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Separating Real Incentives and Accountability

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Abstract

In experimental investigations of the effect of real incentives, accountability—the implicit or explicit expectation of a decision maker that she may have to justify her decisions in front of somebody else—is often confounded with the incentives themselves. This confounding of accountability with incentives makes causal attributions of any effects found problematic. 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 simple event, while incentives have a weaker effect going in the opposite direction. It is thus shown that the confounding of accountability and incentives is relevant for studies on the effect of the latter, and that existing conclusions on the effect of incentives need to be reconsidered in light of this issue.

JEL classification: C91, D71, D81, Z13

Key words: Real v. hypothetical incentives; experimental economics; accountability; dual processing models; 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, 1982; Smith & Walker, 1993), although the actual effect of incentives in different situations is sometimes still debated (Camerer & Hogarth, 1999; Hertwig & Ortmann, 2001; Loewenstein, 1999). Social influences on individual decisions studied in social psychology on the other hand have not received much attention from experimental economists, or from psychologists studying the effects of incentives. Accountability—the implicit or explicit 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 (Lerner & Tetlock, 1999).

When investigating the effects of incentives, accountability is often a confound. Hypothetical conditions provide for more anonymity than games that are actually played out in front of the experimenter, so that accountability is varied together with incentives in studies concerning the latter. An unaccountable hypothetical treatment is thus generally compared to a treatment in which outcomes are really paid out and in which accountability is high. While both accountability and real incentives usually trigger higher levels of attention towards the decision making process, confounding the effects of the two makes causal attributions problematic. It may thus be, in principle, that effects traditionally ascribed to real incentives are in fact due to accountability.

To investigate this issue, we separate accountability and incentive variations in typical experimental 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, for which accountability shows no effect. In a choice task between simple and conjunctive prospects (Bar-Hillel, 1973), we find accountability to increase the frequency of choice for the simple prospects. Incentives on the other hand result in more frequent choices of the conjunctive prospects. When accountability and incentives are confounded, 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 to disentangle real incentives and accountability.

The paper proceeds as follows. Section 2 discusses accountability and its effects. Section 3 presents evidence for the confounding of real incentives and accountability. In section 4 dual processing models are discussed as a possible interpretative framework. Section 5 presents the experiment and discusses results for the different tasks employed. Overall results and their implications are discussed in section 6. Section 7 concludes.

2. Accountability

A substantial literature in social psychology shows that *accountability*—the expectation by a decision maker that she may be called upon to justify her behavior in front of others —can substantially affect human decision making processes (Lerner & Tetlock, 1999). Accountability in front of an audience with unknown views generally results in more cognitive effort. More options are considered 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).

Accountability to an unknown audience 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 reduce the fundamental attribution error (Tetlock, 1985), to improve coherence between gain and loss frames (Miller & Fagley, 1991; Takemura, 1993; Takemura, 1994), 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 *et al.*, 1993). In such cases, accountability has been shown to impair decisions e.g. for ambiguity aversion (Curley *et al.*, 1986; Trautmann *et al.*, 2008), for the dilution effect (Tetlock & Boettger, 1989), and for the attraction and compromise effects (Simonson, 1989).

3. Separating Incentives from Accountability

In investigations of the effects of real incentives, manipulations of incentives need to be clearly set apart from other external influences, in order to permit unequivocal causal attributions of any effect that may be observed. Unfortunately, many studies investigating the effects of real incentives on decisions co-vary accountability with incentives. The undetected manipulation of accountability in incentive studies may cast doubt on the results obtained, all the more so since it is not clear whether accountability might reinforce any potential effects of incentives or attenuate them. In other words, this co-variation implies a loss of control over the experimental conditions (Harrison, 1994; Smith, 1982).

