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Thaler's "all-you-can-eat" puzzle: two alternative explanations*

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Abstract

To determine whether individuals take into account sunk costs when making decisions, Thaler (1980, p.48) conducted an experiment in which anonymous individuals decided to enter an "all-you-can-eat" pizza restaurant; a random selection of those customers was given back the $2.50 they had paid. The result was a surprisingly lower average consumption of pizza by the group that was reimbursed, as compared to the group that was not. Economic theory of consumer suggests that this is inconsistent with rational behavior because only incremental costs and benefits *should* affect decisions. Since the cost of consuming any extra pizza is zero once a person is inside the restaurant, the benefits, then, must undergo some change once those customers are paid back. The literature of behavioral economics suggests that the money paid on entry plays a role in consumer behavior, based on mental accounting and prospect theory. In this paper we integrate several elements of this literature into neoclassical economic theory and make use of this comprehensive economic model to explain Thaler's puzzle. However, this model presents some shortcomings, and in the end we provide a complementary economic explanation involving the physical satiation constraint, which helps to overcome those limitations.

Keywords: Sunk Costs, Mental Accounting, Prospect Theory, Physical Constraint, Satiation.

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1 The experiment

To determine whether individuals take into account sunk costs when making decisions, Thaler (1980, p.48) conducted the following experiment [also mentioned by Frank (2001, Chap.1)]. The individuals of this experiment are anonymous customers of a Pizzeria who progress through two decision stages. First is the "entry-decision": an individual arriving at the front door of a pizza restaurant has to evaluate whether the cost of entry, i.e. $2.50, would be lower than the value of the total (expected) subjective benefits from the pizza he would (expects to) eat.[1] If he deems so and pays the $2.50, a second stage of decisions begins inside the pizzeria of whether to eat each additional piece of pizza. In the end the amount of pizza can be computed. Each decision concerning each piece of pizza depends on its subjective marginal benefits and the marginal cost. The marginal cost for eating any piece of pizza, once inside, is zero. The marginal benefits would decrease as the amount of pizza increases, due to decreasing marginal utility, since individuals stop eating pizza at some point. Consequently, a customer will stop eating pizza whenever his marginal benefits become zero. Although some miscomputations may result, on average we would expect the total benefits to be about the same as for those anticipated for the entry-decision stage.

The experiment begins once individuals are inside the restaurant: some customers are randomly selected to receive their money back without knowing that the others are not. Surprisingly, the result was lower average consumption of pizza by the group that was reimbursed, compared to the group that was not. Economic theory suggests that this is inconsistent with rational behavior because only incremental benefits *should* affect decisions; that is, the customers' historical (sunk) costs should be irrelevant. However, the agent's decision is changed after reimbursement; thus, either marginal benefits or costs have been modified. Since costs remain constant at zero once the customers are the inside the pizzeria, marginal benefits would seem to change afteronce customers are paid back. This suggests that monetary transfers may affect decisions that do not involve monetary transactions.

2 An economic model of "mental accounting" and "prospect theory"

Relevant research in economics and psychology aims to explain human behavior and, in particular, those human actions, sometimes called "anomalies" (Thaler, 1990) that depart from the predictions of neoclassical economics. The research area called "behavioral economics" is the study grounded on experimentation of how humans make decisions from a positive and realistic perspective. We may distinguish two main frameworks of analysis in the treatment of these issues: the mental accounting, which deals with the individual decision process; and prospect theory, which analyzes individual preferences. Using this analytical setup, we can account for Thaler's puzzle.

The results obtained from studying the individual decision process may be grouped under the label "mental accounting" (Thaler, 1999). This term is an attempt to reflect the mental

[1] These total (expected) subjective benefits, which represent his reserve price, are the summation of the subjective marginal benefits of each portion of pizza the customer expects to eat, depending on taste and hunger at that moment and other subjective factors, such as the (expected) benefits of accompanying one's partner who wishes to eat pizza although the other may hate it, in the style of a battle-of-the-sexes.

