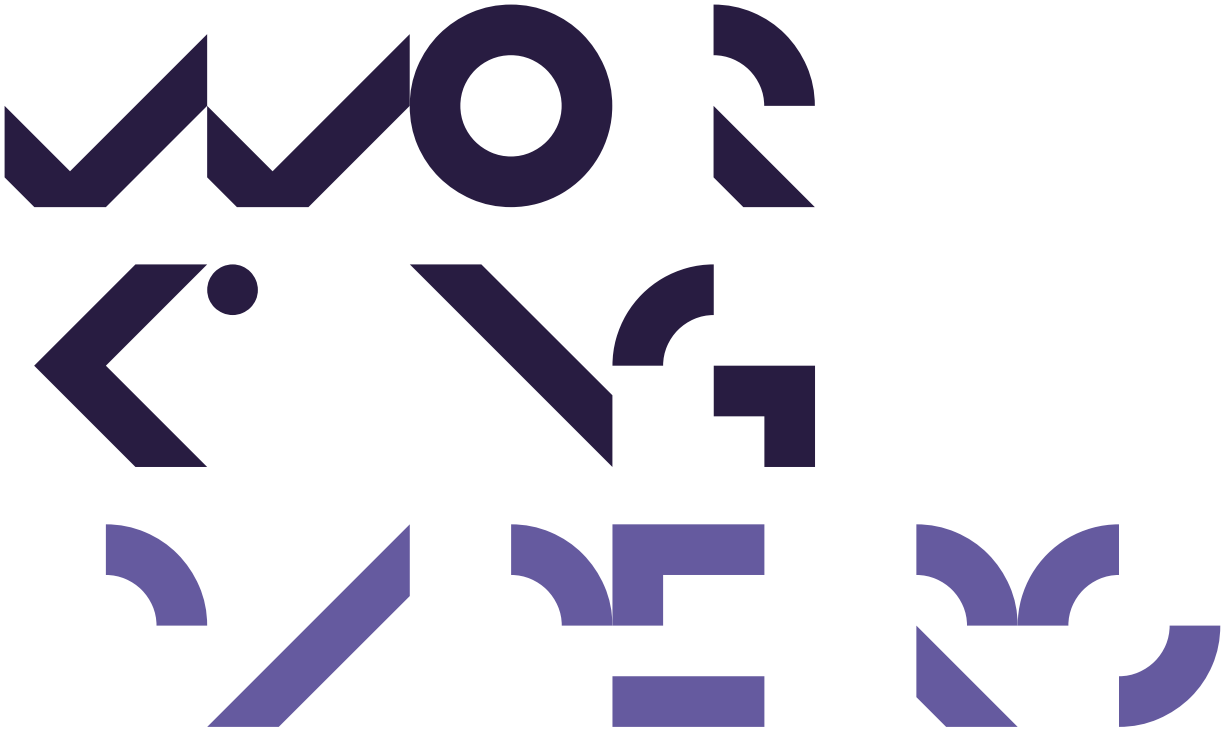

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Correlates of Narrow Bracketing

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Abstract

We examine whether different phenomena of narrow bracketing can be traced back to some common characteristic and whether and how different phenomena are related. We find that making dominated lottery choices or ignoring the endowment when making risky choices are related phenomena and are both associated with low levels of cognitive reflection. In contrast, the phenomena of setting narrow goals or narrow mental budgets seem not to reflect choice errors due to low cognitive reflection, but are tools to overcome self-control problems. Buying small scale insurance is associated with having narrow mental budgets – suggesting that people buy such insurance to insure themselves against the consequences of their own self-control strategy.

JEL Classification: D03, C91, D81, D91

Keywords: Narrow bracketing, mental accounting, risky choices, cognitive skills, self-control

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1 Introduction

It is a puzzle why people often evaluate consequences of choices separately (narrow bracketing) rather than jointly (broad bracketing).[1] Narrow bracketing seem at odds with maximizing behavior, as Read et al. (1999, p.171) note: "Because broad bracketing allows people to take into account all the consequences of their actions, it generally leads to choices that yield higher utility."

But while narrow bracketing typically is considered as an error, it is observed in a wide range of settings, such as consumption decisions or risky choices. Consider the following two examples. First, when making choices in several lotteries, many people tend to evaluate each lottery in isolation from each other, i.e., bracket each lottery narrowly. Such a behavior typically does not maximize expected utility. Rabin and Weizsäcker (2009) theoretically show that if a narrow bracketer does not have CARA preferences, then there exists a pair of independent binary lottery problem where she will make a choice that is first-order stochastically dominated by another. In the most prominent example by Tversky and Kahneman (1981), making the dominant choice is explained by narrow bracketing in conjunction with loss aversion. Second, when buying small scale insurance people seem to ignore the other risks they face in life and their lifetime wealth, i.e., they bracket the insurance decision narrowly. Again, such a behavior typically does not maximize expected utility.

Both examples involve making decisions under uncertainty and seem to involve ignoring some important pieces of information. Thus, the question arises whether these are related phenomena of narrow bracketing and whether the same kind of choice error (caused by the same individual characteristic, like cognitive limitations[2]) or the same behavioral bias (like

[1]The choice bracketing literature goes back to Tversky and Kahneman (1981), Simonson (1990) and Herrnstein and Prelec (1991) (for an overview see e.g. Read et al. 1999; Thaler 1999). The term narrow bracketing goes back to Read et al. (1999). The phenomenon is also referred to as narrow framing (Kahneman and Lovallo 1993), or mental accounting (Thaler 1980, 1985, 1990, 1999). Mental accounting is often associated with how people organize, evaluate, and keep track of their financial activities, but applies also to non-financial activities. Tversky and Kahneman (1981, p.456) use the related term psychological account, defined as "an outcome frame which specifies (i) the set of elementary outcomes that are evaluated jointly and the manner in which they are combined and (ii) a reference outcome that is considered neutral or normal."

[2]Higher cognitive skills typically are correlated with behavior that is more inline with standard economic

loss aversion) drives behavior in both situations. The aim of this paper is to test more generally whether different phenomena of narrow bracketing are related with each other and can be traced back to some common individual characteristics.

In examining the correlation between different phenomena of narrow bracketing, our paper is related to Dean and Ortoleva (2014). They correlate 11 behavioral phenomena (discount rates, risk aversion, present bias, loss aversion, the endowment effect, aversion to ambiguity and compound lotteries, the common ratio and common consequence effects, trust and reciprocity).[3] They claim that observing or not observing certain correlations between these 11 phenomena helps to develop a "parsimonious, general model of economic choice". Our paper is distinct by its focus on narrow bracketing. Yet, it has a similar aim – namely to see whether there is scope for a general model of narrow bracketing.

