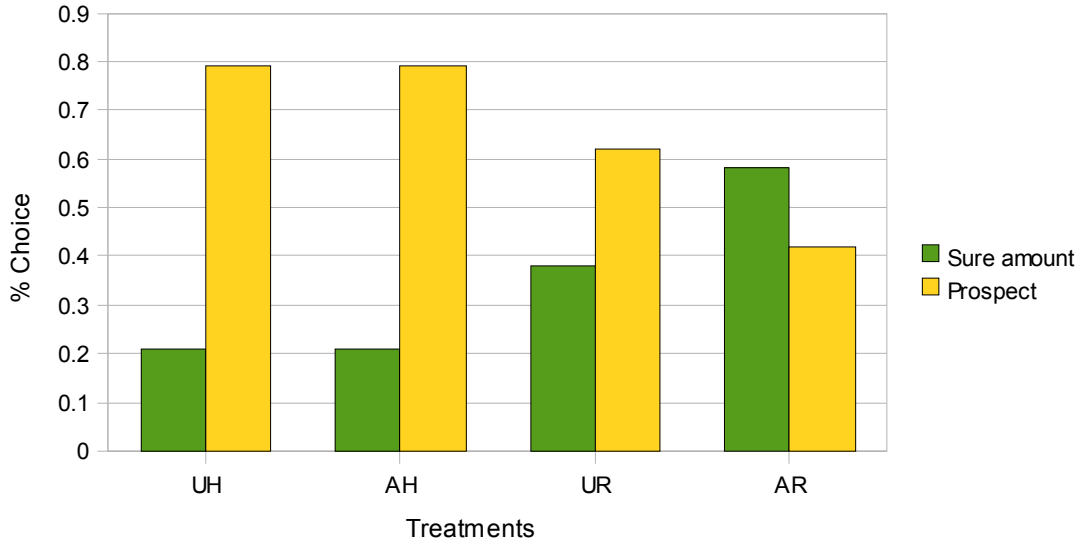

Figure 1: Preferences for the Sure Amount versus Prospect in the Loss Frame

Discussion

As hypothesized, accountability pressures reduce framing effects and make subjects strive for coherence, thus leading to a significant reduction in preference reversals. Incentives on the other hand do not impact the incidence of preference reversals. Indeed, they seem to focus attention on the single tasks in which payoffs can be earned, and thus lead subjects to consider the two frames in isolation. These findings are consistent with previous studies (Kühberger, Schulte-Mecklenberg, & Perner, 2002; Takemura, 1993). Also, no interaction effects are found for the incidence of preference reversals. However,

if accountability and incentives are both present, preference reversals are reduced—an effect that is however shown to be entirely due to accountability.

The within subject design has the advantage that one can detect preference reversals proper, which provide a stronger test than between subject majority switches in frames. In the literature, however, between subjects tests of framing effects are more common (Kühberger, 1998). Treating the results as between subject data and testing bidirectional framing effects (Kühberger, Schulte-Mecklenberg, & Perner, 1999)—i.e. whether choice proportions in each frame differ from indifference between the two choices—another interesting picture emerges. Hypothetical treatments produce a pattern of risk neutrality for gains and pronounced risk seeking for losses. Incentives however have the effect of producing indifference between the sure amount and the prospect in the loss frame, while no effect is found for gains. Finally, there is an interaction effect—accountability is found to reduce risk seeking for losses under real incentives, while no such effect of accountability is found for hypothetical choice.

These results are generally consistent with previous findings in the literature. Accountability has been found to reduce framing effects for problems of this type, both for within subject designs (Takemura, 1993) and for between subject designs (Miller & Fagley, 1991; Takemura, 1994). Framing effects have also been found to persist under monetary incentives (Kühberger, 1998; Kühberger *et al.*, 2002). This is however not surprising, given our hypothesis that incentives would not affect the switching between frames, but would be more important for choices in single frames taken in isolation. The effect of incentives on choices in the loss frame that we found is consistent with the results of Schoemaker (1990), and in general with the evidence on strong effects of incentives in decisions involving losses (Horowitz & McConnel, 2002; List & Gallet, 2001). No effects of incentives are found in the gain frame, which is again consistent with the findings of Schoemaker (1990).