accounts that people establish to create symbolic linkages between specific acts of consumption and specific payments; that is, "[it] is the set of cognitive operations used by individuals and households to organize, evaluate, and keep track of financial activities." (Thaler, 1999, p.183) We must note that this representation differs dramatically from the economic principle of *fungibility*.[2] Among the several approaches within the literature of *mental accounting*, we focus on those dealing with the problems of *budgeting* and *double-entry mental accounting*. The literature of "budgeting" analyzes the individual's distribution of expenditure or income, concentrating mainly on the distribution of expenditure among groups of goods (food, housing, transport, etc.). This distribution of expenditure serves two purposes: first, the budgeting process can facilitate rational trade-offs between competing uses of funds; second, budgeting may act as a self-control device.[3] With respect to "double-entry mental accounting," this analytical framework centers on questions such as how and when people open and close their mental accounts, when an individual considers an expenditure a sunk cost,[4] and which mental accounts come to mind when an agent consumes something or performs a specific act of paying, also known as *coupling*.[5]

The other main stem of research in behavioral economics deals with the analysis of individual preferences and is called "prospect theory."[6] This theory provides an analyis of real choice and finds that individuals are worried more about losses than gains. Kahneman and Tversky first proposed a "value function" that includes two main features: first, individuals treat gains and losses asymmetrically, assigning greater weight to the latter than to the former (i.e., the value function is concave in gains and convex in losses); and, second, events are evaluated first, and then values are added.

The research program in behavioral economics described above provides a framework for understanding Thaler's experiment. Mental accounting explains the fact that customers do not forget the entry cost they have paid, and hence they do not consider it a sunk cost or an irrelevant cost when making further decisions, as economic theory would suggest. Whenever a customer decides to enter the pizzeria and pay the entry cost, the mental account of pizza turns into the red; and the consumption of enough pizza turns this mental account into the black. With respect to those customers who are paid back, prospect theory indicates that they do not close their mental account of pizza because monetary losses are considered more important than gains. Kahneman and Tversky's value function, displayed in Figure 1, shows the welfare loss derived from the expenditure of \$2.50 is greater than the welfare gain derived from the reimbursement of \$2.50 (that is, an individual would be worse off with two losses of \$2.50 than with a single loss of \$5). This causes the average consumption of this group of customers to be lower than that of the group that is not reimbursed the entry cost.

[2] "Fungibility [...] is the notion that money has no labels. [T]he fungibility assumption is what permits all the components of wealth to be collapsed into a single number." (Thaler, 1990, p.194)

[3] See Thaler and Shefrin (1981). Clearly, there is considerable variation among households on how explicit the budgeting process is. In particular, poor people seldom break their budgets, while the rich do so frequently. (See Thaler, 1999, p.193, and Heath and Soll, 1996.)

[4] See, for example, Arkes and Blumer (1985), Soman and Cheema (2001), or Bonifacio, Bouquet, Ferrario and Ponte (2003)

[5] See Prelec and Lowenstein (1998) and Soman (2001).

[6] See Kahneman and Tversky (1979), Tversky and Kahneman (1981) and Frank (2001, Chap.8).