Sometimes the confounding of accountability and incentives can be clearly deduced from the letter of the paper (e.g. in Epley & Gilovich, 2005; Simmons *et al.*, 2006; Wright & Anderson, 1989). This covariation probably occurs for many more studies that vary incentives, and one may assume that it occurs in the majority of cases where it does not emerge clearly from the text that accountability variations have been controlled for. This suspicion is justified by the fact that controlling for accountability generally calls for special experimental procedures to be implemented—procedures that, if applied, could be reasonably expected to emerge from the description of the experimental method. Examples where such controls are implemented and can be deduced from the description of the experimental method are Wilson *et al.* (1996) and Wiseman & Levin (1996).

4. Dual Processing Theories: An Interpretative Framework

Recent theorizing in psychology points in an interesting direction regarding mental processes. According to so-called *dual processing theories* (Chaiken & Trope, 1999; Epstein, 2003; Evans, 2003; Kahneman, 2003a,b; Sloman, 2002) different mental processes may be activated in a given decision problem. An emotional or associative system that is located in an evolutionarily older part of the brain is activated together with a rational or rule-based system. The final decision will then result from the interaction of those two systems.

Dual processing theory assumes that different stimuli may activate different mental processes, which in turn may lead to different outcomes of a decision process.

While incentives have generally been found to increase motivation and improve decision making (Davis & Holt, 1993; Harless & Camerer, 1994; Harrison, 2007; Smith, 1982; Smith & Walker, 1993), there is some evidence that high monetary incentives may under certain circumstances trigger emotional reactions which activate the associative reasoning system (Camerer, 1992; Loewenstein *et al.*, 2001; Rottenstreich & Hsee, 2001). Accountability is thought to mostly activate rational mechanisms (Kirkpatrick & Epstein, 1992; Scholten *et al.*, 2007; Vieider, 2007). The latter may however not always result in better decisions being taken (Dijksterhuis, 2004; Simonson & Nye, 1992; Wilson & Schooler, 1991).

Additional evidence in favor of dual processing theories can be gathered from recent studies in neuroeconomics (Breiter *et al.*, 2001; Fehr & Camerer, 2007; Sanfey *et al.*, 2006). Indeed, susceptibility to framing effects has been found to be associated with increased activity in parts of the brain that are associated with emotional processes (the *amygdala*), while decreased susceptibility to framing effects has been found to be associated with activity in parts of the brain thought responsible for rational processing (De Martino *et al.*, 2006; McElroy & Seta, 2003; McElroy & Seta, 2004). Indications of an increased role of the amygdala in emotional reactions also come from the absence of skin conductance responses in patients whose amygdala is damaged (Bechara *et al.*, 1999).

5. Experiments

5.1 General Structure

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

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: 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 interview them about 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).

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 ($Z=3.396$, $p=0.0007$). Also, the time it took subjects to complete the questionnaire was measured. 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 ($Z=5.839$, $p=0.0000$).

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). In the real incentives treatments they were told to return to their seats after they had been paid their participation fee (and after they had been interviewed in the accountable treatment).

Monetary incentives were implemented using a random incentive mechanism (Abdellaoui *et al.*, 2007; Harrison *et al.*, 2002; Holt & Laury, 2002; Myagkov & Plott, 1997). Its equivalence to a single and payoff relevant decision task has been empirically tested and confirmed (Hey & Lee, 2005; Lee, 2008; Starmer & Sugden, 1991). This manipulation did allow us to use high monetary incentives to test for potential emotional reactions. One out of five subjects was selected for real play, and then one of the tasks was randomly selected for real play. 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 *et al.*, 2007).

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 accountability in the real incentive unaccountable treatment. Also, the procedure was kept intact for the accountable and real incentives 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, 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. These tasks are described next.

5.2 The Framing Effect

Introduction

Different but normatively identical formulations of decision problems have consistently been found to influence choice patterns in a variety of situations. The most famous such situation is the Asian disease problem (Tversky & Kahneman, 1981). Subject are asked to prepare for the outbreak of a new Asian flue 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* (Kühberger, 1998).

