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Mental accounting and decision making: The relationship between relative and absolute savings

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Abstract

The formation of 'mental accounts' by individuals has been hypothesised to explain an apparent departure from rationality in certain decision-making scenarios. In particular, the potential monetary saving on an item is viewed, topically, relative to the original expected cost of that item, rather than relative to the original, expected cost of all items purchased on the same shopping trip. In other words, in a number of contexts the relative saving to be made has been found to be more important than the absolute saving. This paper extends previous experimental work by describing a new experiment that seeks to discover whether this 'mental accounting' characteristic applies more widely. We find that the effect is not detected as the level of absolute saving to be gained increases, suggesting that topical accounts are less important in such contexts. © 1999 Elsevier Science B.V. All rights reserved.

1. Introduction

There is no shortage of experimental results (for example, Thaler, 1994) which indicate that the Savage (1954) axioms of rationality (see Sugden, 1991 for an excellent discussion of rational choice) are violated across a range of decision making situations. One branch of the experimental literature has concerned itself with exploring the use of 'mental accounts' in multi-attribute decision situations (Tversky and Kahneman, 1981; Thaler, 1985, 1990), wherein individuals form separate, psychological accounts and use

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them to evaluate events or options. The evidence from this research suggests that an individual may value two identical monetary gains differently because they are coded and evaluated through two distinct mental accounts. In particular, the same absolute gain or saving on an item appears to be more attractive the higher its relative value in comparison with the original cost of the item, even where total expenditure on all purchases made remains unchanged.

The purpose of this paper is to analyse more closely this relationship between relative and absolute savings, and so to determine whether mental accounting effects apply quite generally or are restricted to the margin, that is to situations where potential absolute savings are small. The next section discusses the existing experimental evidence on the topic, while the following sections describe two new experiments and analyse the results. The final section offers conclusions.

2. Prior experimental evidence

Tversky and Kahneman (1981) illustrated the notion of mental accounts via the following experimental scenario:

Version A: Imagine that you are about to purchase a jacket for $125 and a calculator for $15. The calculator salesman informs you that the calculator you wish to buy is on sale for $10 at the other branch of the store, located 20 min drive away. Would you make the trip to the other store?

Version B: Imagine that you are about to purchase a jacket for $15 and a calculator for $125. The calculator salesman informs you that the calculator you wish to buy is on sale for $120 at the other branch of the store, located 20 min drive away. Would you make the trip to the other store?

Thus, in both versions the choice is whether to drive 20 min to save $5 on total expenditure of $140. The response to the two versions was markedly different. In version A, 68% of participants were willing to make the trip, compared with only 29% in version B. The authors later proposed that individuals frame such problems in 'topical' accounts, relating 'the consequences of possible choices to a reference level that is determined by the context within which the decision arises' (Kahneman and Tversky, 1984, p. 347). That is, individuals do not simply focus on the $5 absolute saving in each version, but rather they relate the $5 saving to the original purchase price of the specific item (the $15 calculator in version A and the $125 calculator in version B). More recently, Kahneman and Tversky's experiments have been replicated by several researchers: Mowen and Mowen, 1986; Frisch, 1993; Ranyard and Abdel-Nabi, 1993. The decision scenarios adopted in each of these studies together with their key findings are summarised in Table 1. The 'jacket and calculator' problem also formed the object of the Joyce and Shapiro (1995) study, but there participants were asked for price savings or travelling times at which they would be indifferent between the two options, rather than for their preferences on a specific, fixed scenario. For this reason, their results have not been included here.