We conduct a large survey among university entrants at Aarhus University. One part of the survey includes 6 different questions and incentivized tasks related to narrow bracketing. Our first set of questions and tasks relates to risky choices. The so-called ABCD example of Tversky and Kahneman (1981) illustrates a tendency to make choices in isolation when people face several choices over pairs of lotteries. Tversky and Kahneman (1981) report that between 60-73% (dependent on hypothetical stake size) of participants make a choice that is first-order stochastically dominated. Rabin and Weizsäcker (2009) replicate the experiment with real stakes and find that 28-34% violate dominance. With large hypothetical stakes they find that 60% violate dominance. Next, we ask subjects which of 5 small scale insurances (cycle, phone, labtop, travel, baggage) they have ever bought. The expected utility model would predict that the consumer is approximately risk neutral for such small risks and thus does not demand small scale insurance. To explain the demand for small scale insurance one hence needs to assume first-order risk aversion (Segal and Spivak 1990). Such can be

theory (e.g., Frederick 2005, Burks, Carpenter, Goette, and Rustichini 2009, Dohmen, Falk, Huffman, and Sunde 2010, Benjamin, Brown, and Shapiro 2013).

[3]Two other studies use a battery of small experiments and survey questions, link them to outcomes and examine the correlation between different behavioral measures. Yet, none of these focus on mental accounting as the current study does. Reuben, Sapienza, and Zingales (2008) conduct the "Templeton-Chicago's MBAs Longitudinal Study". Elicited measures include cognitive ability, time-, risk- and social preferences, competitiveness and certain personality traits. Burks et al. (2008) elicit measures such as cognitive ability, time-, risk- and social preferences, strategic thinking, overconfidence, and personality traits.

caused by loss aversion in conjunction with making the insurance decision in isolation from other risks or ones' life-time wealth, i.e., in conjunction with narrow bracketing. Further, we elicit loss aversion using price lists. The different lists come with different endowments (so as to offset potential losses). When integrating the endowments some lists yield the same terminal outcomes. Some lists come with different endowments, but show the same lottery, so that terminal outcomes differ. By comparing the choices over the different lists we can observe whether an individual integrates (brackets broadly) the endowment or not.

Our second set of questions and tasks relates to non-risky consumption and investment choices. There has been some discussion that narrow bracketing may help to overcome self-control problems (cf. Read et al. 1999). For example, Camerer et al. (1997) informally discuss that narrowly evaluated goals, such as daily work goals, provide better self-control for people who can freely choose their working hours, like cab drivers. Shefrin and Thaler (1988) model how assigning wealth to distinct, narrow accounts allows consumers to control their short-run urge to overspend. Heath and Soll (1996) document how people control their expenditures in mental accounts for narrowly defined categories, such as entertainment, clothing, or food. We include two questions that take up these ideas. First, we ask subjects whether they use mental budgets for expenditures. While the above literature suggests that such mental budgets arise because of self-control problems, there is also some literature that suggest that they might simply be a choice error. In a theoretical model, Gilboa, Postlewaite, and Schmeidler (2010) point to the computational complexity of the consumer's problem as a reason for mental budgets. In line with this, Abeler and Marklein (2010) observes that having narrow mental budgets is related to lower mathematical skills. The second question relates to the idea that narrow goals can help students to achieve self-control. A broad goal allows the individual to slack off and tell himself that he will make up for today's shortfall by working harder tomorrow – a narrow goal precludes such excuses (for a theoretical model see Koch and Nafziger 2014, 2015). Accordingly, we ask subjects how they plan their examination preparation for a fixed number of tasks: set daily, weekly, overall or no goals.

Finally, we included the "lost ticket versus lost money question" by Kahneman and Tversky (1984), which aims to examine whether or not people use narrow, topical accounts. They observe that many people are willing to pay 10$ for a theater ticket if they just lost 10$. But much fewer a willing to pay 10$ for another ticket if they lost the ticket. They explain this

by the fact that when buying a ticket, people open a mental account for the play in which they evaluate the costs of the ticket against the benefits of the play. Paying the price twice does not balance the benefits. In contrast, the loss of the 10$ is not posted to the mental account "theater play" and thus evaluated independently of the play.

Next to these different phenomena of narrow bracketing, we elicit a range of background characteristics that the literature associates with narrow bracketing. Read et al. (1999) discuss that narrow bracketing may arise because of cognitive capacity limitations, cognitive inertia, pre-existing heuristics, or for motivational reasons. Thus, first, we ask subjects about their math grades. Those can be seen as a proxy for intelligence and cognitive limitations. Second, to test for motivational bracketing, we use the brief self control scale by Tangney, Baumeister, and Boone (2004). The scale measures to which extend an individual exercises self-control. Third, subjects perform the cognitive reflection test by Frederick (2005). In the CRT, the answer to a simple math exercise that jumps first into ones head is wrong. Subjects with lower CRT scores are typically more impatient and more impulsive (Frederick 2005) and this in turn might be related to cognitive inertia. Most university students should have the cognitive capacities to solve the simple math equations of the cognitive reflection test correctly. Yet, the way the problem is presented to them let many people choose the impulsive answer. Such unreflected decision making out of an impulse seems closely related to the form cognitive inertia that Read et al. (1999) discuss as a possible cause for narrow bracketing. According to them cognitive inertia reflects the tendency to make decisions according to the way they are presented. And lastly, we elicit loss aversion using price lists because narrow bracketing is often tightly linked to the value function of Kahneman and Tversky 1979[4]).

We observe that females are more prone to narrow bracketing and that almost all[5] phenomena of narrow bracketing are associated with the tendency to give the impulsive answer in the cognitive reflection test. Yet, some of these correlations disappear when including both self-control and cognitive reflection in the regressions – indicating different channels through which cognitive reflection is associated with the different narrow bracketing phenomena.

[4]See, e.g., Thaler (1999) for a discussion. He states that "role of the value function in mental accounting is to describe how events are perceived and coded in making decisions".

[5]Having a topical account for the theater play is unrelated to all other variables.

Making dominated choices in a pair of subsequent lotteries comes in hand with narrow bracketing of the endowment. In both cases, subjects seem to ignore important pieces of information. The correlation with low cognitive reflection suggests that such ignorance arises because narrow bracketers have a tendency to make decisions too impulsively and are prone to cognitive inertia.

One would expect that these narrow bracketing phenomena in risky environments are also correlated with buying small scale insurance. Theory suggests that individuals buy small scale insurance because they do not integrate other risks they face in life or their lifetime wealth when making the decision to buy small scale insurance. Yet, our results suggest that buying small scale insurance is a different phenomenon: There is no correlation between buying small scale insurance, making the dominated choice and ignoring the endowment. Buying small scale insurance however is correlated with having narrow mental budgets for expenditures. Having a narrow mental budget for, e.g., traveling implies that an individual ignores his overall wealth and, e.g., would not pay again for a flight if he missed it – even if he could afford it. Buying small scale insurance hence insures against one's self-imposed narrow mental budgets. Thereby, our result is suggestive for the interpretation that one behavioral anomaly leads to another.