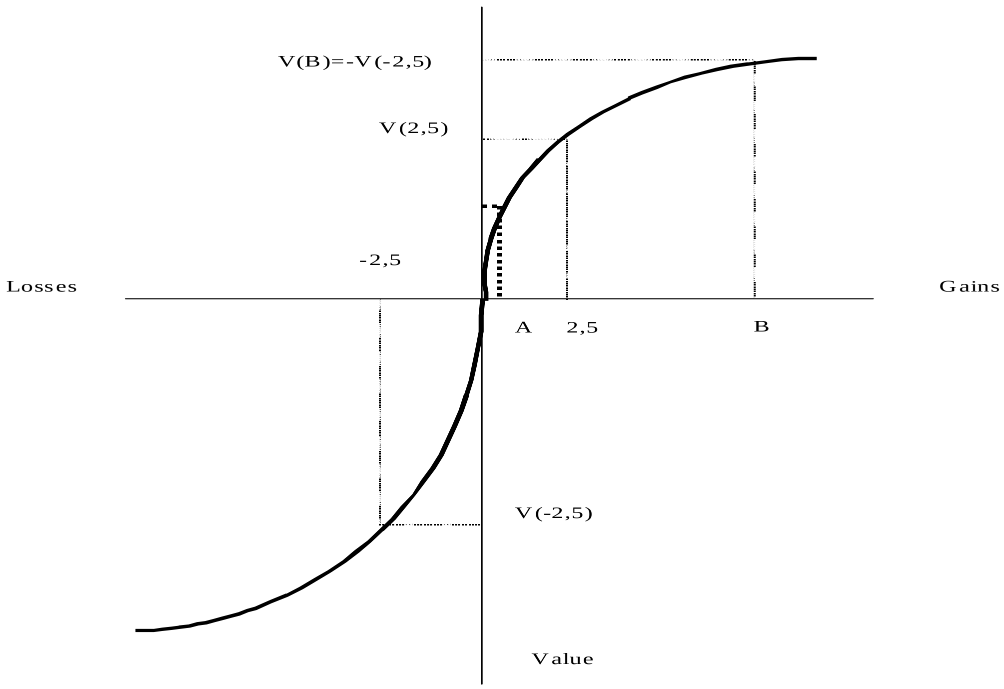

Figure 1: Value function. Kahneman and Tversky's (1979) prospect theory

2.1 The model

Next we present a very simple economic model for providing an economic explanation of Thaler's puzzle that incorporates some of the features found in behavioral economics into neoclassical economic theory. First, consumers assign activities to specific (mental) accounts, so that global budget is distributed among these accounts, a process called *budgeting* (Thaler, 1999). Second, there exists a *double-entry mental account* such that present consumption may be affected by past and future monetary transactions (Prelec and Loewestain, 1998). Finally, consumers are loss-averse regarding individual consumption and payment events, so that events that have negative net utility are given disproportionate weight at the moment of choice (Kahneman and Tversky, 1979).

In terms of mental accounting, individuals divide the goods that can be consumed into groups; let us suppose that G represents the number of these groups. Next, consumers mentally assign their exogenous income $\bar{M}$ to each of these groups of goods, a process called "budgeting" (see Thaler, 1999). This procedure performs as a self-control device to keep spending within the budget (Thaler and Shefrin, 1981): a consumer mentally restricts himself from buying more goods of some group than the amount of income he has previously assigned to that group. That is, a consumer opens G mental accounts and assigns to it some income M_i, $i = 1, ... G$. We may depict this in an economic model by assuming a quasiconcave log-linear consumer preference:

$$U(c_1, ..., c_G, z) = z + \sum_{i=1}^{G} \bar{M}_i \, Lnc_i$$

where c_i is a composite good of group i with price index $\bar{p}_i$, and z is a numeraire non-consumptive good (savings, for example). Given the budget constraint $z + \sum_{i=1}^{G} \bar{p}_i \, c_i \leq \bar{M}$, the budgeting process is easily derived at from the first order condition: $\bar{p}_i c_i = \bar{M}_i$ with $i = 1, 2...\ G$ (and $z = \bar{M} - \sum_{i=1}^{G} \bar{M}_i$).[7] Consequently, there exists a group-mental account j where pizza consumption is assigned (e.g., under weekend night activities); this account is upper-bounded by the spending limit of $\bar{M}_j$ dollars.

We present a three-period economic model that formalizes the mental accounting system (Pralec and Loewenstein, 1998) and the asymmetric treatment of gains and losses (Kahneman and Tversky, 1979). The timing is as follows. In period $t = 1$, the decision is made to pay $\tau = \$2.50$ and enter the pizzeria , in which the customer holds a preconception as to the amount of pizza he will consume x^e. If he decides to enter and pays, he "opens" a sub-mental account of pizza. Then, inside at period $t = 2$, he has to decide how much pizza to eat x. At this time some of the customers are paid back , a transfer denoted by η. Customer behavior is an intent to turn the red mental account of pizza into the black and depends on the recalled feeling of paying and on the reimbursement. Finally, at period $t = 3$, the consumer exits the pizzeria with the remaining income, $\bar{M}_j - \tau$, and consumes other goods of the group j, denoted by y. If he declines the all-you-can-eat offer, he skips period $t = 2$, does not consume any pizza, and spends all his Mj consumption on other goods y of group j $\bar{M}_j$.