Beyond the interest of these findings for framing effects *per se*, they open interesting insights on the differential motivational effects of accountability and incentives. Indeed, accountability appears to act as a motivational trigger for analytic thinking styles that increases the search for coherence between the two frames. This conclusion is also supported by the finding that subjects take on average much longer to

come up with a decision under accountability than when they are unaccountable. Although instructions for accountable and unaccountable subjects were of the same length, accountable subjects took on average almost 7 minutes more to complete the questionnaire ($Z=5.839$, $p=0.0000$).

Rather than bringing up issues of coherence, incentives seem to rather focus attention on true preferences in the loss frame. If both accountability and incentives are present, preference reversals are also reduced relative to the the baseline case in which neither is present. This effect can however be seen here to be entirely due to accountability. In order to test for the generality of this finding, we now proceed to show the effects of accountability and incentives in a quite different decision task.

3.3 Choice between simple and compound events

Introduction

People have been known to be affected by biases in the comparative evaluation of probabilities of simple and compound events (Bar-Hillel, 1973). A simple event such as drawing a red ball from an urn containing 50 red balls and 50 black balls to win a prize is compared to a conjunctive event such as drawing 7 red balls in succession with replacement from an urn containing 90 red balls and 10 black ones to win the same prize. The second, conjunctive, event is thereby generally preferred by a majority of subjects, even though it gives a probability of winning of .48 compared to the .5 of the simple event. When the same simple event is however compared to a disjunctive event, such as drawing at least one red ball in seven trials with replacement from an urn containing 10 red balls and 90 black balls, then the simple event is preferred by a majority of subjects, even though the disjunctive event has a higher probability of .52.

This bias in the evaluation of simple versus compound prospects has been attributed in the literature to an anchoring and adjustment process (Holtgraves & Skeel, 1992; Tversky & Kahneman, 1974; Kruglanski & Freund, 1983). Subjects are thought to anchor their probability estimate for the conjunctive prospect at the probability of success in any single stage—thus 9/10 of a red ball for the conjunctive event and 1/10 for a red ball for disjunctive event in the example above—and then fail to adjust these initial estimates to a sufficient degree.

Accountability and incentives may result in a different motivational focus in this type of task. Incentives tend to focus attention on outcomes, and are thus unlikely to improve decision making in this type of task. Such a hypothesis seems also to be supported by findings on the ineffectiveness of real incentives at increasing adjustment away from an anchor (Wilson *et al.*, 1996), although existing studies tend not to be incentive compatible due to the nature of the tasks they employ. The hypothesis that incentives may be ineffective is also consistent with effects found for *outcome accountability*, whereby attention is focused not on the decision making *process* as in our manipulation, but rather on the outcomes that obtain (Siegel-Jacobs & Yates, 1996). This may lead decision makers to neglect precise probability calculations in favor of decision heuristics. Accountability on the other hand is more likely to focus the attention of the decision maker on the reasoning process, and to induce them to undertake probability calculations that can be used later to justify their decisions.

Method and Hypotheses

Task. Six choice pairs of the kind proposed by Bar-Hillel (1973) were used, giving subjects a choice between a simple prospect involving one draw from an urn, and a conjunctive prospect involving repeated draws from an urn with replacement. The choice pairs were selected so that the overall probability of winning would always be lower in the conjunctive prospect than in the simple prospect. The conjunctive prospects used presented varying levels of calculation difficulties and were more or less close in probability to the simple prospect (see Appendix B).

Incentives. The choices involved can be played out in an incentive-compatible way. The prize for extracting a winning ball (or combination of balls) from the urn was €20.

Encoding. The choice was encoded as a dummy variable, with 0 indicating a choice of the (normatively superior) simple event, and 1 indicating a choice of the conjunctive event. These dummies where then summed for all six choice pairs to obtain a general index ranging from 0 to 6. Figure 2 shows the occurrence of this index by treatment.