Finally, as hypothesized above, having narrow study goals or setting narrow mental budgets appear indeed to be self-regulation tools. People with higher perceived self-control are more likely to set narrow goals and narrow mental budgets. Further, self-control, not cognitive limitations/inertia seem to be the predominant motive for narrow goals/budgets. Specifically, the negative raw correlation between narrow goals/budgets and cognitive reflection disappears in a regression where the self-control score is included. To understand this note that low cognitive reflection scores mirror impulsiveness/impatience. And people with a lower cognitive reflection score, i.e., people who are more impulsive have higher scores on the brief self-control scale, i.e., recognize a higher need to self-regulate. The more impulsive/impatient, the bigger the self-control *problem* and the higher the need to exercise self-control (as measured by the self-control scale) and the more likely the individual is to tackle the self-control problem with narrow goals/budgets.

2 Experimental Design

The study is part of a survey administered to all first year students at Business and Social Science, Aarhus University, Denmark in Fall 2013 (the full survey is described in Epper, Koch, and Nafziger 2015). The survey consisted of several incentivized parts and a questionnaire. The survey ran online using the Qualtrics survey software. A total of 643 participants (response rate 21%) completed the entire survey. Average earnings for the entire survey were 148 kr. (approx 22$). In the following, we describe only those tasks that are relevant for the current study.

2.1 Relevant individual characteristics and skills

Cognitive skills We ask subject about their Math grade in the university qualifying exam (where $1 = F, 2 = E, \ldots, 6 = A$). Further, participants complete the cognitive reflection test (CRT) by Frederick (2005). The task is incentivized in that participants receive 2 kr. for each correct answer. In the CRT, the "impulsive" answer to a simple math exercise is wrong. For example, the impulsive answer to the question "'A bat and a ball cost 110 kr. in total. The bat costs 100 kr. more than the ball. How much does the ball cost?" is 10 kr., while the correct answer is 5 kr. There are 3 such questions in total. The variable 'CRT' measures the number of correct answers a subject gives.

Self-control We include the brief self-control scale (Tangney, Baumeister, and Boone 2004). The scale consists of 13 statements, which relate to the perceived ability of an individual to exercise self-control, such as the ability to break habits, resist temptation and keep good self-discipline. It includes questions such as "I am good at resisting temptations" or "Pleasure and fun sometimes keep me from getting work done". Summing up the ratings and standardizing by 13 provides the variable 'BSC' ranging from 1 to 5.76, where higher values indicate higher self-control.[6]

[6]The BSC scale correlates in our survey with e.g., BMI, grades, length of gaps between high school and university.

Risk preferences We elicit risk preferences with price lists. Upon entering this part of the survey, subjects receive the information that they will face 9 questions in which they have to make a choice between an Alternative A and B. The order of the questions is randomized. Under Alternative A they get an amount of money for sure. Under Alternative B the amount of money is uncertain: with probability 0.5 the subject receives x_1 and with probability 0.5 he receives x_2. Questions are associated with different endowments (w). If Alternative B involves losses, any such loss would be deducted from the endowment. Tables 1-3 list the nine lotteries grouped by terminal outcome ($t_1 = w + x_1$ and $t_2 = w + x_2$).
After subjects answered all 9 questions, the computer randomly selects one of them as the 'question that is paid'. Each question is equally likely to be selected. For the 'question that is paid' the computer randomly selects one of the rows from the list in that question as the 'row that counts'. Each row is equally likely to be selected. For the row that counts the computer checks whether the participant liked Alternative A or Alternative B better. If he liked Alternative A better, then he gets the sure amount that is listed in that row. If he liked Alternative B better, then the computer randomly selects the outcome for this alternative. The specific price lists are designed by Epper (2015), who outlines also how to estimate the loss aversion parameter (λ) from these choices (We use the parameter λ_{nl} from his estimation). Note that $\lambda > 0$ means that the individual is loss averse, while $\lambda < 0$ means that the individual is gain seeking.

Table 1: Lottery Configuration 1

Type	LotteryID	w	x_1	x_2	Pr	t_1	t_2	EV	$EV + w$	Spread
loss	1	80	0	-80	0.50	80	0	-40	40	80
mixed	2	40	40	-40	0.50	80	0	0	40	80
gain	3	0	80	0	0.50	80	0	40	40	80

Table 2: Lottery Configuration 2

Type	LotteryID	w	x_1	x_2	Pr	t_1	t_2	EV	$EV + w$	Spread
loss	4	160	-40	-120	0.50	120	40	-80	80	80
mixed	5	80	40	-40	0.50	120	40	0	80	80
gain	6	0	120	40	0.50	120	40	80	80	80

Table 3: Lottery Configuration 3

Type	LotteryID	w	x_1	x_2	Pr	t_1	t_2	EV	$EV + w$	Spread
loss	7	160	0	-160	0.50	160	0	-80	80	160
mixed	8	80	80	-80	0.50	160	0	0	80	160
gain	9	0	160	0	0.50	160	0	80	80	160

2.2 Mental accounting

Asset integration We use the risk-preference task to construct the variables 'Integration 1' and 'Integration 2'. These variables measures to which extend participants integrate (bracket broadly) the endowment when making their lottery choice. Specifically, the 'mixed lotteries' in configuration 1 and 2 (ID 2 and 5) show the same lotteries (i.e., have the same x_1 and x_2), but, due to different endowments, have different terminal outcomes (i.e., have different (t_1, t_2)). The variable 'Integration 1' is equal to 1 if a subject makes different choices in the two lists, and 0 otherwise. Note that making different choices in this context indicates that the subject integrates the endowment. Further, each of the configurations 1-3 encompasses three different lotteries, which however all lead to the same terminal outcomes. We hence construct the variable 'Integration 2' as follows. It counts how many lottery pairs that have the same terminal outcomes have the same chosen certainty equivalent. Hence, the variable 'Integration 2' ranges from 0 to 9 – the higher the value the more often the subject integrates (brackets broadly) the endowment.

ABCD lottery We include the ABCD lottery by Tversky and Kahneman (1981). Participants face the following pair of concurrent decisions. They are asked to first examine both decisions.

1. Choose between (before answering, read Decision 2):

   A winning 24 kr.

   B a 25% chance of winning 100 kr. and a 75% chance of not winning or losing any money.

2. Choose between:

C losing 75 kr.

D a 75% chance of losing 100 kr., and a 25% chance of not winning or losing any money.

