Keeping doors open:

The effect of unavailability on incentives to keep options viable

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Abstract

Decision makers must often expand efforts to preserve the future viability of current options. Do decision makers sometimes value such options more highly than the outcomes they make possible? In five experiments using a "door game," we demonstrate that decision makers care a great deal about options and are willing to invest effort and money in order to keep options open, even when the options themselves seem to be of little interest. This general decision rule of keeping options viable is shown to be resilient to information about the outcomes, to increased experience, to the cost of the options, and to the saliency of the cost and of the option elimination. Experiment 5 provides initial evidence that the mechanism underlying the tendency to keep doors open is a type of loss aversion and not regret.

I find that absence still increases love.— Hopkins

Distance sometimes endears friendship, and absence sweeteneth it.—Howell

Absence makes the heart grow fonder: Isle of Beauty, fare thee well! — Bayly

Imagine a student who is uncertain whether he wants to become a computer programmer or a poet. Our student in this case is facing a dilemma: On one hand, he wants to keep both options available because he is uncertain about the two professions or about his future preferences. On the other hand, keeping both options open has its own cost. In his desire to keep both options open, our student might divide his time and effort between the two types of classes and at the end of his education might have become proficient in both, yet he would not be an expert in either.

Along the same line, consider a person pursuing two different potential romantic partners. As soon as our romantic decision maker places greater focus on one possible partner, the other candidate's potential decreases. This neglect is then recognized by the 'less desirable' candidate, who begins to realize the relationship is not moving forward. Hence, they begin to seek other possible relationships, removing themselves from the competition even further. Given the possible loss of a romantic option, our enthusiastic dater might try to spend most of her time with the option of her choice, but may continue spending some effort on the other option, largely to prevent it from disappearing and to maintain its viability. However, much like the education example above, keeping doors open has its costs. In this case, the cost might be reduced commitment or lack of time and energy to dedicate to the focal relationship.

The central focal point of the current work concerns the way decisions makers view options that might disappear. From a naïve rational (economic) perspective, one could expect that the value of an option would be based solely on the expected value of the outcomes it represents – the value of keeping a potential romantic partner viable reflects one's perception of the expected value of this

relationship. From a psychological perspective, however, there is evidence that people value options beyond the items which they represent. Brehm (1956) argued that people prefer flexibility and freedom in choice, even when this increased flexibility implies a sacrifice of their consumption pleasure (see also Simonson 1990; Gilbert and Ebert 2002). Moreover, such desire for flexibility is not limited to humans and has been exhibited in pigeons, which were willing to expend effort in order to have the flexibility of a future choice (Catania 1975). Finally, there is some evidence to suggest that individuals have a preference for options, which could be a general heuristic for choice flexibility or an independent utility component for choice options.

A different psychological perspective on the value of options is based on loss aversion (Tversky and Kahneman 1991), and the endowment effect (Kahneman, Knetsch and Thaler 1990; Bar-Hillel and Neter 1996; Carmon and Ariely 2000). It has been demonstrated repeatedly that ownership of an item increases the attachment for this item and hence increases its valuation (for a review see Sayman and Öncüler 2002). Although, options for items are very different from the items themselves (the possibility of dating a person is very different from the experience of dating that person, and investing in keeping the possibility of dating a person is very different from investing in that person), and although it is not possible to own an option in the same way as to own an item, losing an option is closely related to the loss of an item. Specifically, the loss of an option also implies the loss of the item – because once an option for an item no longer exists, neither does the item itself. Based on this similarity in terms of loss and the large influence of loss on consumer decision making (Tversky and Kahneman 1991), we argue that it is likely that individuals will also experience loss aversion and a pseudo-endowment effect for options themselves. The idea here is that in some cases, decision makers will not want the item in question, yet the possibility that the option for that 'unwanted' item will disappear will be psychologically aversive. This combination will cause individuals to invest in order to keep the option, regardless of their disinterest.

In summary, we argue that in many cases options are important (education and romance are just two examples), and that the ways in which individuals view their options, and not only the items / objects, might determine their behaviors (as indicated in the opening quotes). In terms of the effects of option availability on the tendency to keep doors open, we propose that there are reasons to expect that decision makers will be willing to exert effort to keep options viable above and beyond the value of the options themselves. Specifically, in the following experiments we attempt to answer six questions: 1) Does the mere fact that options could become unavailable make the decision maker's behavior different from that in the situation where options can always be exercised? 2) Do decision makers' interest in alternatives increase when the options could become unavailable? 3) Does the tendency to invest in keeping doors open decrease with more information or learning about the items? 4) Does the tendency to invest in keeping doors open change with explicitness of the cost? 5) Does the (visual) saliency of potential elimination play a large role in the tendency to keep doors open? 6) What are the psychological mechanisms underlying the tendency to keep doors open? Is it protection against possible regret?