Hypotheses. Overall, we expected a substantial number of choices of the normatively inferior conjunctive event. We hypothesize that accountability should lead to a more thorough assessment of probabilities and hence to more frequent choices of the superior simple event by focusing attention on the probabilities involved. As to the effect of incentives, no prior study exists to the author's knowledge on effects of incentives on choices between simple and conjunctive events. The general evidence on anchoring and adjustment mechanisms would lead one to expect no effects of incentives.

There are several secondary hypotheses. Given the hypothesis that observed irrationalities are due to anchoring at the single-extraction probability and insufficient adjustment away from that probability, we hypothesize that the number of irrational choices increases with the difference between single-extraction probabilities in the two urns. Also, this anchoring effect should be observed only for unaccountable subjects, since we have hypothesized accountability to increase adjustment away from the anchor. In the same spirit, more rational decisions should be taken for wider gaps in the overall probability of winning between the simple and the conjunctive event. Finally, lower numbers of extractions in the conjunctive event make it easier to calculate probabilities and should thus increase choices for the superior simple event.

Results

As expected, most subjects chose at least some conjunctive events. Overall, accountability significantly improves decisions, leading to more choices of the simple prospect ($Z=3.449$, $p=0.0006$; $r=0.27$). Incentives on the other hand are found to significantly impair decisions, leading to more choices of the conjunctive prospect ($Z=2.018$, $p=0.043$; $r=0.16$), although the effect size is much smaller than for accountability. Remarkably, 17 accountable subjects consistently chose the superior simple event, as opposed to only 2 unaccountable subjects. Table 4 shows the average number of choices for the normatively inferior conjunctive prospect by treatment. If one compares unaccountable hypothetical choices to the ones under accountability and real incentives, no significant effects ($Z=1.03$, $p=0.30$, $r=0.11$) are observed inasmuch as the two effects cancel out.

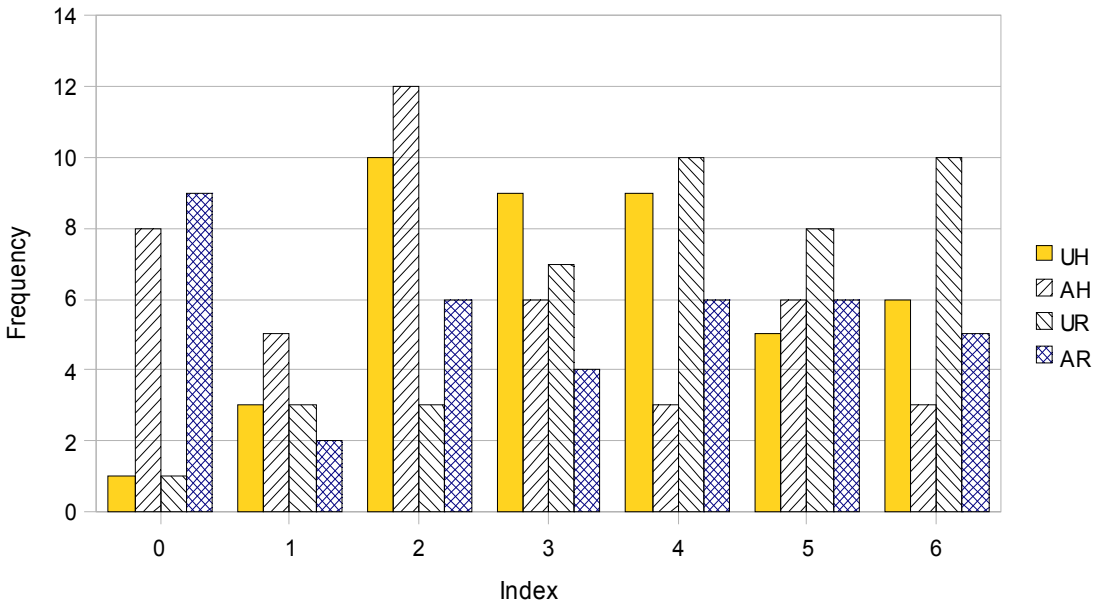

Figure 2: Frequency of Choice for the Conjunctive Prospect
The gray area indicates the control treatment UH. Upwards slashes (/) indicate accountability, downward slashes (\ ) real incentives.