The Asian disease problem as described has been shown to have a number of confounds that may reinforce the observed decision pattern. Similar results have however also been obtained with equally structured monetary prospects that avoid most of those issues. The latter furthermore have the advantage of permitting the use of real incentives.

Method

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 incentives possible. Subjects could win €25 in expected value. 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 and 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 and playing a prospect with a 75% probability of losing €20 and a 25% probability of losing nothing.

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 accountable and unaccountable subjects overall (aggregated across incentive levels) 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 (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].

Table 3 presents statistical comparisons treatment by treatment, which permit some additional insights into what is driving the results. Under hypothetical conditions, unaccountable subjects commit more preference reversals than accountable subjects, an effect that is marginally significant. A similar marginally significant result of accountability is obtained under real incentives. Incentives on the other hand are not found to affect preference reversals between frames.

[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). According to Cohen's (1988) classification, effect sizes of approximately r=0.10 can be seen as small, r=0.25 as medium, and r=0.38 as large, even though this scale should be used with caution.

Treatments	Statistics	Treatments	Statistics
UH > AH:	p=0.066, Z=1.502 r=0.16	AH =UR:	p=0.119, Z=−1.181 r=0.13
UH = UR:	p=0.377, Z=0.316 r=0.03	AH = AR:	p=0.403, Z=0.247 r=0.03
UH > AR:	p=0.045, Z=1.697 r=0.2	UR > AR:	p=0.083, Z=1.386 r=0.16

Table 3: Treatment by Treatment Comparison of Framing Effects
The inequality signs are used to indicate that there are more (>) or fewer (<) preference reversals in the first treatment than in the second; the equality sign (=) stands for no statistically significant difference; p-values reported are all one-sided.

An interesting insight is gained by considering the gain and loss frame separately and treating them as between subject data. 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 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).

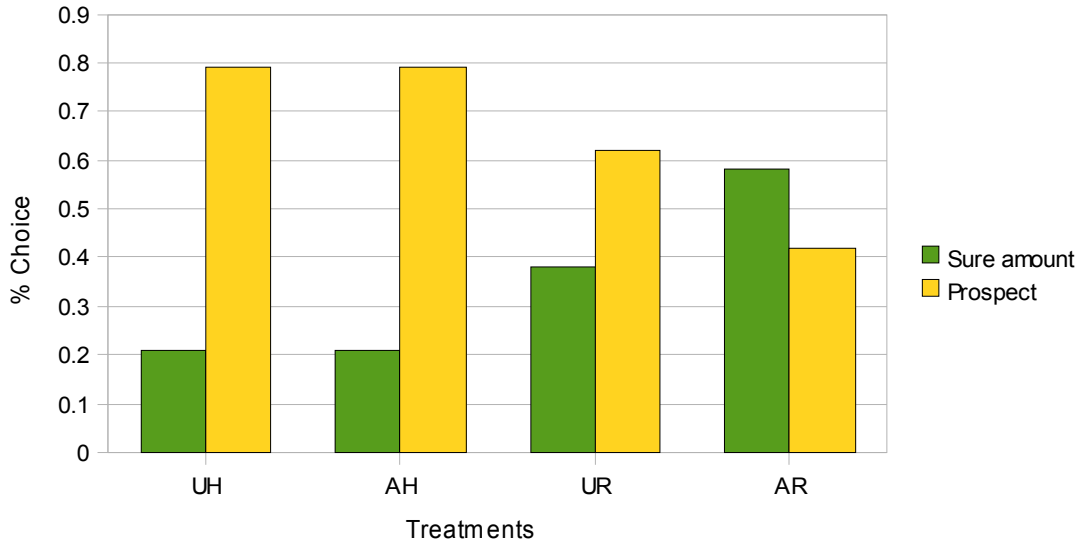

Figure 1: Preferences for the Sure Amount versus Prospect in the Loss Frame

Discussion

Accountability pressures improve the rationality of subjects and make them 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. These findings are consistent with some previous studies (Kühberger *et al.*, 2002, Takemura, 1993). Since incentives *per se* do not have an effect on the occurrence of preference reversals between the frames, there are no interaction effects to speak of that one could study. However, if accountability should be varied together with incentives in an experimental test of the latter, there is a risk that any improvement in decision making found may be attributed to incentives instead of accountability, as can be seen from the comparison of the UH and AR treatments, where the effect is indeed strong.