The Experiments: General

Because all the experiments use the same basic design, we will start by describing the overall paradigm (the "game") and provide more details about specific differences as they pertain to the individual experiments.

The general structure of the game involved a sequential search task (Camerer 1995; Ratchford and Srinivasan 1993; Zwick, Weg, and Rapoport 2000), in which respondents were faced with multiple alternatives, each associated with different payoff distributions. Playing the game inevitably generated real life consequences, since respondents' earnings for their participation were based solely on their performance in the game. The respondents in this game faced a dilemma because they wanted to find

the best alternative, yet search was costly. Thus, respondents had to tradeoff possible value of additional search with search cost to determine their stopping rule (Saad and Russo 1996).

As a metaphor for "keeping options open," we created a computer game with three doors to three rooms (for a schematic illustration of the game see Figure 1). One door was red, another blue, and the third green. By clicking with the mouse on one of the doors (door-click) respondents opened that door and entered the room. Once in the room, respondents could either click in that room (room-click) or click on a door to a different room (door-click). Each room-click resulted in a payoff sampled randomly from that room's distribution, and each door-click transferred the respondent to that room but without any payoff. Respondents were allowed a fixed number of clicks and the process continued until respondents had used all their clicks. The total number of clicks was indicated clearly on the screen, both in terms of how many clicks the respondent had used and in terms of how many clicks they had left until the end of the experiment. The number of clicks available was reduced by one click for any type of click (both door and room clicks). Charging the respondent a click to switch rooms created the cost of switching we were after.

The main manipulation of interest was the availability of the doors as a function of the actions of the player (**option-availability**), which was varied at two levels: constant-availability and decreased-availability. In the **constant-availability** conditions, respondents were given access to all three rooms throughout the experiment and these three rooms remained as viable options at all times. In the **decreased-availability** conditions, the room availability depended on the action of the respondent. In these conditions, every time a respondent clicked either on a door or within a room, the doors to the other two rooms were reduced in size by $1/15^{th}$ of their original width, and once their size reached 0 the doors were eliminated. With this shrinking factor, an option (room) that was not clicked on within 15 clicks was eliminated and was no longer visible or available. A single entrance (door-click) to a room, revitalized it to its original size and the process continued.

••• Figure 1 •••

The analogy between the experimental game and the examples presented earlier should be clear. The three doors represent different academic (or romantic) options where there exists uncertainty, about which of the options would be the most desirable. In addition, in the decreased-availability conditions the viability of an option is threatened when there is no investment in, or attention to, that option. Moreover, after a certain amount of neglect, options become unavailable, and this state is irreversible. In sum, our experimental respondents, much like the student or the romantic decision maker, must decide at each point whether to put all their efforts (clicks) into their current choice or whether to continue searching and incurring search costs (spending clicks).

Experiment 1: Does Decreased Availability Increase Attractiveness?

Experiment 1 was designed to provide an initial answer to the question whether decreased availability of options would make them more attractive (questions 1 and 2). Our hypothesis was that the decreasing-availability condition would cause respondents to invest in keeping options viable.

Method

Respondents: Forty-four respondents were recruited by advertisements around campus and from within the computer lab where the experiment took place. The experiment lasted about 15 minutes, and respondents were paid according to their performance (more on this later). Respondents were randomly assigned to one of two conditions.

Design: The overall structure of the game was as described in the general description of the game. The expected value of each room-click was 3¢, but the three rooms were associated with three different distributions (see Table 1). Door 1 was highly concentrated around mean 3 (Normal with variance 0.64), door 2 was symmetric around the same mean but much more diffused (Normal with variance 2.25), and door 3 was highly skewed toward high numbers (chi square with 3 degrees of freedom).

The payoff distributions across these three rooms ranged from -2¢ to 14¢ with the lower numbers being more frequent than higher numbers (so that the mean value was 3¢). Respondents had a total of 100 clicks in the experiment, which they could allocate as they saw fit between switching rooms (door-clicks) and getting one-time payoffs within a room (room-clicks).

••• Table 1 •••

The main manipulation in Experiment 1 was option-availability as explained in the 'experiments: general' section.