Participants are explained that for this question the computer randomly selects one participant as the 'participant who is paid'. The participant who is paid will be given an extra 100 kr. on top of his other earnings. If his choice involves making losses, these losses will be taken out of these 100 kr.
In Tversky and Kahneman (1981) the majority of subjects choose AD. Yet, the choice AD is stochastically dominated by BC. If one considers the compound lottery implied by AD, one sees that it has a 25% chance of gaining 24 kr. and a 75% chance of loosing 76 kr. In contrast, the compound lottery BC brings a 25% chance of gaining 25 kr. and a 75% chance of loosing 75 kr. We create a dummy variable ('AD') that is equal to 1 if the subject chooses AD and 0 else.

Small scale insurance Participants are asked which kind of 5 different small scale insurances (cycle, phone, baggage, travel, computer/laptop) they have ever bought. The answer is coded as 0 (never bought a specific insurance) and 1 (bought specific insurance). The variable 'Insurance' aggregates these answers by counting how many items have a response of 1. Thus, it ranges from 0 to 5.

Having a topical mental account This question builds on the "lost ticket versus lost money question" by Kahneman and Tversky (1984). Participants are asked to imagine that they decided to go to a concert. In the first question, they should imagine that they already paid the admission price of 200 kr., but have lost the ticket. In the second question, they notice that they have lost 200 kr. Each time, they are asked, using a 5-point Likert scale, how likely they would pay 200 kr. for a ticket. The variable 'Theater' is equal to 1 if a subject is less likely to replace the ticket if he lost the ticket than if he lost the money. Hence, this variable indicates whether a subject has a narrow, topical mental account for the theater play.

Self-control and narrow bracketing We include two questions where the possible reasons for specific narrow mental bracket might be driven by self-control problems. First, we ask participants, using a 5-point Likert scale, whether they divide their monthly budget into several separate budgets (such as budgets for housing, clothes, leisure expenditures, study related expenditures and the like). This defines the variable 'Mental Budget', where higher values of the variable indicate that a subject is more likely to have a mental budget.
Second, we ask participants to consider the hypothetical situation where two weeks before an exam the lecturer hands out 30 practice exams (all questions for the actual exam will be drawn from these practice exams). It takes 4 hours to work on a practice exam. Participants are then asked how and whether they set goals for the number of exams they solve: daily goal (value 1), weekly goal (value 2), overall goal (value 3) for the 2 weeks, no goal (value 4). Thus, higher values of the variable 'Goal' imply broader goal levels. Yet, in the regressions, the variable might suggest that a cardinal interpretation – which it has not. Thus, we also use the dummy 'Narrow Goal' which is equal to 1 if the subject chooses a daily goal and 0 if he chooses any other goal type.

3 Predictions

We summarize predictions on correlation in table 4. According to Read, Loewenstein, and Rabin (1999) there are three broad determinants of narrow bracketing. First, cognitive capacity limitations. People are cognitively not able to process different pieces of information together. Second, cognitive inertia. People are in principle able to process different pieces of information together. But they do not do so and simply follow the way the problem is presented to them. Third, pre-existing heuristics and conventions. For example, it is natural to divide the week into "weekdays" and "weekend". And forth, motivated bracketing. People evaluate their goals narrowly so as to achieve self-control.
If cognitive capacity limitations play a role for bracketing, then we should observe that more intelligent people bracket more often broadly rather than narrowly. As a proxy for intelligence, we use math grades. As discussed before, a low score on the cognitive reflection test might mirror some form of cognitive inertia. If motivational bracketing is the dominating concern, then we should observe that people who have higher self-control bracket more often

narrowly rather than broadly. Self-control can be proxied by the BSC scale.

The dominated choice AD is typically explained by narrow bracketing in conjunction with loss aversion (Kahneman and Tversky 1984). Narrow bracketing is typically considered as a mistake in this situation (Rabin and Weizsäcker 2009). Thus, we predict that the the dominated choice is negatively correlated with Math scores, the CRT score and positively with loss aversion. But not with self-control. Buying small scale insurance and asset integration should follow a similar pattern as choosing AD. In all cases, the subject ignores some important pieces of information, such as the endowment, lifetime wealth, or other risks. Ignoring one's lifetime wealth can, for example, arise because the individual has narrow mental budgets for categories. Thus, there might be a correlation with having mental budgets. Further, there should be a correlation between buying small scale insurance and loss aversion. The expected utility model would predict that the consumer is approximately risk neutral for such small risks and thus does not demand small scale insurance. To explain the demand for small scale insurance one hence needs to assume first-order risk aversion (Segal and Spivak 1990). Such can be caused by loss aversion in conjunction with narrow bracketing.[7]

Choosing narrow mental budgets or choosing a narrow, daily study goal is most likely a form to exercise self-control. That is, we expect a positive correlation with the BSC score. Further, if narrow goals indeed are a self-control strategy rather than due to cognitive limitations, we should observe that people who set narrow study goals have better math grades. In contrast, if narrow study goals were due to cognitive limitations we should observe a negative correlation. Further, we expect a negative correlation with the CRT score. First, narrow goals/budgets can be form of a choice error due to cognitive inertia. Second, the low cognitive reflection score mirrors impulsiveness/impatience. The more impulsive/impatient, the bigger the self-control *problem* and the higher the need to exercise self-control (as measured by the self-control scale) and the more likely the individual is to tackle the self-control problem

[7]Yet, Sydnor (2010) points out, insurance decisions are always in the loss domain and thus the direct implication of loss aversion is to some extend unclear. However, Kőszegi and Rabin (2006)-type of reference dependent preferences can explain the demand for small scale insurance. Sydnor (2010) also points out further reasons for buying small scale insurance: overweighing of small probabilities and social pressure by the salesman, which we cannot test for with our data.

with narrow goals/budgets. Further, there might be a positive relationship between loss aversion and the two self-regulation strategies, narrow goals and narrow mental budgets. In a theoretical model, Koch and Nafziger (2014) outline the relationship between goal setting, loss aversion and self-control problems. For sufficiently severe degrees of loss aversion narrow goals are always better than broad goals in a risk-free environment. Yet, as Koch and Nafziger (2014) and Koch and Nafziger (2015) outline, in a *risk-free environment* loss aversion is not necessary to make narrow goals effective.

Divergent answer in lost ticket vs. lost money question may arise because of cognitive limitations or cognitive inertia. People do not recognize (due to capacity limitations or cognitive inertia) that the economic problem at hand is the same no matter whether they lost the ticket or the money. That is, higher values of the variable 'Theater' might be traceable to the same common ground as the dominated choice AD, buying small scale insurance or to lower values of 'Integration': people do not read and process all pieces of the questions together because of cognitive capacity limitations or cognitive inertia. In such a cases, we would expect a negative correlation with Math and CRT.The connection between loss aversion and the Theater-variable is not entirely clear.[8]

Finally, if mental accounting is a more general principle, i.e., if people do not apply it in just one domain, then we should observe a correlation between all the different narrow bracketing variables.