The consumer temporal preferences are assumed to be represented by a quasilinear continuous utility function

$$U_j(x, y) = V(x) + \beta y$$

where β is a time discounting parameter, and $V()$ is a monotone continuous function. At period $t = 1$ the consumer makes the entry decision, given expected consumption x^e. If he optimally chooses not to enter, his consumption basket will be $(0, \bar{M}_j)$, and his welfare will be $U_j(0, \bar{M}_j) = V(0) + \beta\bar{M}_j$. On the other hand, he will decide to pay the entry fee if $U_j(x^e, \bar{M}_j - \tau) \geq U_j(0, \bar{M}_j)$, that is, when the welfare derived from the consumption of pizza offsets the reduction of the consumption of other goods of the same group,[8] i.e., $V(x^e) - V(0) \geq \beta\tau$.

In mental accounting, these preferences $V()$ would reflect the period $t = 2$ balancing of the mental account of pizza. The entries for this account comprise the following: the pain associated with money loss in paying the entry fee τ at period $t = 1$; the benefits of

[7] With respect to standard neoclassical microeconomic theory, where all goods must be known at the moment of the decision, the procedure of the mental accounting system has some interesting advantages. It allows for devoting some amount of expenditure to a group of goods (e.g., food, sporting events, etc.) although many of the goods later assigned to each group, and then purchased, may be unknown at the moment of budgeting.

[8] This is the standard microeconomics consumer surplus, see Varian (1992, Chap.14) for the quasilinear case. Thaler (1999, p.188) denoted it the *acquisition utility*.

consuming pizza x at period $t = 2$; and, the benefits of increased money if the customer is paid back, i.e., $\eta = \$2.50$. The formulation of this balance would be

$$v_j(x, \tau, \eta) \equiv V(x) = \phi(-\tau) + w(x) + \phi(\eta)$$

where $\phi()$ is the Kahneman and Tversky value function, an increasing monotone asymmetric function of income modifications,[9] and where $w()$ is the welfare function derived from the direct consumption of pizza.[10]

Then, if the consumer decides to pay the entry fee at period $t = 1$, he will "open" a mental account of pizza, which initially is in the red, i.e., $\phi(-\tau)$. Once inside the pizzeria, period $t = 2$ begins, and the customer confronts the decision of how much pizza to eat. He is impelled to convert the red mental account of pizza into black, that is $w(x) \geq \phi(-\tau)$. We should note, in addition, that if the entry fee is returned, i.e., $\eta = \$2,50$, this money will be coupled with the pizza, so that this money increases the income available for this group of goods $\bar{M}_j$; it is not seen as an unexpected increase in global income $\bar{M}$. Consequently, each reimbursed customer is constrained at period $t = 2$ by the mental accounting restriction: $w(x) + \phi(\eta) \geq \phi(-\tau)$.

Now, we will look at the amount of pizza eaten in each case. The fact that the amount of pizza eaten $x^*(\tau, \eta)$ is an increasing function of the all-you-can-eat fee τ and a decreasing function of the money paid back reveals two findings. First, if no money is refunded, $\eta = 0$, and the customer's welfare is a function of the entry fee τ:

$$u_j(\tau) \equiv U_j(x^*(\tau, 0), \bar{M}_j - \tau) = \phi(-\tau) + w(x^*(\tau, 0)) + \beta(\bar{M}_j - \tau)$$

It must be noted that the slope of this function is negative, i.e., $u_j'(\tau) = -\phi'(-\tau) + w'(x^*(\tau, 0))\ \partial x^*(\tau, 0)/\partial\tau\ -\beta \leq 0$, and that the free-lunch case yields higher welfare than the no-enter event: $u_j(0) > U_j(0, \bar{M}_j)$. Therefore, it is easy to graph functions $U_j(x^*(\tau, 0), \bar{M}_j - \tau)$ and $U_j(0, \bar{M}_j)$ to find an upper threshold $\hat{\tau} \leq \bar{M}_j$ such that for $\tau \in [0, \hat{\tau}]$ the customer will enter the pizzeria.

Second, the mental account of pizza must change from being in the red to the, i.e., $w(x^*(\tau, \eta)) + \phi(\eta) \geq \phi(-\tau)$; thus, we may expect the consumer to achieve some given positive level of welfare. If the customer decides to enter the pizzeria, the amount of pizza eaten where there is no refund will be greater than the amount of pizza eaten if the entry fee is paid back: that is, $x^*(\tau, 0) > x^*(\tau, \tau)$ and Thaler's puzzle is solved. Although the behavioral literature goes no further than this, we might proceed with the argument that this model predicts that the amount of pizza eaten if the customer is reimbursed will also be greater than the amount of pizza eaten if the pizza is free i.e., $x^*(\tau, \tau) > x^*(0, 0)$, because no effort must be made to turn the mental account of pizza into the red.