Procedure: Upon arrival in the lab respondents were seated individually and given instructions for the game, including specific instructions for their condition. The greatest variant to the instructions was that the respondents in the decreased-availability condition had also been given instructions regarding the rules governing the shrinking and disappearance of the doors. These respondents encountered a screen that informed them that if they did not visit a door within 15 clicks, it would no longer be available to them, and that the size of the doors would shrink to alert them about the availability of the rooms. All respondents received instructions that emphasized that their goal in the experiment was to make as much money as they could, and that the amount they made would be paid to them at the end of the experiment.

In Experiment 1 we did not tell the respondents anything about the different distributions for the three different rooms, and so they had to learn about the distributions while playing the game.

Results and Discussion

It is interesting to note a few benchmarks for the behavior of the respondents. First, respondents who picked a single room and stayed there during the whole game would have made on average $3.00, with an implicit opportunity cost of 3¢ for each room switch (door-click) because the expected payoffs from all three rooms were the same. Relative to this standard, the respondents in Experiment 1 earned significantly less [Mean = $2.67, t(43) = 9.22, p < 0.001]. This reduction in payoffs was a

consequence of switching rooms, which occurred on the average of 11 times per respondent. Next we compared how switching and payoffs varied across the two different conditions. A comparison of the average number of room switches (door-clicks) revealed that switching was more likely to occur in the decreased-availability condition (Mean = 13.43) than in the constant-availability condition (Mean = 8.78), with this difference being statistically significant [$t(42) = 2.05$, $p = 0.046$].

Finally, we examined how the tendency to switch rooms changed as a function of "click number," i.e. the total number of clicks used. Note that click number combines the effects of two different components, both working in the same direction. First, as click number increases, respondents have more experience, better estimation of the distributions, and thus have a reduced need to explore the different options. Second, the expected benefit of exploring different options is reduced with click number because the time horizon during which respondents can use this information is reduced. As can be seen in Figure 2, there was a decreasing tendency to switch rooms as click number increased [$F(9, 387) = 5.09$, $p < 0.001$]. More importantly, there were interesting differences in how the tendency to open other doors changed as a function of the two option-availability conditions. The first 10 clicks indicated no difference between the two conditions [$F(1,42) = 0.01$, $p = 0. 98$], most likely since there was no risk of eliminating an option within this first block of ten clicks. However, in the next 7 blocks of 10 clicks, the tendency to switch was much higher in the decreased-availability condition (Mean = 1.44) compared with the constant availability condition (Mean = 0.8) [$F(1,42) = 7.78$, $p < 0.008$]. During the last 2 blocks of 10 clicks, there was no distinction between the two conditions [$F(1,42) = 0.07$, $p = 0.79$]. This reduction in difference near the end of the game could be attributed to 1) the learning of the distributions, 2) the low value of information at that stage of the game, or 3) the effect of the end itself – where the eminent elimination of all three options made the elimination of any option seem less painful.

••• Figure 2 •••

In summary, the different analyses reveal a main effect for option-availability; decision makers' interests in alternative options increase when they are threatened by their unavailability. The mere fact that options could have been lost promoted more frequent room-switches – indicating that indeed the threat of unavailability makes the heart grows fonder.

Experiment 2: Effects of Knowledge on the Desire to Keep Doors Open

The results of Experiment 1 serve as a pretest for all the following experiments, establishing the main phenomenon in which people switch rooms more often when there is a possibility of losing options. Although the findings clearly show that our respondents were willing to invest to keep their options open, it remains unclear as to whether this investment was an overinvestment or underinvestment than an optimal level. It is possible, for example, that in the face of uncertainty it is the right strategy to keep options open and act on them as information about distribution accumulates. In other words, from the results of Experiment 1, it is unclear if keeping doors open is a rational or irrational behavior. Experiment 2 manipulates the level of knowledge respondents had about the distributions; the logic is that if the reason for investing in keeping options available is the lack of knowledge, providing respondents with more information about the payoff distributions should eliminate the difference between the decreased and constant availability conditions. On the other hand, if the tendency to keep options viable is related to aspects other than the expected value of those options (such as preference for flexibility or pseudo-loss aversion), providing additional information will not eliminate the effects of option-availability on room switching.

Method

Respondents: One hundred and five respondents were recruited by advertisements around campus and from within the computer lab where the experiment took palace. Respondents were randomly assigned to one of six conditions.