Table 1
Summary of reported experimental results

Study	Description	No. of participants	Absolute saving in dollars	Relative saving	Extra time (minutes)	Choosing to travel (%)
Tversky and Kahneman (1981)	Purchase of a jacket and a calulator at same store, with discount on calculator available at alternative store; student subjects	88 93	5 5	1/3 1/25	20 (drive) 20 (drive)	68 29
Mowen and Mowen (1986)	(1) Replication of Tversky and Kahneman; student subjects	77 77	5 5	1/3 1/25	20 (drive) 20 (drive)	27 14
	(2) Partial replication-purchase of books and calculator; students	35 41	5 5	1/2 1/25	5 (drive) 5 (drive)	63 39
	(3) Mailing of two cheques against purchase invoices, where it is th e last day to take a $20 discount on one; students	76 75	20 20	1/10 1/500	45 (drive) 45 (drive)	83 55
	(4) Replication of (3) with managers	39 37	20 20	1/10 1/500	45 (drive) 45 (drive)	80 54
Frisch (1993)	(1) Purchase of a calculator only, with discount on calculator available at alternative store; student subjects.	136 136	5 5	1/3 1/25	10 (drive) 10 (drive)	53 21
	(2) Choice of speedy or regular train to Portland or San Francisco, speedy train being more expensive; students	136 136	20 20	1/3 1/3	60 (train) on 60 base 60 (train) on 540 base	81 89
Ranyard and Abdel-Nabi (1993)	Partial replication of Kahneman and Tversky including some variation on the price of the second item (jacket); student subjects	175 200 75	5[a] 5[a] 5[a]	1/3 1/3 1/23	20 (walk) 20 (drive) 20 (drive)	70 52 23

[a] Savings experienced in £.

The results from all four studies indicate behaviour consistent with a mental accounting effect. In all but one of the reported experiments, significantly more participants were willing to travel for a monetary gain on an item where the gain was a relatively high proportion of the non-discounted cost of the item, than where it was a relatively low proportion. The only exception was Frisch's train journey scenario. Here, the experimental manipulation was concerned not with the relative amount of the cash saving (which at $20 remained one-half of original cost) but with the relative journey time increase, double in condition 1 falling to a one-ninth increase in condition 2. The willingness to travel was unaffected by the change in journey time, this aspect appearing to be dominated by the high cash saving available (both in relative and absolute terms).

For small, absolute gains there is also a broad consistency in the magnitude of individuals choosing to travel, due allowance being made for slight differences in the precise specification of the mode of travel and the travelling time. Around 50–60% of subjects were prepared to travel for a high, relative saving, compared with 20–30% when the relative saving was low. This pattern changed, however, when the level of absolute saving increased. In the Mowen and Mowen study, over 50% of participants, both students and managers, were prepared to drive for 45 min to take advantage of a $20 saving, even though this saving amounted to far less than 1% of the original invoice value. While the authors correctly report their findings as a demonstration of the use of topical accounts in a business context, their results also suggest that above some threshold level, individuals may evaluate an option more in terms of the *absolute* value of any financial gain than its *relative*, topical value. The mental accounting effect may cease to apply. The purpose of this paper is to test this suggestion through the two new research experiments described below.

3. Experimental design

3.1. Experiment 1

The experimental design was adapted from the 'jacket and calculator' problem described above. As in the Kahneman and Tversky study, subjects considered a hypothetical purchase of two consumer products from two different stores. The two products in the current study were an electronic organiser and a portable compact disc player. These were chosen since it is highly likely that both would be available at the same store, and both exhibit a substantial variation in specification and quality so that a large variation in price is also plausible. In store X, a 10 min round trip walk away, the electronic organiser and portable compact disc player were available at a combined price of £340. The two could be purchased cheaper at store Y, a 30 min round trip walk away (an extra 20 min), where a discount on the organiser was available. The discount varied from one-twelfth, through one-sixth to a more substantial one-third, *relative* to the price of the organiser at store X, this range being broadly in line with previous studies. The *absolute* value of the discount was £5, £10 or £15. Thus, there were nine versions of the same basic scenario, incorporated in a 3 × 3 research design, as summarised in Table 2.

Table 2
Summary of experimental design

Absolute saving on organiser at store Y	Relative saving on organiser at store Y	Relative saving on organiser at store Y	Relative saving on organiser at store Y
	One-twelfth	One-sixth	One-third
£5	1 £60, £280	2 £30, £310	3 £15, £325
£10	4 £120, £220	5 £60, £280	6 £30, £310
£15	7 £180, £160	8 £90, £250	9 £45 £295

Figures in each cell represent the number of the version of the scenario, the price of the electronic organiser at store X, and price of the electronic organiser at store X, and the price of the portable CD player at store X.