[8]Both Tversky and Kahneman (1981), as well as Thaler (1999) note a tight connection between the value function of Kahneman and Tversky (1979), that is characterized by loss aversion, and mental accounting. The value function serves to evaluate outcomes within the given mental account. Yet, the connection between the value function/loss aversion and a mental account does not only arise for narrow mental account, but also for broad mental accounts. While the *impact* of loss aversion is weaker if people have a broad account (as typically some losses will cancel out), people with a broad account may still be equally loss averse than those with a narrow account. Further, from a theoretical point of view, the relationship between loss aversion and the variable Theater depends on how exactly people evaluate the different domains (money/ticket and play) in their topical account.

	Integration 1/2	AD	Insurance	Theater	Goal	Mental Budget
Integration 1/2						
AD	$--$					
Insurance	$--$	$++$				
Theater	$-$	$+$	$+$			
Goal	$-$	$+$	$+$	$+$		
Mental Budget	$-$	$+$	$+$	$+$	$++$	
Loss aversion	***	$++$	$++$	$+$	$+$	$+$
Math	$++$	$--$	$--$	$--$	$+^{**}, -^{*}$	$-$
CRT	$++$	$--$	$--$	$--$	$--$	$--$
BSC					$++$	$++$

Table 4: Predictions on correlations; $++$ ($--$) indicates strong relation (possibly motivated by theory); $+$ ($-$) possible relation if narrow bracketing is a general phenomenon; * $-$ if cognitive limitations; ** $+$ if self-control strategy; *** note that if a subject integrates, we cannot observe loss aversion, hence no prediction is possible here.

Table 5: Summary statistics

	N	Average	Std.dev.	Min	Max	=0	= 1	=2	=3	>3
Asset integration 1	649	0.66	0.47	0	1	0.34	0.66			
Asset integration 2	649	1.44	1.95	0	9	0.39	0.29	0.15	0.07	0.10
AD	643	0.32	0.47	0	1	0.68	0.32			
Insurance	645	1.69	1.48	0	5	0.27	0.24	0.19	0.17	0.12
Theater	645	0.33	0.47	0	1	0.67	0.33			
Goal	645	1.90	1.02	1	4		0.49	0.20	0.22	0.08
Narrow goal	645	0.49	0.50	0	1	0.51	0.49			
Mental budget	648	2.79	1.37	1	5		0.26	0.16	0.23	0.34

Notes: Integration 1:= 0 if lottery choice $(-40, 40, p = 0.5)$ unaffected by endowment 40 vs. 80, and = 1 otherwise. Integration2: number of times the same certainty equivalent is chosen for pairs of lottery choices with same final outcomes if endowment is integrated. AD: = 1 if dominated choice for lottery pair chosen,= 0 otherwise. Insurance: No. of small scale insurance categories {phone,cycle,computer,baggage,travel}. Theater account: = 1 if more likely to purchase theater ticket if money amount of ticket lost than if already purchased ticket lost. Narrow goal: = 1 if daily goal chosen in exam vignette, = 0 if broader goal category chosen. Goal: goal choice in exam vignette, 1=daily, 2=weekly, 3=bi-weekly, 4=none. Mental budget: 1 = not like me at all to set mental budgets 5 = very much like me ...

Table 6: Summary statistics (independent variables)

	N	Average	Std.dev.	Min	Max	=0	>0	= 1	=2	=3	>3	=4	=5	=6	=7	=8
Female	610	0.55	0.50	0	1	0.45		0.55								
Loss aversion	607	2.01	4.01	-1	10		0.53									
Math grade	610	4.55	1.15	1	6			0.01	0.05	0.12		0.27	0.34	0.22		
CRT	610	1.33	1.12	0	3	0.31		0.25	0.24	0.20						
BSC	610	3.29	0.58	1.54	4.92						0.67					

Notes: Loss aversion:> 0 loss averse, < 0 gain seeking. Math grade: 1=F, 2=E, 3=D, 4=C, 5=B, 6=A. CRT: no. of correct items on Cognitive Reflection Test (Frederick 2005). BSC: average score on brief self-control scale (Tangney, Baumeister, and Boone 2004), > 3 (< 3) indicates high (low) perceived self control. Liquidity: 1=< 350 kr. within next 3 days (≈ 50 $) 7= > 7,000 kr. (≈ 1000 $), average liquidity is about 5,300 DKK.

4 Results

Table 5 provides summary statistics. It shows that narrow bracketing is a prevalent phenomenon. 32% of subjects choose the dominated combination AD – a result that is in line with the one of Rabin and Weizsäcker (2009) for real stakes. 73% of subjects bought at least 1 type of small scale insurance. When looking at the way subjects integrate their endowment, we observe that one third makes exactly the same choice in the two identical mixed lotteries which have however different endowments (variable Integration 1). If we allowed for small mistakes (up to 3), then this share would increase to 65%. If we consider the lotteries with the same terminal outcomes (Integration 2), we observe that only 39% make the same choice in the respective lotteries, i.e., always integrate the endowment. Almost half of the participants choose a narrow study goal, and around one third is very likely or likely to have a narrow mental budget. Interestingly, more than two thirds of the subjects make the same choice in the lost-ticket-vs.-lost-money question. This result is in contrast to the one of Kahneman and Tversky (1984), where the larger fraction of subjects switches their choice.
Regarding the background variables, in the overall population, loss aversion is not significant, yet reference dependence emerges (cf. Epper 2015). Thus, loss aversion is not prevalent in our population, which might explain some of the (unexpected) non-significant results we observe later. Only 20% of subjects have all 3 questions in the CRT correct, and the average BSC score is 3.3. The average math grade is 4.5 which corresponds to a BC in the US system.
Tables 7 and 8 present raw correlations and tables 9-11 presents results from regressions. The regressions show either OLS coefficients and logit marginal effects, depending on whether the dependent variable is dichotomous or not. Note that the marginal effects from the logit are for discrete increase from 0 to 1 for the dichotomous variables female and AD, otherwise the interpretation is as usual treating variables as continuous.
Overall, we observe in the correlation table that low cognitive reflection scores is associated with almost all phenomena of narrow bracketing. The correlations between CRT and insurance, narrow goals and budgets disappears however in the regressions (see below). Further, females are more often narrow bracketers than men.[9] The only exception is having a topical

[9]Although this result is interesting, we should note that we do not have any hypothesis regarding gender

mental account for the theater play. This variable is is not correlated with any of the other variables.