Design & Procedure: The three rooms in the door game were again associated with three different distributions with the same mean value (see Table 1). Experiment 2 included the same option-availability manipulation as in Experiment 1, but with two important differences. First, the manipulation of the option-availability was crossed with a manipulation of **information**, which was varied on three levels: **no-prior-information**, **practice-information**, and **descriptive-information**. Second, in Experiment 2 respondents were allocated 50 clicks as their clicking budget. The no-prior-information conditions were a basic replication of Experiment 1. In these two conditions (constant and decreased availability) respondents did not get any prior information about the distributions, and they were simply given the opportunity to play the game. In the practice-information conditions, respondents played the game twice, first for practice without getting any of the payments and then for real. Respondents were clearly informed that the distributions in the real game were exactly the same as in the practice game, thus increasing their knowledge about these distributions for the real part of the experiment (the part for which they got paid). Finally, respondents in the descriptive-information conditions were told that the averages of the distributions of all three boxes were identical, and they were also shown a graph describing the three distributions where the skewness and variance of each distribution had been depicted. Note that although respondents in the descriptive-information condition knew the three distributions, they did not know which rooms corresponded to which distributions. Thus, if they were not satisfied with the equal expected value across the three rooms, respondents could have searched the three rooms for their preferred distribution.

Results and Discussion

As in Experiment 1, our main dependent measure was the frequency of room switches across the different conditions, analyzed in a 2 (option-availability) by 3 (information) between subjects ANOVA (see Figure 3a). The overall ANOVA of the switching behavior revealed a main effect for option-availability [$F(1, 99) = 56.66$, $p < 0.001$], replicating the results of Experiment 1 in terms of the main

effect of option-availability. The overall ANOVA also reveled an effect for information [$F(2, 99) = 6.99, p < 0.001$], showing that the no-prior-information conditions induced more switching than the other two conditions [$F(1,101) = 12.78, p < 0.001$], which were not different from each other [$F(1,61) = 1.85, p = 0.18$]. Finally, the analysis showed a non significant interaction between option-availability and information [$F(2, 99) = 1.32, p = 0.27$], demonstrating that the different information conditions did not change the effect of option-availability on switching behavior – respondents with no prior information about the distributions exhibited the same type of behavior as respondents who had more information about these distributions.

Next, we examined the number of times that our respondents switched to another room, clicked in that room once and switched back. We call this behavior "**pecking.**" If information reasoning is the main reason for investing in keeping options open, and respondents are rational (maximize their own expected payoffs), then we could consider such pecking behavior as an irrational over-investment in keeping options open because it provides little information (one more sample) at a high cost (3 clicks – one for switching away, one for sampling the payoffs and one for switching back). An ANOVA analysis of pecking behavior showed a significant main effect for option-availability [$F(1, 99) = 5.97, p = 0.016$], suggesting that in the face of a possibility that an option would become unavailable respondents showed "irrational" behavior more often (Mean in the decreased-availability condition = 0.36), than in the constant-availability condition (Mean = 0.07). Surprisingly, the effect of information on pecking was not significant [$F(2, 99) = 0.682, p = 0.508$], as was the interaction between option-availability and information [$F(2, 99) = 0.435, p = 0.649$], suggesting that the different amounts of information had no effect on respondents' over-investment in keeping options open. In sum, respondents showed more pecking behavior under the threat of option-disappearance irrespective to the amount of information.

In another attempt to examine the irrational aspect of keeping doors open, for each respondent we measured the number of clicks from the start of the experiment in which they stopped visiting each of the three rooms. The smallest number of the three was the first time respondents eliminated a door from their options – which we termed the **elimination point**. We reasoned that the comparison of this elimination point could demonstrate the amount of investment across different conditions. If respondents over-invested in options in order to keep them, then their elimination point would be bigger than those of other conditions.

An overall ANOVA of elimination point (see Figure 3b) revealed a main effect for option-availability [$F(1, 99) = 44.67$, $p < 0.001$], a non significant effect for information [$F(2, 99) = 0.322$, $p = 0.725$], and a significant interaction effect between option-availability and information [$F(2, 99) = 4.76$, $p = 0.011$]. Together these results indicate that although respondents felt they did not need any more of the options early in the process (as indicated by the elimination-point in the constant-availability condition: Mean = 9.8), respondents kept the least preferred option viable for longer in the decreased-availability condition (Mean = 27.14), in the face of the possibility that it would become unavailable irrespective of their informational state. However, as the interaction suggested (see Figure 3b), in the practice-information condition, respondents seemed more sensitive to availability.