We next examine the influence of the number of extractions, differences in total probability of winning, and differences in probability of extracting a winning ball in a single extraction on decisions. In order to do this, we put the data in a panel format with choices in the six tasks entered as consecutive decisions, and executed a random effects Probit analysis regressing choices on the explanatory variables. As hypothesized, a higher single-extraction probability difference makes a choice of the conjunctive event more likely ($Z=2.17$, $p=0.03$). This effect is qualified by a strong interaction between single-extraction probability and accountability ($Z= -2.65$, $p=0.008$). When subjects are unaccountable, the single-extraction probability difference indeed exerts a strong influence ($Z=3.0$, $p=0.003$). For accountable subjects however this difference disappears ($Z= -0.18$, $p=0.858$). Overall, a high number of extractions in the conjunctive event makes its choice less likely ($Z= -5$, $p=0.000$), while the overall probability of winning does not significantly influence choices ($Z=1.51$, $p=0.132$). There are no significant interactions of the latter two variables with accountability.

	Hypothetical	**R**eal Incentives
Unaccountable	3.42	4.05
Accountable	2.49	2.90

Table 4: Incentive and Accountability Influences on Choices for Simple versus Conjunctive Events
Numbers reported refer to the index described above and represent the average number of conjunctive events chosen by subjects in each treatment.

Discussion

As hypothesized, accountability exerts a strong influence on decisions, increasing the frequency of choices for the superior simple prospect. An immediate suspicion may be that this is just caused by the fact that a choice of he simple event seems somehow easier to justify because of its simplicity. This explanation is however ruled out by findings on choices between simple and disjunctive effects reported by Kruganski & Freund (1983). Indeed, the latter found that when accountable and unaccountable subjects are offered a choice between simple events and compound events of the disjunctive type, accountable subjects choose the superior compound events more often than unaccountable subjects. While this effect can still be explained with anchoring and adjustment (subjects anchor their probability estimate for the compound event at the now lower probability of a single extraction), it is inconsistent with the simple explanation put forward above.

Also, the statistical evidence on the influence of single-extraction probabilities on decisions clearly points in the direction of anchoring and insufficient adjustment as an explanation for the findings. Indeed, the difference in probabilities of extracting a winning ball in a single trial significantly increases choices for the conjunctive event, which indeed indicates anchoring and insufficient adjustment as the mechanism underlying the observed choice behavior. The fact that such effects are strong for unaccountable subjects but absent for accountable subjects further confirms the interpretation that accountability increases adjustment away from the anchor.

Surprisingly, incentives are found to have the opposite effect, increasing choices for the conjunctive prospect, although the effect is less strong than for accountability. Indeed, incentives produce an effect size of r=0.16 compared to the effect size of r=0.27 of accountability, and when both manipulations are combined the effect of accountability overwhelms the effect of incentives, as can be seen from the comparison of treatments

UH and AR. If both were present in a decision making context, the effect of accountability could thus be expected to overwhelm the negative effect of incentives.

For the particular choice task employed here, incentives are found to make decisions worse by increasing choices for the normatively inferior conjunctive events. Expected value differences between choices are arguably small. One could thus conceivably argue that the difference in incentives may not be large enough to cover subjective costs involved in the probability calculations (Harrison, 1994). This does however not explain why incentives have here an opposite effect, directing decisions away from rationality. The latter fact may be explained by some recent evidence that at least in some instances monetary payoffs may trigger emotional reactions (Camerer, 1995; Loewenstein, 2000; Rottenstreich & Hsee, 2001), and can thus lead to increased heuristic processing. It remains however to be seen whether larger monetary differences would induce subjects to take better decisions, or whether irrationality would be accentuated.