For illustration, version 4 is reproduced as Fig. 1; its precise format and wording is based in part on the Joyce and Shapiro (1995, p. 187) instrument.

Subjects were randomly allocated to one of the nine treatments and were given a copy of the appropriate decision scenario with a unique identification number. Then they decided whether to purchase the products at store X or store Y. As a check that subjects were participating seriously, as opposed to perhaps randomly circling one store without reading through the case, they were also required to write down on the instrument the prices at which they had decided to purchase each item. These were subsequently examined to ensure consistency with the store choice. Further incentive was provided by offering several cash prizes, numbers being randomly drawn and matched with the students' identification numbers. This form of incentive scheme was adopted as the task had no correct answer and so rewards could not be directly linked to performance. A total of 338 subjects participated, all being students within the Leeds University Business School.

3.2. Experiment 2

The second experiment again adopted the compact disc player and electronic organiser context, and incorporated the same experimental design regarding the levels of absolute and relative monetary savings. However, this time the 'costs' of those savings were also varied. For the £10 absolute saving, subjects would have to travel an additional 40 minutes, increasing to 60 min for the £15 absolute saving. This is equivalent to determining whether mental accounting (where the emphasis is given to relative savings) still explains behaviour when both the absolute savings and the costs of those savings are high; that is, where the stakes are high both on the up-side and the down-side. The procedure for subjects participating in these six new versions of the scenario were identical to those in Section 3.1. A total of 223 further students participated in experiment 2, again all being drawn from the Leeds University Business School.

Instructions

Thank you for agreeing to take part in our study. Please read the following paragraph, try to imagine yourself in the situation described and answer the question below it. This question has no right or wrong answer.

Situation

It's a typical Saturday morning and you plan to go shopping to buy two items - an electronic organiser and a portable compact disc player. After conducting some research, you find that two stores have the most attractive prices on the particular brands and models of these items that you wish to purchase. Store X, which is a 10 minute round trip walk from your home, is offering the electronic organiser at £120 and the portable compact disc player at £220. Store Y is offering the portable compact disc player at the same price of £220, but is offering the electronic organiser at £110. However, because Store Y is less conveniently located, it would take you an *extra* 20 minutes round trip to make your purchases at Store Y (ie. 30 minutes in total). Prior to deciding whether to shop at Store X or Store Y, you are considering the prices and travelling times involved.

Question

At which company would you choose to purchase the two items?

<div align="center">

Store X

(please circle one)

Store Y

</div>

Please write down the prices at which you are purchasing the two items:

<div align="center">

CD Player   _____   Organiser   _____

</div>

Fig. 1. Experimental scenario layout.

4. Results and analysis

The results for the 338 students participating in Section 3.1 are shown in Table 3. For each of the nine versions of the decision scenario the cell displays the number of subjects opting to buy the products at store X, the number opting to take the saving from store Y, and the proportion of subjects willing to travel to make the saving.

The first column of Table 3, where the absolute amount of the potential saving increases from £5 through £10–£15, indicates that the proportion of subjects willing to travel an extra 20 min walk to gain this amount also increases significantly ($\chi^2 = 10.06$), as would be expected from the standard tenets of rational decision making. No such

Table 3
Summary of Results for Experiment 1

Absolute saving	Choices made by participants			
	Relative saving one-twelfth (8.3%)	Relative saving one-sixth (16.7%)	Relative saving one-third (33.3%)	χ^2 statistics
£5				
Store X	21	12	12	
Store Y	16	24	26	
n	37	36	38	6.08[a]
Store Y/*n*	43.2%	66.7%	68.4%	
£10				
Store X	15	6	6	
Store Y	22	34	32	
n	37	40	38	8.85[a]
Store Y/*n*	59.5%	85.0%	84.2%	
£15				
Store X	8	7	5	
Store Y	30	29	33	
n	38	36	38	
Store Y/*n*	78.9%	80.6%	86.8%	0.90
χ^2 statistic	10.06[b]	3.93	4.68	