••• Figure 3 •••

In summary, the results of Experiment 2 replicated Experiment 1 by showing that reduced option-availability increases the tendency to invest in keeping options open. More importantly, Experiment 2 demonstrates that this effect couldn't be simply attributed to information. Providing our respondents with more experience (in the practice-information condition) or telling them explicitly about the distributions (in the descriptive-information condition) decreased their overall switching behavior, but it did not change the effect of decreased-availability on switching (the difference between the two option-availability conditions). Together with the results of Experiment 1, these findings suggest that

1) there is an inherent tendency to keep options open, even when doing so is costly, 2) that people are overzealous in their preference for keeping options open (based on the analyses of pecking and elimination point), and 3) that the informational aspect of learning about the payoff distributions is not a sufficient explanation to account for this effect.

Experiment 3: Effects of Cost Saliency on the Desire to Keep Options Open

Experiments 1 and 2 demonstrated that the threat of option-disappearance causes decision makers to sacrifice payoffs in order to keep options viable. Moreover, this tendency remained even when it became more apparent that keeping these options open had no expected value (such as in the descriptive-information condition). It is possible, however, that while our respondents understood that keeping options available had little value, they did so because they did not understand the costs of keeping these options available. Specifically, the cost in experiments 1 and 2 was implemented as an opportunity cost, losing a click every time respondents switched to a different room. While we carefully explained to the respondents that they lost a click for every door-click, and presented them with an updated click-counter after every click, opportunity costs might have been less heavily weighted compared with out-of-pocket explicit costs (Thaler 1980). Our respondents may have simply failed to carefully consider the value of opportunity cost, leading to the frequent switching. Experiment 3 examined this issue by including a condition in which respondents paid explicitly for switching rooms. We reasoned that if the high level of switching in Experiments 1 and 2 was due to the low saliency of the cost, then making the cost explicit (and higher) would decrease switching, and eliminate the effect of option-availability. On the other hand, to the extent that room switching is not influenced by the cost, we would increase our confidence that the desire to keep options open is a basic heuristic.

Method

The basic design of Experiment 3 was the same as Experiment 1 with two differences: First, all respondents engaged in 100 practice clicks before beginning with the 100 real clicks (the same as in the practice-information condition in Experiment 2 but with 100 clicks). Second, we included explicit penalties for door-clicks (room switching).

Respondents: Eighty-six respondents were recruited by advertisements around campus and from within the computer lab where the experiment took place. Respondents were randomly assigned to one of four conditions.

Design & Procedure: Experiment 3 included the same option-availability manipulation as in Experiment 1. The main additional manipulation in Experiment 3 was **cost**, which was varied on two levels: **implicit-cost**, and **explicit-cost**. Cost and option-availability were crossed in a 2 by 2 between respondents design. In the implicit-cost conditions the cost of switching rooms was the loss of a click (as in experiments 1 and 2). In the explicit-cost conditions the cost of switching rooms was the cost of losing a click (implicit cost) and in addition, 3¢ was deducted from their payoffs every time the respondents moved to a different room. We picked this amount because it was the expected value of a click (see Table 1), making the total cost of switching in the explicit conditions twice as much as in the implicit conditions. The loss of 3¢ per switch was noted on the screen for every door-click in the same way that payoffs for each room-click were posted.

Results and Discussion

An overall ANOVA of door-clicks indicated a significant main effect for option-availability [$F(1, 82) = 13.411$, $p < 0.001$], a marginal effect for cost [$F(1, 82) = 3.484$, $p = 0.066$], and a non-significant interaction between option-availability and cost [$F(1, 82) = 0.380$, $p = 0.539$]. As can be seen in Figure 4, the effect of option-availability replicated the previous experiments, showing that decreased-availability caused more switching behavior (Mean = 13.26) than constant-availability (Mean = 5.36). The marginal effect of cost showed that switching was more frequent, but not significantly so, in the

implicit-cost condition (Mean = 10.8) compared with the explicit-cost condition (Mean = 6.65). Note that although the cost manipulation was marginally significant, the important aspect was that the magnitude of the cost effect (lamda = 3.48) was much lower than that of the option-availability effect (lamda = 13.41). Most importantly, the non-significant interaction between option-availability and cost illustrated that the desire to keep options open persisted even when the cost was more explicit and even when it was twice the magnitude. Finally, the amount of experience in this experiment was higher (100 clicks instead of 50), which allowed us to look at later trials in which respondents had more experience –the effects of availability and cost persisted throughout the 100 clicks.

••• Figure 4 •••

In summary, Experiment 3 suggests that even if there is an explicit cost in addition to the implicit opportunity cost, the tendency to "keep options open" remains. The explicit cost increases the amount of attention people pay to it and thus reduces switching (albeit slightly). However, even with the increased and explicit cost, decision makers' interest in alternatives increase when the options could become unavailable.