People who make the dominated choice AD have lower CRT scores and are more loss averse. The low CRT score hints that people who make the dominated choice do not think carefully about the problem. Further, people who choose AD are also more likely to ignore the endowment (Integration 2) in the risk questions. Similarly to making dominated choices, people who ignore the information about the endowment also have lower CRT scores.[10] Figures 4 illustrate these relations graphically by plotting the marginal effect at the mean of the independent variable.

Thus, making the dominated choice AD and ignoring the endowment seem to be related problems. In contrast, and unexpectedly, buying small scale insurance seems to be a different phenomenon. Neither is it correlated with loss aversion, nor with AD/Integration. However, people who buy more often small scale insurance have lower Math grades and CRT scores (CRT renders insignificant in the regressions though) – indicating that cognitive limitations play a role (see also figure 4). Further, the Insurance variable is correlated with the variables Mental Budgets and Goal (the latter renders insignificant in the regressions). Subjects who are more likely to adopt mental budgets are also more prone to buy small scale insurance. It might be that those people have, e.g., a narrowly defined budget for travel, or to buy work-related equipment like a laptop. They would not replace their laptop if it got stolen or buy a new flight if they missed it – even if they could afford it if they thought about their lifetime wealth. Hence, they buy insurance to protect themselves against these adverse events.

People who have more self-control are more likely to set narrow study goals and to have narrow mental budgets, and the later two variables are also positively correlated. Figure 4 demonstrates the connection between narrow goals and self-control, and narrow goals and mental budgets by plotting the marginal effect at the mean of the independent variables. Subjects who have narrow goals/budgets have lower CRT scores. Yet, this relationship ren-

differences, i.e., the result is exploratory.

[10]Van der Heijden, Klein, Müller, and Potters (2012) observe that impatient individuals react more to the framing of a choice than patient individuals. They argue that 'accessibility' is a common factor of both impatience and reactions to frames.

ders insignificant in the regressions. One explanation is that the CRT score is negatively correlated with the BSC score (Spearman's rho$= -0.135$, $p = 0.0009$). Hence, when regressing narrow goals/budgets on both CRT and BSC, CRT might render insignificant because all the effects of impulsiveness expressed in the CRT relevant for setting narrow goals/budgets are captured in BSC. This indicates that both tools arise indeed because of self-control problems and unlikely because of cognitive inertia.

Table 7: Spearman correlations I

	Integration1	Integration2	AD	Insurance	Theater	Goal	Narrow goal	Mental budget
Integration1	1.00							
Integration2	-0.12***	1.00						
AD	0.03	-0.14***	1.00					
Insurance	0.00	0.01	0.01	1.00				
Theater	0.01	0.05	-0.06	-0.03	1.00			
Goal	-0.04	-0.01	0.02	-0.08*	0.04	1.00		
Narrow goal	0.00	0.01	-0.02	0.06	-0.03	-0.93***	1.00	
Mental budget	0.06	-0.04	0.06	0.10***	-0.00	-0.19***	0.16***	1.00

* p <0.10, ** p <0.05, *** p <0.01

Table 8: Spearman correlations II

	Integration1	Integration2	AD	Insurance	Theater	Goal	Narrow goal	Mental budget
Female	0.10**	-0.10**	0.04	0.12***	0.04	-0.23***	0.22***	0.19***
Loss aversion	-0.03	-0.02	0.07*	0.01	-0.02	0.04	0.01	-0.04
Mathgrade	0.04	-0.02	0.01	-0.09**	0.01	-0.07*	0.06	-0.00
CRT	-0.05	0.12***	-0.12***	-0.08**	0.04	0.11***	-0.09**	-0.10**
BSC	0.05	-0.02	0.03	0.04	0.03	-0.24***	0.21***	0.13***

* p <0.10, ** p <0.05, *** p <0.01

Table 9: Regression table 1

	Integration 1			Integration 2			Insurance			Mental budget		
Integration 2							-0.01		-0.01	-0.05**		-0.04
							(0.03)		(0.03)	(0.03)		(0.03)
AD	0.03		0.03	-0.63***		-0.61***	-0.00		-0.04	0.16		0.14
	(0.04)		(0.04)	(0.14)		(0.14)	(0.13)		(0.13)	(0.12)		(0.12)
Insurance	-0.00		-0.01	-0.02		-0.02				0.09**		0.06*
	(0.01)		(0.01)	(0.05)		(0.05)				(0.04)		(0.04)
Theater	0.00		-0.00	0.26		0.27	-0.09		-0.09	0.03		0.01
	(0.04)		(0.04)	(0.17)		(0.17)	(0.12)		(0.12)	(0.12)		(0.12)
Narrow goal	-0.00		-0.03	0.02		0.11	0.13		0.06	0.43***		0.30***
	(0.04)		(0.04)	(0.15)		(0.16)	(0.12)		(0.12)	(0.11)		(0.12)
Mental budget	0.02		0.01	-0.10*		-0.08	0.11**		0.08*			
	(0.01)		(0.01)	(0.05)		(0.06)	(0.04)		(0.04)			
Female		0.08**	0.08**		-0.57***	-0.56***		0.34***	0.29**		0.42***	0.31***
		(0.04)	(0.04)		(0.16)	(0.16)		(0.12)	(0.13)		(0.12)	(0.12)
Loss aversion		-0.01*	-0.01*		-0.02	-0.01		0.01	0.01		-0.00	-0.01
		(0.01)	(0.01)		(0.02)	(0.02)		(0.01)	(0.01)		(0.01)	(0.01)
Math		0.02	0.02		-0.08	-0.08		-0.10*	-0.10*		-0.00	-0.01
		(0.02)	(0.02)		(0.07)	(0.07)		(0.05)	(0.05)		(0.05)	(0.05)
CRT		-0.02	-0.02		0.16**	0.12		-0.07	-0.06		-0.06	-0.04
		(0.02)	(0.02)		(0.07)	(0.07)		(0.06)	(0.06)		(0.05)	(0.05)
BSC		0.03	0.03		0.09	0.09		0.04	0.01		0.26**	0.22**
		(0.03)	(0.03)		(0.13)	(0.13)		(0.10)	(0.11)		(0.10)	(0.11)
Constant	0.61***	0.47***	0.47***	1.88***	1.65***	1.99***	1.38***	1.90***	1.82***	2.45***	1.82***	1.79***
	(0.05)	(0.13)	(0.14)	(0.23)	(0.51)	(0.53)	(0.16)	(0.43)	(0.44)	(0.11)	(0.40)	(0.42)
$\mathbf{R}^2$	0.00	0.02	0.02	0.04	0.04	0.07	0.01	0.03	0.03	0.05	0.05	0.07
N	641	607	607	641	607	607	641	607	607	641	607	607

Notes: OLS regression coefficients. Robust standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, *** $p < 0.01$.