[a] Significant at 95% level with two degrees of freedom.
[b] Significant at 99% level with two degrees of freedom.

significant increase is apparent, however, in the second and third columns. Thus, the *absolute* value of the saving is not the only monetary criteria upon which individuals assess its attractiveness; its *relative* value is also important. The impact of this latter criteria can be assessed by considering the three rows of Table 3. For absolute savings of £5 and £10 there is a significant increase in the proportion of subjects prepared to travel the extra time as the relative amount of the saving increases ($\chi^2 = 6.08$ and 8.85, respectively). This is consistent with a theory of choice that utilises a topical accounting framework. As the absolute value of the discount increases to £15, though, there is no significant difference in the proportion of subjects willing to travel to store Y as the relative value of the discount increases from one-twelfth to one-third. The mental accounting effect disappears.

One possible limitation of these findings is that the absolute value of the monetary savings was increased while keeping the 'cost' of those savings constant. The walk to store Y remained an extra 20 min in all cases. The design of the research instrument adopted in Experiment 2 allowed for this by increasing the extra walking time to store Y in proportion to the increases in absolute savings. The results of Section 3.2 are displayed in Table 4. For most variants of the decision scenario, increasing the time factor for walking in proportion to the absolute savings to be made led to a fall in the number of subjects choosing to travel to store Y, as would be expected. Surprisingly, this was not the case for version 4 (£10 absolute saving, 1/12 relative): this is seen as an experimental anomaly rather than an indication of some other systematic effect. The results show that

Table 4
Summary of results for experiment 2

	Choices made by participants			
	Relative saving one-twelfth (8.3%)	Relative saving one-sixth (16.7%)	Relative saving one-third (33.3%)	χ^2 statistic
Saving £5 and 20 min extra				
Store X	21	12	12	
Store Y	16	24	26	
n	37	36	38	6.08[a]
Store Y/*n*	43.2%	66.7%	68.4%	
Saving £10 and 40 min extra				
Store X	10	14	13	
Store Y	28	23	24	
n	38	37	37	1.24
Store Y/*n*	73.7%	62.2%	64.9%	
Saving £15 and 60 mins extra				
Store X	9	10	9	
Store Y	28	27	28	
n	37	37	37	
Store Y/*n*	75.7%	73.0%	75.7%	0.10
χ^2 statistic	10.69[b]	0.99	1.06	

[a] Significant at 95% level with two degrees of freedom.
[b] Significant at 99% level with two degrees of freedom.

for the £10 and £15 absolute savings there was no significant increase in the proportion of subjects willing to travel to store Y as the relative value of the absolute saving increased. Again, this supports the contention that, after controlling for the cost (additional journey time) of the increase in absolute saving, the mental accounting effect disappears when the absolute value of the monetary gain surpasses a certain threshold level.

5. Conclusions

This paper has sought to establish the general applicability of mental accounting to multi-attribute decisions where the levels of absolute savings vary. For decision situations that hinged on whether it was worth an extra 20 min round-trip walk to gain a monetary saving, the results replicate previous research evidence that for a small (£5 or £10) saving on a product, individuals will be more likely to take the walk the higher that saving is relative to the product's undiscounted cost. That is, they employ some form of topical accounting system. However, this tendency was no longer detected as the absolute value of the saving increased to £15. Similar findings emerged when the cost of the saving, that is the extra journey time, was also increased.

Thus, while the previously observed mental accounting effect was confirmed, it was not detected when the absolute saving increased beyond some 'threshold' level. One

explanation for this result is that as the absolute amount of savings increases more people will tend to travel at any fraction of the price, so that a mental accounting effect would be harder to demonstrate without much larger samples. In any case, such an effect, if present, is clearly of little importance at larger levels of absolute saving.

Acknowledgements

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