Experiment 4: Effects of Visual Saliency on the Desire to Keep Doors Open

Although the effect of option-availability did not diminish with the saliency of cost, it is possible that the visual salience of potential losses overwhelmed any other effects. In Experiments 1-3, the manipulation was such that for every click in one of the rooms, the door to the other two rooms decreased by 1/15th of its original size, until it disappeared from the screen altogether. This disappearance created a very strong feeling of impending loss, which even we, as the experimenters, felt. It is possible that taking away options in such a way could cause their disappearance to be very aversive (Kahneman, Knetsch and Thaler 1990; Bar-Hillel and Neter 1996; Carmon and Ariely 2000), in which case respondents' investments in keeping these options viable could be justified. In Experiment 4 we included a manipulation that weakened the visual disappearance of the options. In

these conditions, the visual representation of the doors remained on the screen even after they were no longer available. Additionally, this manipulation addressed the possibility that respondents may have simply disliked seeing doors disappear as a general rule (see Amir and Ariely 2002), and had been willing to invest in order to keep them visible. We hypothesized that if the visual disappearance of the doors (options) serves as a main motivator for keeping the doors open, eliminating the visual disappearance would eliminate the difference between the constant and decreased availability conditions. On the other hand, if the visual disappearance of the doors were not a main motivator, visual saliency should have no effect.

Method

Respondents: Forty-five respondents were recruited by advertisements around campus and from within the computer lab where the experiment took palace. Respondents were randomly assigned to one of three conditions.

Design & Procedure:

Experiment 4 included the same option-availability manipulation as previous experiments: constant and decreased –availability. The main change in Experiment 4 was that there were two versions of the decreased–availability condition which varied on their **visual saliency** (high and partial). The high-saliency condition was the same as in the previous experiments, i.e., the availability of doors was indicated by its width, and once the width reached zero, it disappeared altogether. In the partial-saliency condition, there were constant indications of the doors' original size (much like a door frame), and the decreased potential of each door was indicated by partial shading of the doorframe (in lighter color). Note that in both versions of the decreased-availability conditions, indication of the room's availability (width of door in high saliency, and width of shading in partial saliency) was always decreased by $1/15^{th}$ of the original width with every click at a different location. Finally, in order to

make the overall saliency of Experiment 4 higher, the payoffs were increased by multiplying every sample from the distributions by 2.

Results and Discussion

Experiment 4 was analyzed as a 1 factor ANOVA, comparing the constant-availability condition to the high-saliency and partial-saliency conditions (both being versions of decreased-availability). The overall model showed that switching behavior was significantly different under each given condition [$F(2, 42) = 10.74$, $p < 0.001$]. Consistent with the previous experiments, the lowest amount of switching occurred in the constant-availability condition ($M = 3.62$), followed by the high-saliency condition ($M = 9.58$), and the partial-saliency condition ($M = 11.5$). The high and partial saliency conditions were not statistically different from each other [$F(1.22) = 0.467$, $p = 0.5$], although the direction of the effect took the opposite direction from the earlier hypothesis, suggesting that reduced salience would reduce the effect. Switching rooms in the constant-availability condition proved lower than that of both the high and partial saliency conditions [$F(1, 43) = 20.7$, $p < 0.001$]. The results thus show that visual saliency was not a main driver of the effect of option-availability in our game. The desire to keep options open is as consistent even when the visual saliency of the loss is reduced.

Experiment 5: Effects of Regret on the Tendency to Keep Doors Open

The previous four experiments demonstrated that threats to future availability have a strong influence on the desire to keep doors open. Experiments 2, 3, and 4 examined whether information, saliency of cost, or visual saliency of option-loss is the basic mechanism for this effect. These three experiments eliminated these explanations as possible mechanisms for the tendency to keep options viable. Experiment 5 attempts to examine yet another possible mechanism, which is protection against possible future regret. The idea here is that respondents might not try to maximize their payoffs, but instead try to minimize their possible regret, keeping the doors open as protection against possible

future regret (see also Kahneman and Tversky 1982a; Mellers, Schwartz, Ho, and Ritov 1997; Mellers, Schwartz and Ritov 1999; Simonson 1992).

In Experiment 5 we introduced counterfactuals for the forgone outcomes (i.e., outcomes for the doors not chosen). By introducing these counterfactuals we created the possibility for high regret (Kahneman and Tversky 1982b; Zeelenberg et al 1998). Our hypothesis was that when the possibility for regret was high, the tendency to keep options open would be higher. In addition, we manipulated whether information about options remained available even when the options themselves were not. We hypothesized that when the information about an option remained available even after the elimination of the option itself, the potential for regret would be very high and thus drive decision makers to keep options viable longer.