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 *et al.*, 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 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. This interaction effect would thus reinforce the effect of incentives if accountability and incentives should be confounded.

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; see also Sieck & Yates, 1997). Framing effects have been found to persist under monetary incentives (Kühberger, 1998; Kühberger *et al.*, 2002). The effect of incentives on choices in the loss frame that we found is consistent with the general evidence on strong effects of incentives in decisions involving losses (Cummings *et al.*, 1995; Hogarth & Einhorn, 1990; Horowitz & McConnel, 2002; List & Gallet, 2001). Unlike some of to the evidence on effects of incentives on risk attitude in the gain domain (Burke *et al.*, 1996; Harrison, 1994; Kachelmeier & Shehata, 1992; Slovic, 1969), no effects of incentives are found in the gain frame.

The connection between decreases in framing effects and the activation of rational processes is supported by findings on dual processing systems. McElroy & Seta (2003) found that subjects with predominantly analytic/systematic thinking styles are less affected by framing than subjects with a predominantly heuristic/holistic thinking style. McElroy & Seta (2004) found an association of increased preference reversals and activation of areas of the brain where holistic thought processes take place, while absence of preference reversals is associated with the activation of rational parts of the brain. DeMartino *et al.* (2006) found that decision switching for different frames is associated with increased activity of the amygdala, the part of the brain where emotional processes are supposed to be activated. Decreased susceptibility to framing effects is associated with increased activity in the prefrontal and orbital cortex, the part of the brain where rational processing is thought to take place. Evidence on different thinking styles also derives from Sunghan *et al.* (2005), who found that older adults are more affected by

framing. Older adults have been known to rely more heavily on heuristic thinking than younger adults (Epstein, 2003; Johnson, 1990).

Beyond the interest of these findings for framing effects *per se*, the general message is to be found in the importance of keeping manipulations of accountability and incentives separate. Indeed, accountability appears to act as a motivational trigger for analytic thinking styles that increases the strive for coherence between the two frames. This conclusion is also supported by the finding that subjects take on average much longer to complete their decisions under accountability than when they are unaccountable. Incentives seem to rather focus attention on true preferences in the loss frame. If accountability is confounded with incentives, there is a risk that both effects may be attributed to the latter, a conclusion that is not warranted. Next we proceed to examining a decision problem in which such confounding may have even graver consequences.

5.3 Choice between simple and compound events

Introduction

People have been known to be affected by biases in the evaluation of probabilities of simple versus 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. It seems plausible that this bias in probability assessment is largely due to low cognitive effort, with the implication that accountability should lead to a more thorough assessment of probabilities and hence to a better final estimate. The potential effect of incentives is less clear.

Method

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 A).

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.