An alternative hypothesis suggested by an anonymous referee is that subjects may be afraid of "sudden death" in the single-extraction alternative. In settings where the choices are played out for real, the simple prospect ends after the first and only extraction, delivering a verdict that the subject has either won or lost. The compound prospect on the other hand drags out the outcome determination process, and may thus appear preferable when choices are played out for real. This should on the other hand not play a role under accountability alone, since decisions are not actually played out. This hypothesis can be tested by running a condition in which the decision is played out at once using the probabilities resulting from the contraction of the compound prospect. A closer investigation of the causes underlying the effect of incentives found is however left for future research.

The opposite effects of accountability and monetary incentives found may have important implications for the analysis of real-world decisions. Anchoring and insufficient adjustment has been used to explain the conjunction fallacy (Tversky & Kahneman, 2002), to model ambiguity aversion (Einhorn & Hogarth, 1985; Hogarth & Einhorn, 1990), and to explain poor articulation of preferences (Slovic, 1995). Anchoring and adjustment has also been used to explain how people predict the preferences of their

spouse (Davis, Hoch, & Ragsdale, 1986), how consumers evaluate product bundles (Yadov, 1994), for property pricing decisions (Northcraft & Neale, 1987), for purchase quality decisions (Wansink, Kent, & Hoch, 1998), and for a host of other issues. The effects of accountability and incentives found may thus lead to differential predictions for those phenomena according to the measure in which the two elements affect the decisions involved.

Consistently with our findings, accountability has been found in the literature to improve decisions in choices between simple and compound events (Kruglanski & Freund, 1983). The evidence on the effects of incentives on anchoring and adjustment on the other hand is more mixed. The latter fact is partially due to the distinction between internally generated and externally given anchors in the anchoring and adjustment literature (Epley & Gilovich, 2001; Strack & Mussweiler, 1997). This distinction in turn has been based at least in part on the differential effect of incentives found for the two mechanisms (Chapman & Johnson, 2002; Epley & Gilovich, 2005). The distinction between internally generated and externally given anchors seems however to have been exaggerated (Simmons *et al.*, 2006), and there may be other reasons for the differential effects of incentives on anchoring found in the literature.

Indeed, most of the judgment tasks previously used in the anchoring and adjustment literature have the limitation that they cannot be incentivized in an incentive-compatible way. Only the best estimates in a group of people are typically rewarded, which may have led to strategic behavior of subjects. Also, the particular incentive structure employed has led to a covariation of accountability with incentives—even though the accountability that is at stake is of the implicit kind, and thus likely less strong than the explicit kind used in the present study. For instance, Epley & Gilovich (2005) vary accountability together with incentives while studying the effect of the latter on adjustment from an anchor. While subjects in the hypothetical condition remain anonymous, subjects in the incentive condition are asked to report their names and addresses on the experimental questionnaire so that they can be contacted. Similar problems also occur in Wright & Aboul-Ezz (1988), Wright & Anderson (1989), and Simmons *et al.* (2006).

4. General Discussion

The results of the two experiments presented above show that financial incentives and accountability may provide a different kind of motivation to decision makers at least in some instances. While incentives are not found to have any effect on within subject preference reversals between frames, accountability is shown to reduce such preference reversals and increase coherence between frames. Similarly, accountability and incentives seem to activate different motivations in choices between simple and compound events. While incentives increase the choice frequency of compound events, accountability favors choices of the normatively superior simple event. Beyond and above the potential explanations of such differential effects discussed above, this evidence goes to show that accountability and incentives may produce different motivations, thus influencing decisions in different directions.

The differential effects found underline the importance of gaining a clear understanding both of the separate effects of incentives and accountability, and of their interaction. Such an understanding seems indeed valuable when it comes to the applicability of findings from the experimental economics laboratory to the real world, where these different motivations may often coexist and have different degrees of importance. Furthermore, the results obtained point in an interesting new direction as far as the debiasing of decision making processes and the design of optimal institutions is concerned—the careful combination of market incentives and accountability structures. In this sense, we belief that economics could generally benefit from a more general awareness of accountability issues, which can be assumed to be important in many of the real-world interactions that economists study.