Returning to our initial dating example, the case where the information about the other alternatives is known is analogous to a case where the potential dates live in the same neighborhood and where information about their lives is readily available. The case where the information is eliminated when an option is eliminated is analogous to a case where a potential date at some point gets married (and thus is no longer available as a potential date), and moves away such that the information about that option is eliminated as well. The case where the information is not eliminated with the option is analogous to a case where the potential date at some point gets married (and thus is no longer available as a potential date), yet remains in the same neighborhood such that the information about that option is readily available even after the option is not available.

Method

Respondents: Sixty-five respondents were recruited by advertisements around campus and from within the computer lab where the experiment took place. Respondents were randomly assigned to one of five conditions.

Design & Procedure:

Experiment 5 had five conditions, all of which had 50 practice clicks followed by 50 real clicks (for which respondents got paid). The first 2 conditions were constant-availability and decreased-availability (as in the practice-information conditions in Experiment 2). The novel conditions in Experiment 5 introduced information about the forgone payoffs in the rooms that respondents were not in (counterfactuals). In these conditions, the payoffs for all three rooms appeared after each click within any room, yet the respondents received only the payoffs for the room they clicked in. The forgone payoffs for the other two rooms were a reminder of what they could have earned if they had clicked in either one of the other two rooms. The first new condition (**constant-counterfactual**) was a variation of the constant-availability condition. In the constant-counterfactual condition the availability of the options was constant (as in the constant-availability condition) and so was the counterfactual information, which appeared after every room-click. The other two new conditions (**eliminated-counterfactual and persistent-counterfactual**) were variations of the decreased-availability condition. In the eliminated-counterfactual condition, the information about an option was eliminated once that option was no longer available. Initially all respondents were presented with the information for all options, but as soon as any option became unavailable the information about it ceased to be displayed. This meant that the availability of the counterfactual depended upon the availability of the option itself. In the persistent-counterfactual condition, information about the other options was not eliminated even in cases where an option was no longer available – it persisted and was available throughout all the clicks. This meant that the availability of the counterfactual did not depend upon the availability of the option itself, and it was always presented.

Based on literature discussing the topic of regret, we expected that respondents would expend the highest level of effort (room-switching) to keep options open in the persistent-counterfactual condition, less in the eliminated-counterfactual, and the least in the constant-counterfactual condition. On the other hand, if the tendency to keep options open largely relates to a general aversion to losses, we

expected that room switching would be the highest in the eliminated-counterfactual condition, simply because in this condition, it is not just the option that is eliminated but also the information about it (i. e., two aspects are eliminated rather than one).

Results and Discussion

There were five conditions in Experiment 5, two types of constant-availability conditions (constant-availability and constant-counterfactual) and three decreased-availability conditions (decreased-availability, eliminated-counterfactual, and persistent counterfactual). Two of these conditions were a replication of the previous general results (constant-availability and decreased-availability). The other three conditions had additional information about the options not chosen (the counterfactual conditions). It is important to note that because there was more information given in the counterfactual conditions (information about the other rooms), these conditions promoted reduced incentives for switching rooms.

First, the constant-availability and decreased-availability conditions replicated previous results (see left side of Figure 5). Switching in the constant-availability condition (Mean = 4.0) was lower than the switching in the decreased-availability condition (Mean 8.87), and this difference was statistically significant [$t(26) = 3.69$, $p < 0.01$]. Next we compared the amount of switching within the two conditions without counterfactual information to the three conditions using the counterfactual information. There are two possible forces that can influence switching behavior: information and regret. If switching is more influenced by the need for information than by regret, switching should occur more often in the conditions without counterfactual information. On the other hand, if switching is more influenced by regret than by the need for information, switching should occur more often in the conditions with counterfactual information. As can be seen in Figure 5, the results suggest that regret plays a larger role than information. Switching under the conditions without counterfactual information (Mean = 6.61) was lower than the switching under the conditions with counterfactual

information (Mean 8.3), although this overall difference was not statistically significant [t(63) = 1.15, p = 0.25].

Finally, we tested the magnitude of switching within the three counterfactual conditions. We predicted that there would be more switching in the two decreased-availability counterfactual conditions (eliminated-counterfactual and persistent-counterfactual) than in the constant-counterfactual condition. Within the two decreased-availability counterfactual conditions, we predicted that the tendency to switch would be higher in the persistent-counterfactual condition compared with the eliminated-counterfactual condition. In short, we predicted that switching would occur least in the constant-counterfactual condition, followed by the eliminated-counterfactual and the most switching would occur in the persistent-counterfactual condition.