[9] A similar idea was introduced in the Baumol-Tobin model, where monetary transactions derive disutility to consumers because cash withdrawals (e.g. queuing at the bank) are time consuming

[10] The timing of purchase and consumption may allow for the consideration of *coupling* between payment and consumption, both at the moment the consumer pays the entrance fee and while consuming the good (Pralec and Loewenstein, 1998, and Soman, 2001); however, we will not consider this due to the slight time interval between both events.

2.2 Shortcomings of the model when explaining the pizza experiment

The above economic model introduces several elements from the literature of prospect theory and "double-entry" mental accounting theory. This model offers an explanation as to why on average two groups of customers consume different amounts of pizza, depending on whether one group is reimbursed. However, some issues remain unsolved. First, why do customers decide to stop eating pizza at some point $x^*(\tau, 0)$? Two answers come forward: because they are simply full, or because they have reached some *given* point at which the mental account of pizza goes into the black. If it is the latter, then how is this given point found, or, "how black" does the pizza mental account have to be? In the economic model this point is taken as given, and behavioral economics provides no answer.

The former answer above introduces the second shortcoming: the model is unable to explain why customers who are reimbursed eat a different amount of pizza from those for whom the pizza is free, i.e., $x^*(\tau, \tau) > x^*(0, 0)$, instead of both groups stopping at the same point, when they are full. By incorporating some features of double-entry mental accounting and prospect theory into the economic model to explain consumers' behavior, we would find a monetary transfer $\hat{\eta} > \tau = \$2.50$ such that the customer eats the same amount as he would in the free-good case, $x^*(\tau, \hat{\eta}) = x^*(0, 0)$. Beyond this threshold, for $\eta > \hat{\eta}$ the customer would consume less than if the pizza were free!! This prediction resulting from our economic model is interesting because the literature of behavioral economics does not cite any example or experimental evidence along these lines.[11]

3 A complementary explanation: the role of physical satiation

In order to surmount some of the aforementioned shortcomings, in this section we present a very simple economic model that includes physical. If we observe that standard economic theory holds past sunk costs as irrelevant to subsequent decision-making, other costs or constraints could play a role in apparently irrational behavior. We will show that physical satiation pertains to this case.

We maintain the previous framework and simplify it to emphasize the role of the physical constraint by considering that no monetary loss or gain will affect welfare, i.e., $\phi() = 0$. In addition, we find the physical satiation constraint[12]

$$x + \sigma y \leq S.$$

where σ is the constant physical rate of substitution between goods x and y. The budget constraint depends on $\bar{M}_j$ and τ, and we skip the case in which no pizza can be eaten due to insufficient resources, i.e., $\tau > \bar{M}_j$. For simplicity, we will focus on the case of

[11] It is plausible to believe that if the money received is great enough, i.e., $\eta = \$100$, the customer will immediately leave the pizzeria to go to a fancy French restaurant, for example. This means that there exists an even higher threshold $\hat{\hat{\eta}} >> \hat{\eta}$ where no pizza is eaten.

[12] Despite its economic significance, the introduction of the physical constraint is novel. Agents are restricted by monetary, physical and temporal constraints. The first comprises the standard practice for microeconomic courses (see, e.g., Varian 1992), while the last was introduced into neoclassical economics by Becker (1965) and developed by DeSerpa (1971) and Evans (1972).