It seems important to note that the point of these findings is not to dispute the importance of real incentives in experiments. To the contrary, the results constitute a warning for scholars who try to generalize their hypothetical experimental results to the real world. Since monetary incentives are shown to often have effects on the decision making process, the absence of salient real incentives from experiments threatens experimental control and may impact the external validity of such experiments. At the same time, there is a strong message for scholars who want to study the effect of incentives—the choice of how to design the experiment and what level of obersvability to

implement will be important for the generalizability of any findings to the real world. An explicit discussion of the level of accountability in the experiment, and how that accountability relates to real-world situations thus seems desirable.

Accountability may sometimes have acted as a confound in past studies about the effect of real incentives. Indeed, while hypothetical treatments do create a situation of anonymity for subjects, real decisions are often played out in front of the experimenter, so that an accountability confound may have occurred. Sometimes such a confounding of accountability and incentives can be deduced from the description of experimental procedures in the paper (e.g. in Burke *et al.*, 1996; Epley & Gilovich, 2005; Libby & Lipe, 1992; Simmons, LeBoef, & Nelson, 2006; Slovic, 1969; Wright & Anderson, 1989). For instance, Epley & Gilovich (2005) vary accountability together with incentives while studying the effect of the latter on adjustment from an anchor. While subjects in the hypothetical condition remain anonymous, subjects in the incentive condition are asked to report their names and addresses on the experimental questionnaire so that they can be contacted—a manipulation that has been found to be sufficient by itself to generate accountability pressures (see e.g. Trautmann, Vieider, & Wakker, 2008, study 1).

If such a confound should indeed be present, it may then be difficult to draw causal conclusions from the results of the study. Accountability variations that have occurred in practice while studying incentives are however likely to be much weaker and of a more implicit kind than the strong explicit manipulation employed in the experiments of this paper. Indeed, the latter has been used with the purpose of proving a general point. Nevertheless, it seems desirable to avoid such covariation of even implicit kinds of accountability with incentives as much as possible in order to keep control over the experimental process.

5. Conclusion

The present study examined the separate impact of accountability and financial incentives in typical individual decision making tasks. Conducting experiments in which accountability and monetary incentives are carefully kept apart we demonstrated that they may indeed have different, and even opposite, effects. This shows the importance of

awareness of the potential importance of social effects when using effects found in the laboratory to infer conclusions about the real world. To the degree in which accountability is present in real world situations but not in the laboratory, such direct inferences may be of limited applicability as long as the interaction of incentives and accountability is not better understood.

The results obtained have also a more general relevance for economic theory at large. Given that social motivations appear to play a strong role in human decisions making processes, it seems desirable to take them more explicitly into account when formulating economic theories. Also, a better empirical understanding of their separate effects, and even more importantly of their interaction, could lead to the design of better institutions that may lead people to spontaneously make better decisions. Explicit provisions about accountability may also help the effort of designing better contracts in situations of incomplete knowledge or asymmetric information such as encountered in principal-agent relationships.

Appendix A: Experimental Manipulations

Hypothetical Unaccountable:
There are no right or wrong answers to the questions we ask. We are only interested in your choices. Please do however think carefully before indicating your choice, since the answers you provide are important and may be used for developing policy recommendations. Your answers cannot be traced back to you and it is important for us that they stay **completely anonymous**. Please also note that in all the choices below you are asked to imagine to play the games, but that the games **will not** actually be played out for real money (as a matter of fact, they won't be played at all).

Once you are done filling in all the questions, please put the filled-in questionnaire into the cardboard box next to the door. The experimenter will then pay you the €15 for your participation and you can leave.