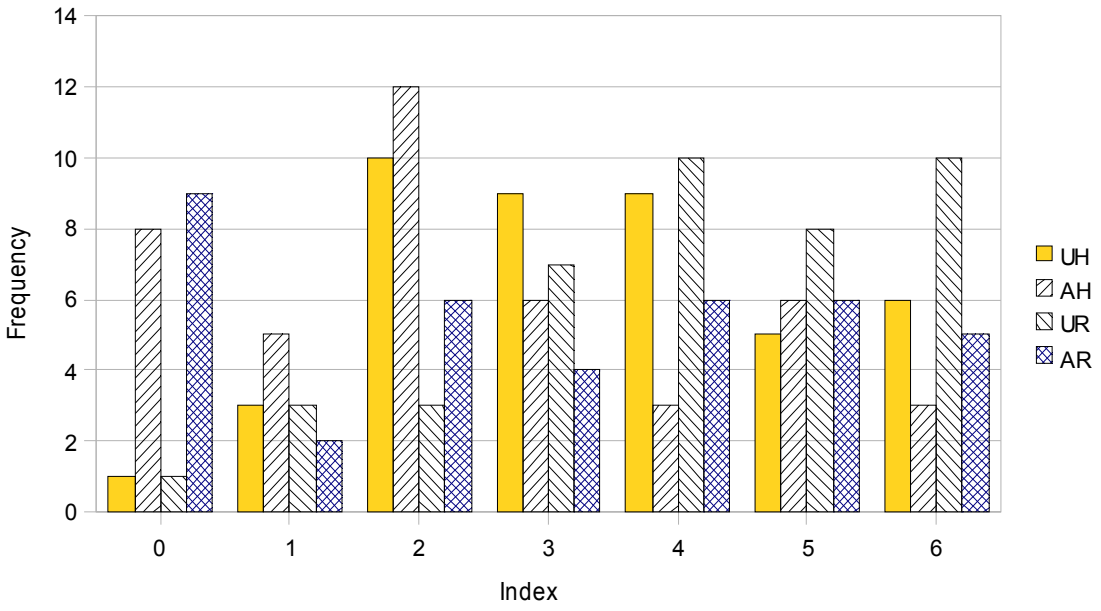

Figure 2: Frequency of Choice for the Conjunctive Prospect
The gray area indicates the control treatment UH. Upwards slashes (/) indicate accountability, downward slashes (\ ) real incentives.

Results

Most subjects chose at least some conjunctive events. This was to be expected, as some probabilities were difficult to calculate and close to the ones of the simple prospects (see appendix A). Overall (aggregating across incentives), 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 ($Z=2.018$, $p=0.0436$; $r=0.16$), although the effect size is much smaller than for accountability. This can be seen also from figures 3a and 3b, which show the aggregated data for the accountability manipulation and the incentive manipulation. 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.

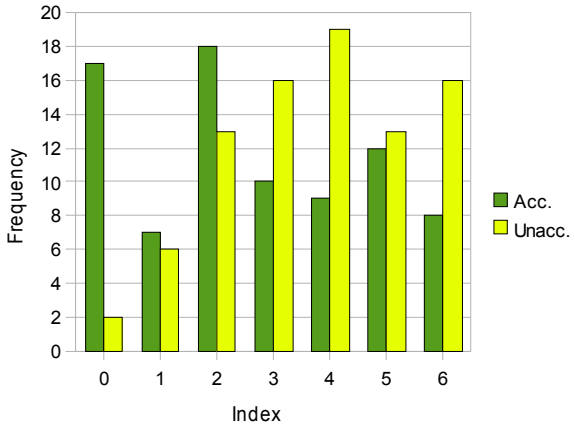

Figure 3a: Overall Effect of Accountability

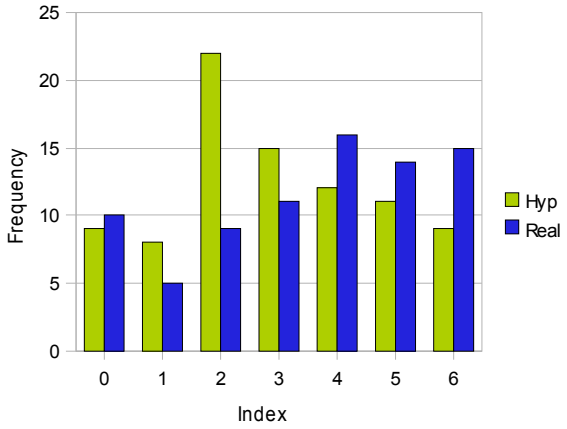

Figure 3b: Overall Effect of Incentives

	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.