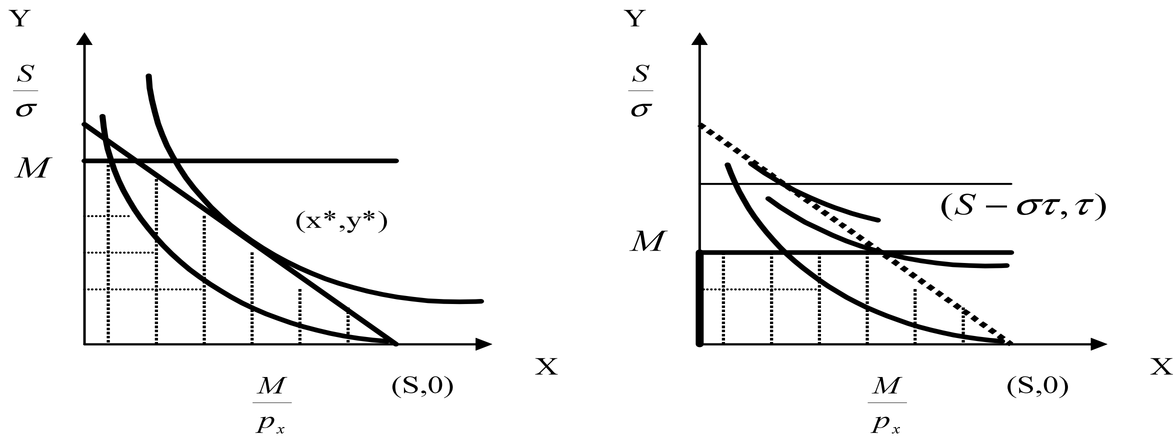

Figure 2: Customer budget set and optimal choice before and after being refunded for the case of alternative indifference maps, if the set of baskets that are not physically constrained is bigger than the monetary budget set, i.e., $\bar{M}_j < \S/\sigma$.

$\tau = \bar{M}_j = \$2.50$. The budget constraint is arrived at by (see figure 2),

$$B(\tau, 0) = \left\{(x, y) \mid \text{ with } x = 0,\ y \in [0, \min\{\bar{M}_j, S/\sigma\}], \text{ and } y = 0,\ x \in [0, S]\right\}.$$

There are two possible optimal corner decisions: $(x^*(\tau, 0), y^*(\tau, 0)) = (S, 0)$, and $(x^*(0, 0), y^*(0, 0)) = (0, \min\{\bar{M}_j, S/\sigma\})$. The first indicates that the customer decides to enter the pizzeria, $\tau > 0$, and that he will stop eating when he is full because his intake is bounded by the physical constraint.

Next, the budget constraint for those customers who are reimbursed the entry fee, $\eta = \tau$, becomes

$$B(\tau, \eta) = \left\{(x, y) \mid y = \in [0, \min\{\bar{M}_j, S/\sigma\}]\, x \in [0, S - \sigma y]\right\}.$$

(see figure 2). This means that new baskets are available for the consumption of both goods. Due to the physical constraint, if the consumer finds it optimal to increase the consumption of other goods y, he will have to reduce the consumption of pizza x; that is, if $y^*(\tau, \eta) > 0$ for $\eta > 0$ the new optimal allocation will be $(x^*(\tau, \eta), y^*(\tau, \eta)) = (S - \sigma y^*(\tau, \eta), y^*(\tau, \eta))$. This means a reduction in the amount of pizza consumed after the consumer is paid back the all-you-can-eat fee; thus, Thaler's puzzle is also explained by introducing a physical constraint.

This framework incorporating the physical constraint also allows us to understand why a higher reimbursement $\eta > \tau$ lowers even further the amount of pizza consumed, by increasing y. This might be the case if the customer preferences describe an indifference map such that the optimal basket is always set at the kink of the budget set, leaving the optimal basket as $(x^*(\tau, \eta), y^*(\tau, \eta)) = (S - \sigma\eta, \eta)$ for $\eta > 0$, (see Figure 2b). However, there must exist some upper bound $\hat{\eta}$ at which there are no further reductions in pizza consumption, although, depending on the consumer preferences, the case could also exist that no pizza is consumed when $\hat{\eta} = S/\sigma$.

3.1 Final remarks

First, with respect to the shortcoming of the behavioral economics framework, the introduction of a physical constraint formalizes the feeling of "being full" and provides an explanation as to why a consumer stops eating at $x^*(\tau, 0)$. Second, if this physical constraint does play a key role, it accounts for a customer's eating less when he is paid back and explains Thaler's puzzle because it predicts this reduction in the consumption of pizza, $x^*(\tau, 0) > x^*(\tau, \tau)$, obviating the need to resort to double-entry mental accounting. Finally, the model including physical satiation predicts that the consumer will consume the same amount whether he is paid back or whether the pizza is free, $x^*(\tau, \tau) = x^*(0, 0)$. This outcome differs from the prediction of the economic model that uses mental accounting and prospect theory, so further empirical and experimental evidence would be required to address this point.