Hypothetical Accountable:
There are no right or wrong answers to the questions we ask. We are only interested in your choices. Please do however think carefully before indicating your choice, since the answers you provide are important and may be used for developing policy recommendations. Please also note that in all the choices below you are asked to imagine to play the games, but that the games **will not** actually be played out for real money (as a matter of fact, they won't be played at all).

Once you are done filling in all the questions, please raise you hand and an experimenter will approach you. You can then leave the room with your questionnaire and go to another room, where another experimenter will be waiting for you. That second experimenter will interview you in detail about the **reasons for your choices**. This interview is meant to assess the reasoning that has lead you to make each single decision. Once the interview is over, the experimenter will pay you the €15 for your participation and you can leave.

Real Incentives Unaccountable:
There are no right or wrong answers to the questions we ask. We are only interested in your choices. Please do however think carefully before indicating your choice, since the answers you provide are important and are used for developing policy recommendations. It is important for the experiment that the answers you provide will stay **completely anonymous**.

Once you are done filing in all the questions, you can deposit your questionnaire in the cardboard box next to the exit. After that, please go back to your seat and wait for further instructions from the experimenter.

Please note that some participants will be selected to play out their choices in the following experiments for **real money**. Specifically, 1 out of 5 participants will be selected to play one choice for real money (see below for the procedure). Then, it will be randomly determined which experiment will be played out for real. Since you do not

know in advance which one of the questions will be selected for real play, you should think about each one in turn as if it is the only one on which your payment depends.

Since it is very important for us not to know who plays the games for real, we have devised the following mechanism. A sheet with a randomly determined number is stapled to your instructions. Please tear that sheet off and keep it to yourself. The experimenter has a bag with corresponding numbers. Once everybody is back in the room after the interview, the experimenter will extract some numbers from his bag for real play. Please note that the experimenter does have no way to associate such a number with you personally, and that you are thus completely anonymous at this point.

The experimenter will then announce the number extracted and play out the choices that are selected. Everybody will have to stay until the end of the entire procedure. Please do not make yourself known if your number is extracted! Whatever is won from the extractions will be put in an envelope with the corresponding number. These envelopes will then be handed by the experimenter to the secretary on the 11th floor of the H-building (H11-2) immediately after all games have been played. You can then pick up the envelope with the money at the secretariat by presenting the number corresponding to the envelope.

Real Incentives Accountable:
There are no right or wrong answers to the questions we ask. We are only interested in your choices. Please do however think carefully before indicating your choice, since the answers you provide are important and are used for developing policy recommendations.

Once you are done filling in all the questions, please raise you hand and an experimenter will approach you. You can then leave the room with your questionnaire and go to another room, where another experimenter will be waiting for you. That second experimenter will interview you in detail about **the reasons for your choice**. This interview is meant to assess the reasoning that has lead you to make each single decision.

Please note that some participants will be selected to play out their choices in the following experiments for **real money**. Specifically, 1 out of 5 participants will be selected to play one choice for real money (see below for the procedure). Then, it will be randomly determined which experiment will be played out for real. Since you do not know in advance which one of the questions will be selected for real play, you should think about each one in turn as if it is the only one on which your payment depends.

Since it is very important for us not to know who plays the games for real, we have devised the following mechanism. A sheet with a randomly determined number is stapled to your instructions. Please tear that sheet off and keep it to yourself. The experimenter has a bag with corresponding numbers. Once everybody is back in the room after the interview, the experimenter will extract some numbers from his bag for real play. Please note that the experimenter does have no way to associate such a number with you personally, and that you are thus completely anonymous at this point.

The experimenter will then announce the number extracted and play out the choices that are selected. Everybody will have to stay until the end of the entire procedure. Please do not make yourself known if your number is extracted! Whatever is won from the extractions will be put in an envelope with the corresponding number. These envelopes will then be handed by the experimenter to the secretary on the 11th floor of the H-building (H11-2) immediately after all games have been played. You can then pick up the envelope with the money at the secretariat by presenting the number corresponding to the envelope.