Some additional insights can be gained from the treatment by treatment comparison displayed in table 5. In the hypothetical treatments, accountability increases choices for the normatively superior simple prospects. This effect of accountability is replicated under real incentives. For unaccountable subjects, monetary incentives increase choices for the normatively inferior conjunctive prospects. This effect of incentives does however not carry over to accountable subjects, where the effect of incentives seems to be overwhelmed by the strong accountability effect. Since accountability and incentives produce effects in opposite directions, the strongest difference obtains between accountable subjects under hypothetical conditions and unaccountable subjects under real incentives. Passing from unaccountable hypothetical to real incentives under accountability on the other hand does not result in any significant difference as the two effects cancel out.

Treatments	Statistics	Treatments	Statistics
UH > AH:	p=0.007, Z=2.451 r=0.26	AH < UR:	p=0.0001, Z=−3.747 r=0.41
UH < UR:	p=0.029, Z=−1.898 r=0.21	AH = AR:	p=0.19, Z=−0.869 r=0.1
UH = AR:	p=0.15, Z=1.030 r=0.11	UR > AR:	p=0.008, Z=2.406 r=0.27

Table 5: Treatment by Treatment Comparison of Choices for Simple versus Conjunctive Events
The bigger or smaller signs are used to indicate that there are more (>) or less (<) choices for the conjunctive prospects in the first treatment than in the second; the equal sign (=) stands for no statistically significant difference; p-values reported are all one-sided.

Discussion

Accountability exerts a strong influence on decisions, increasing the frequency of choices for the superior simple prospect. Incentives on the other hand increase 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. Confounding accountability and incentives would thus lead to the conclusion that incentives have no effect, a conclusion that is not warranted based on the data presented.

The bias in the evaluation of simple versus compound prospects observed has been attributed in the literature to an anchoring and adjustment process (Holtgraves & Skeel, 1992; Kahneman & Tversky, 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 conjunctive event and 1/10 for a red ball for disjunctive event in the example given in the introduction to the present section—and then fail to adjust these initial estimates to a sufficient degree. Anchoring and insufficient adjustment has been used to explain the conjunction fallacy (Tversky & Kahneman, 2002), the fundamental attribution error (Tetlock, 1985), to model ambiguity aversion (Einhorn & Hogarth, 1985; Hogarth & Einhorn, 1990), and to explain scarce articulation of preferences (Slovic, 1995) and thus preference reversals (Tversky *at al.*, 1988). Anchoring and adjustment has also been used to explain how people predict the preferences of their spouse (Davis *et al.*, 1986), how consumers evaluate product bundles (Yadav, 1994), to criticize contingent valuation studies (Boyle *et al.*, 1997; McCollum, 1997), for property pricing decisions (Northcraft & Neale, 1987), for purchase quality decisions (Wansink *et al.*, 1998), and for a host of other issues. The effects of accountability and incentives found may thus lead to differential predictions 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 increase adjustment away from an anchor, and thus to improve decision making (Kruglanski & Freund, 1983). The evidence on the effects of incentives 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 literature (Epley & Gilovich, 2001; Stack & Mussweiler, 1997). This distinction 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 are 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 obvious covariation of accountability with incentives. 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 *et al.*, 2008a, study 1). Similar problems also occur in Wright & Anderson (1989) and Simmons *et al.* (2006).

If one compares the findings in this paper on the difference between treatments UH and AR to traditional findings in the literature that suffer from the confounding of accountability and incentives, the results are very similar. It emerges however clearly from the data presented above that this null result is due to the fact that the opposite effects of accountability and incentives cancel out. Taken separately, both accountability and incentives are shown to affect the decision making process.