4 Conclusion

In this paper we have presented two complementary economic models that account for Thaler's puzzle. The first model introduces some elements of behavioral economics into the neoclassical economic theory. We have provided this framework in order to shed light on the puzzle, and we find it convincing, but with some shortcomings. Next, a very simple model that includes a physical satiation constraint complements the above explanation surmounts the shortcomings, as well as providing a theoretical explanation for the empirical result. We point out that further empirical and experimental research must be undertaken to understand conflicting predictions between the two economic models, and, in particular, whether physical satiation does play a crucial role in the consumption of these kinds of goods.

Finally, one can identify straightforward applications with regard to our analysis of Thaler's puzzle. For example, we might determine that hotel customers will consume on average less of a breakfast buffet if its cost is included in the price of the room, rather than presented separately. Combining mental accounting, prospect theory, coupling, transaction utility, and the physical satiation constraint may go a long way in clarifying many persistent problems.

References

1. Arkes, Hal R.; and Catherine Blumer (1985), "The Psychology of Sunk Cost," *Organizational Behavior and Human Decision Processes*, vol.35 (February), pp.124140.

2. Becker, Gary (1965) "A theory of the allocation of time," *Economic Journal*, 75, pp.439-517

3. Bonifacio, Matteo; Paolo Bouquet; Roberta Ferrario; and Diego Ponte (2003) "Rationality, Autonomy and Coordination: the Sunk Costs Perspective," in Paolo Petta,

Robert Tolksdorf, Franco Zambonelli (eds.) *Engineering Societies in the Agents World III, Third International Workshop, ESAW 2002, Revised Papers*, Lecture Notes in Computer Science, vol. 2577, Springer-Verlag Heidelberg, pp.29-38.

4. DeSerpa, A.J. (1971) "A Theory of the Economics of Time," *The Economic Journal* vol. 81, pp.828-845.

5. Evans, A. (1972) "On the theory of the economics of time," *Scottish Journal of Political Economy*, 19, pp.1-19.

6. Frank, Robert (2001) *Microeconomics and Behaviour*, McGraw-Hill.

7. Heath, C.; and Soll, J. B. (1996) "Mental accounting and consumer decisions," *Journal of Consumer Research*, 23, pp. 40-52.

8. Kahneman, Daniel and Amos Tversky (1979) "Prospect theory, an analysis of decision under risk," *Econometrica* vol.47, n.2, pp. 263-291.

9. Prelec, Drazen; and George Loewenstain (1998) "The Red and the Black: Mental Accounting of Savings and Debt," *Marketing Science*, 17, n.1, pp. 4-28.

10. Soman, Dilip (2001) "Effects of Payment Mechanism on Spending Behavior: The Role of Rehearsal and Immediacy of Payments," *Journal Of Consumer Research*, vol. 27, pp.460-474.

11. Soman, Dilip; and Amar Cheema (2001) "The Effect of Windfall Gains on the Sunk-Cost Effect," *Marketing Letters*, vol.12, n.1, pp.51-62.

12. Thaler, Richard H. (1980) "Toward a Positive Theory of Consumer Choice," *Journal of Economic Behaviour and Organization*, 1, pp. 39-60.

13. Thaler, Richard H. (1990) "Anomalies. Saving, Fungibility, and Mental Accounts," *Journal of Economic Perspectives*, vol.4, n.1, pp. 193-205.

14. Thaler, Richard H. (1999) "Mental Accounting Matters," *Journal of Behavioral Decision Making*, 12, pp. 183-206.

15. Thaler, Richard H.; and Shefrin, H. M. "An Economic Theory of Self-Control," *Journal of Political Economy*, 39, pp. 392-406.

16. Tversky, Amos and Daniel Kahneman, (1981) "The Framing of Decisions and the Psychology of Choice," *Science* 211, pp. 453-458.

17. Varian, Hal (1992) *Microeconomic Analysis, 3rd. edition*, W.W. Norton and Company, New York.

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