Appendix B: Choices between Simple and Compound Prospects

Below 6 hypothetical problems are presented to you. Each one of them involves choosing between an option that involves one single extraction from a bag and one that involves multiple extractions from a different bag. In the multiple extraction option, the poker chip you have extracted will be placed back in the bag and the chips in the bag will be mixed before you extract again, so as to keep the composition of the bag constant. This holds true for all the problems below. Please pay attention however to both the composition of the bags and the number of extractions, which vary across problems. Your answers will be completely anonymous.

Problem 1
Imagine you were given a choice between two options to win €20. Option A involves extracting one chip from a bag containing 10 red and 10 green chips. If you extract a red chip, you win €20; if you extract a green chip, you win nothing. Option B involves extracting 7 chips in sequence with replacement from a bag containing 18 red chips and 2 green chips. If all 7 chips extracted are red you win €20; if one or more of the chips extracted are green, you win nothing. What would you choose?

- Option A (extract 1 time from a bag with 10 red and 10 green chips, win if red)
- Option B (extract 7 times from a bag with 18 red and 2 green chips, win if 7 times red)

Problem 2
Imagine you were given a choice between two options to win €20. Option A involves extracting one chip from a bag containing 5 red and 15 green chips. If you extract a red chip, you win €20; if you extract a green chip, you win nothing. Option B involves extracting 5 chips in sequence with replacement from a bag containing 15 red chips and 5 green chips. If all 5 chips extracted are red you win €20; if one or more of the chips extracted are green, you win nothing. What would you choose?

- Option A (extract 1 time from a bag with 5 red and 15 green chips, win if red)
- Option B (extract 5 times from a bag with 15 red and 5 green chips, win if 5 times red)

Problem 3
Imagine you were given a choice between two options to win €20. Option A involves extracting one chip from a bag containing 5 red and 15 green chips. If you extract a red chip, you win €20; if you extract a green chip, you win nothing. Option B involves extracting 7 chips in sequence with replacement from a bag containing 16 red chips and 4 green chips. If all 7 chips extracted are red you win €20; if one or more of the chips extracted are green, you win nothing. What would you choose?

- Option A (extract 1 time from a bag with 5 red and 15 green chips, win if red)
- Option B (extract 7 times from a bag with 16 red and 4 green chips, win if 7 times red)

Problem 4

Imagine you were given a choice between two options to win €20. Option A involves extracting one chip from a bag containing 2 red and 18 green chips. If you extract a red chip, you win €20; if you extract a green chip, you win nothing. Option B involves extracting 4 chips in sequence with replacement from a bag containing 10 red chips and 10 green chips. If all 4 chips extracted are red you win €20; if one or more of the chips extracted are green, you win nothing. What would you choose?

- Option A (extract 1 time from a bag with 2 red and 18 green chips, win if red)
- Option B (extract 4 times from a bag with 10 red and 10 green chips, win if 4 times red)

Problem 5

Imagine you were given a choice between two options to win €20. Option A involves extracting one chip from a bag containing 4 red and 16 green chips. If you extract a red chip, you win €20; if you extract a green chip, you win nothing. Option B involves extracting 6 chips in sequence with replacement from a bag containing 15 red chips and 5 green chips. If all 6 chips extracted are red you win €20; if one or more of the chips extracted are green, you win nothing. What would you choose?

- Option A (extract 1 time from a bag with 4 red and 16 green chips, win if red)
- Option B (extract 6 times from a bag with 15 red and 5 green chips, win if 6 times red)

Problem 6

Imagine you were given a choice between two options to win €20. Option A involves extracting one chip from a bag containing 6 red and 14 green chips. If you extract a red chip, you win €20; if you extract a green chip, you win nothing. Option B involves extracting 2 chips in sequence with replacement from a bag containing 10 red chips and 10 green chips. If all 2 chips extracted are red you win €20; if one or more of the chips extracted are green, you win nothing. What would you choose?

- Option A (extract 1 time from a bag with 6 red and 14 green chips, win if red)
- Option B (extract 2 times from a bag with 10 red and 10 green chips, win if 2 times red)

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