For the particular choice task employed here, incentives are found to make decisions worse by increasing choices for the normatively inferior conjunctive events. Recent studies contain some indication that at least in some instances high monetary payoffs may trigger emotional reactions (Camerer, 1995; Loewenstein, 2000; Rottenstreich & Hsee, 2001), and can thus lead to the activation of the experiential system. An indication in this direction is obtained by a marginally significant effect of age ($p=0.087$), which is consistent with the finding that for adults the reliance on heuristic processing increases with age (Epstein, 2003; Johnson, 1990). A similar effect has been found by Kirkpatrick & Epstein (1992), where the preference of subjects to bet on urns with larger absolute numbers of winning balls even when they offer inferior probabilities is reinforced by monetary incentives. More general implications of these findings are discussed next.

6. General Discussion

Beyond the importance of the present experimental findings for the literature on the decision biases involved, there is a more general lesson to be drawn. The results generally

show the danger to experimentally confound accountability and incentives when trying to test the effect of the latter. Many existing studies on the effects of incentives have that confound.

One should 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 real incentives from experiments threatens to 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—if accountability is not controlled for in such experimental studies, then any effect that is found (or indeed, not found) cannot be attributed to the incentives themselves, but must rather be ascribed to the interaction between incentives and accountability. There is thus a problem of internal validity.

Accountability variations that have occurred in practice while studying incentives are likely to be weaker than the strong manipulation employed in the experiments of this paper. Indeed, the latter has been used with the purpose of proving a general point. However, the effects found for accountability are extremely strong, and it is known in the social psychology literature that even much weaker variations of accountability can produce sizable effects. Unless such variations are carefully controlled for, one can never be completely sure that monetary incentives—and not accountability variations, however small—are at the root of changes in behavior that have been observed.

The experimental controls implemented in this study to separate accountability from incentives are complicated. However, it does not appear necessary to implement such complicated measures for every investigation of real incentives. The most important lesson to be learned is that accountability should be kept constant between hypothetical and real incentive treatments in order to maintain control over the experimental conditions. The level of accountability at which this is done depends mostly on concerns of external validity, and may well be different according to the exact problem investigated. Keeping accountability constant could thus be achieved by playing out choices under both real incentives and hypothetical conditions, as done by Wiseman & Levin (1996). While in the real incentive condition they actually played out choices and

subjects were paid the resulting amount, in the hypothetical condition choices were still played out in front of the experimenter and outcomes were recorded on the instructions. Accountability was thus held constant across conditions. Another type of control was used by Wilson *et al.* (1996). They provided two tasks for both real and hypothetical incentives, one task in which they were truly interested and a filler task. While in one treatment the task of interest was played out, in the other treatment the filler task was played out.

The particular tasks employed may have led to especially strong effects of our manipulations. This is especially true for the choice tasks between simple and compound events, which have a clearly correct answer that can be calculated. Once again it is important to stress how effects of both accountability and incentives can occur for any kind of decision, and how their interaction can fundamentally undermine the finding of a study that co-varies both elements. Indeed, effects of accountability have been found also for problems where no "correct" answer exists (Huber & Seiser, 2001; Ratner & Kahn, 2002; Sedikides *et al.*, 2002), and so have effects of incentives (Harrison, 2007; Slovic, 1969). In which cases one manipulation may have effects and the other one not, or the effect of one manipulation may be overwhelmed by the effect of the other is an empirical question.

7. Conclusion

Traditional studies of monetary incentives are likely to have varied accountability together with monetary incentives, thus making clear causal attributions of any effects found (or not found) problematic. Conducting experiments in which accountability and monetary incentives are carefully kept apart we demonstrated the existence of such confounding effects. Mis-attributions of the effects of accountability to incentives are thus likely to have occurred in the literature. The message is thus that accountability needs to be carefully controlled for in studies of monetary incentives. Based on this evidence, the effects of real incentives may have to be reassessed using careful accountability controls. If accountability and monetary incentives are co-varied, we can only attribute any effect that may be found to the two phenomena jointly, but not to one or the other.

Appendix A: 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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