Table 10: Regression table 2

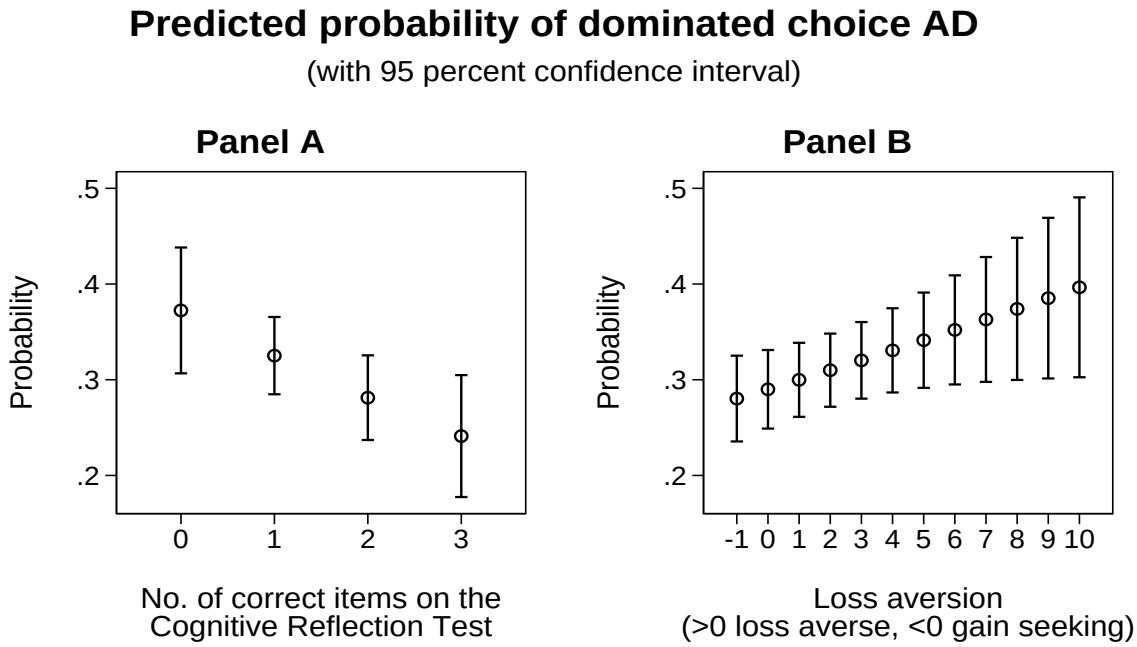
	AD			Theater			Narrow goal		
Integration 2	-0.22***		-0.22***	0.07		0.07	0.00		0.03
	(0.06)		(0.05)	(0.04)		(0.04)	(0.04)		(0.05)
AD[a]				-0.24		-0.32	-0.13		-0.19
				(0.19)		(0.20)	(0.17)		(0.19)
Insurance	-0.00		-0.02	-0.04		-0.04	0.06		0.03
	(0.06)		(0.06)	(0.06)		(0.06)	(0.05)		(0.06)
Theater[a]	-0.24		-0.31				-0.13		-0.25
	(0.19)		(0.20)				(0.17)		(0.19)
Narrow goal[a]	-0.12		-0.19	-0.13		-0.25			
	(0.17)		(0.19)	(0.17)		(0.19)			
Mental budget	0.09		0.08	0.02		0.01	0.24***		0.17***
	(0.06)		(0.07)	(0.06)		(0.07)	(0.06)		(0.07)
Female[a]		0.02	-0.04		0.22	0.33*		0.87***	0.83***
		(0.19)	(0.20)		(0.18)	(0.19)		(0.18)	(0.18)
Loss aversion		0.05**	0.05**		-0.02	-0.01		0.01	0.01
		(0.02)	(0.02)		(0.02)	(0.02)		(0.02)	(0.02)
Math		0.08	0.08		0.02	0.03		0.11	0.12
		(0.08)	(0.08)		(0.08)	(0.08)		(0.08)	(0.08)
CRT		-0.24***	-0.21**		0.10	0.07		-0.02	-0.02
		(0.09)	(0.09)		(0.08)	(0.08)		(0.08)	(0.08)
BSC		0.03	0.07		0.15	0.19		0.64***	0.61***
		(0.15)	(0.16)		(0.15)	(0.16)		(0.15)	(0.15)
N	641.00	607.00	607.00	641.00	607.00	607.00	641.00	607.00	607.00

Notes: Logit marginal effects (dichotomous dependent variable). Robust standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, *** $p < 0.01$. ^{a} marginal effect for discrete change of dummy variable from 0 to 1.

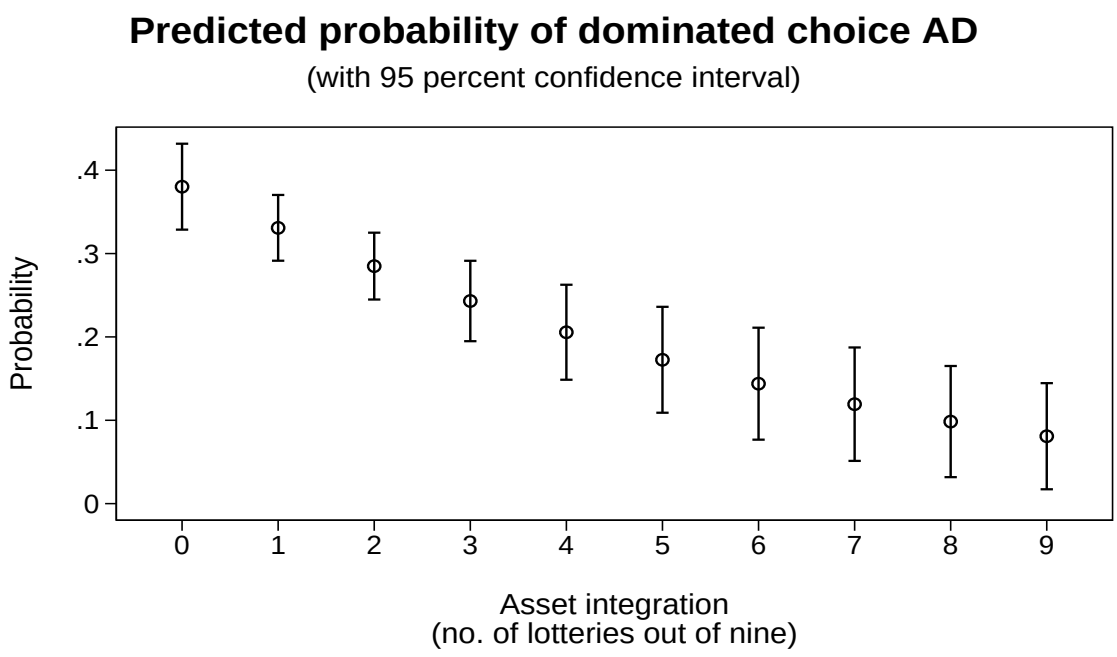
Table 11: Regression table 3

	Goal breadth		
Asset integration 2	-0.01	-0.01	-0.02
	(0.02)	(0.02)	(0.02)
AD	0.07		0.09
	(0.09)		(0.09)
Insurance	-0.04		-0.02
	(0.03)		(0.03)
Theatre account	0.11		0.17**
	(0.09)		(0.09)
Mental budget	-0.15***		-0.10***
	(0.03)		(0.03)
Female		-0.45***	-0.41***
		(0.08)	(0.08)
Loss aversion		0.01	0.01
		(0.01)	(0.01)
Math grade		-0.06	-0.06
		(0.04)	(0.04)
CRT		0.03	0.02
		(0.04)	(0.04)
Perceived self control		-0.37***	-0.35***
		(0.07)	(0.07)
Constant	2.33***	3.58***	3.77***
	(0.12)	(0.28)	(0.28)
$\mathbf{R}^2$	0.05	0.11	0.14
N	641	607	607

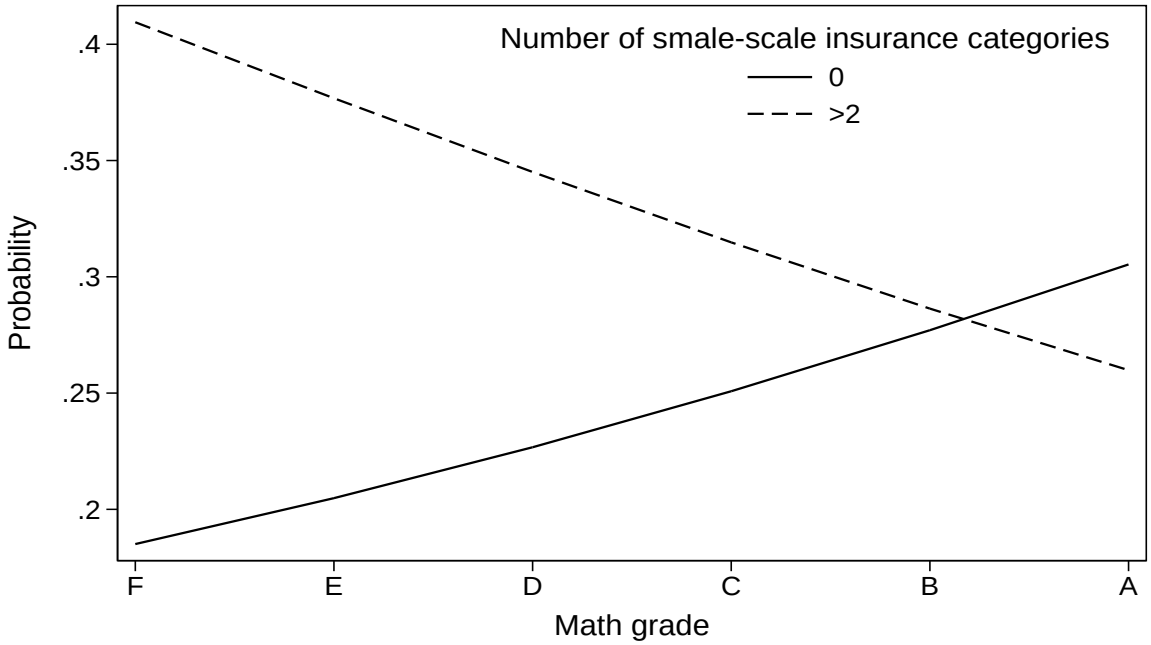
Notes: OLS regression coefficients. Robust standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.



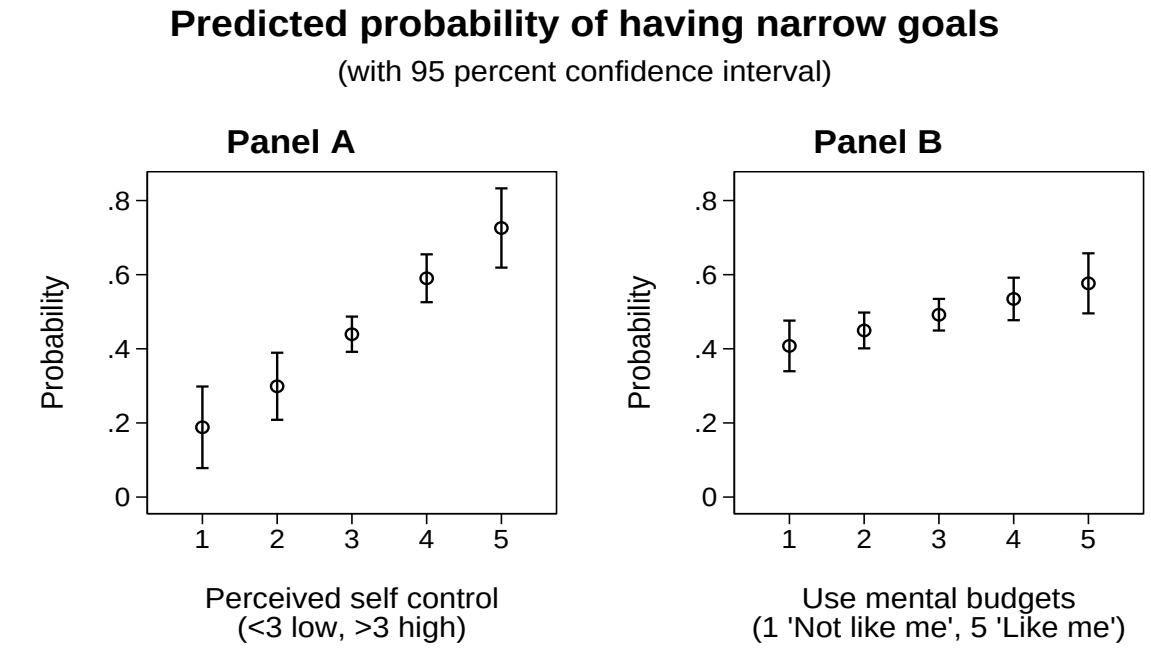
Note: Marginal effect at the mean of the independent variables.



Note: Marginal effect at the mean of the independent variables.



Notes: Predicted probabilities from ordered logit regressions using the Stata clarify macro described in King et al. (2000).



Note: Marginal effect at the mean of the independent variables.

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