As can be seen in the right panel of Figure 5, these results have one predicted and two surprising outcomes (the expected result was to see an increased trend from left to right). The predicted outcome was the replication of previous experiments by showing that switching in the constant-counterfactual condition (Mean = 4.92) was lower than switching in the two decreased-availability counterfactual conditions (Mean = 9.92), and this difference was statistically significant [t(350 = 2.19, p = 0.035]. This replication also provides additional support against the information explanation (Experiment 2), because it demonstrates that the effect of option-availability is not eliminated with additional information about the other options. The first surprising outcome was that the persistent-counterfactual condition was not significantly different from the constant-counterfactual condition [t(23) = 0.75, p = 0.46]. The second surprising outcome was that the eliminated-counterfactual condition had higher switching than all the other conditions [t(63) = 4.71, p < 0.001]. Recall that based on the ideas of regret and counterfactuals, we hypothesized that the persistent-counterfactual condition would induce the highest level of switching behavior. The fact that the disappearance of the counterfactual with the option increased the tendency to keep doors open suggests to us that

respondents treated the loss of the information about the option as a loss. In other words, it seems that respondents did not want to lose options <u>or</u> information about the options and in both cases were willing to invest in order to keep things (options or information) from disappearing. Perhaps what is at work here is a general heuristic to maintain what one has and to protect against its loss.

In sum, these results suggest that the mere disappearance of items, whether they are options or information about the options, is aversive and hence respondents are willing to invest in order to reduce the possible experience of loss. We think about this effect as a disappearance aversion similar in some ways to the general ideas of loss aversion.

••• Figure 5 •••

General Discussion

The experiments presented here seem to capture an aspect of human behavior that extends beyond interpersonal relationships and applies even to abstract monetary options – the possibility that options will become unavailable in the future increases their attractiveness. The results of the five experiments show that this basic tendency causes people to invest effort (in our case money) in order to keep options from disappearing, which in turn can cause less preferred options to be maintained in spite of their maintenance cost. The threat of unavailability does make the heart grow fonder.

We would like to argue that the results apply beyond the simple abstract, stylized game we have here, to many cases in which decision makers encounter tradeoffs between the future availability of options and the cost of these options. For example, when buying a new computer, consumers face the dilemma of deciding whether to buy a system that suits their current needs or purchasing an expandable system (more slots for cards, memory, etc.) that could also fit their future needs. The main source of the dilemma in this case is the uncertainty of whether future expansion will be needed or if the option to expand for the future is worth the cost at the present. Our potential computer buyer can take action at the purchasing time to ensure that the expansion option remains available to him,

whether he later decides to expand or not. Other examples of cases in which consumers have to make decisions in the face of "disappearing" options are purchases of additional warranty when buying new electronic products, or deciding whether to buy pictures of oneself from a third party (such as on a white water rafting trip). In such cases, consumers are given the opportunity to act upon the options (the warranty or the pictures), while realizing this will be their only chance for this action and that not acting on the options will be irreversible. We suspect that the effectiveness of such tactics is based on the option's non-availability in the future – causing these options to be viewed more favorably and to be acted upon more frequently.

In summary, we created a game that captures a general phenomenon whereby people are willing to invest in order to keep options, as well as information about these options, open. We speculate that the desirability to keep options open is an emotional heuristic; whereby the affective component of the possible unavailability in the future creates motivation for investment in these options (for a review of emotions in decision making see Mellers 2000). Like other heuristics, this heuristic is most likely generally, but not universally, useful. One of the interesting and important questions about this heuristic is whether it is aimed at protection against future losses or whether it is aimed at keeping (or increasing) flexibility in future choices. Future research might aim to provide a better understanding regarding the goal of this heuristic. For example, imagine an experiment in which respondents have had an "insurance policy" whereby they could at a later stage pay a fee to have an option reappear. In such cases, options that are not attended to would disappear, but the future flexibility will remain high. Would that kind of protection against irreversibility reduce the effects of unavailability? A related experiment could test a case where some of the options (doors) are unavailable at the onset of the experiment, yet they could become activated during a certain time frame (a certain number of clicks). The question is whether such options would be activated at all, and if so, whether the effort to keep them open would be the same as options that had been available initially. The logic of this setup is that

pseudo-endowment (or loss aversion) should be sensitive to the initial state of the options (with more effort predicted for option's that are initially available), while the desire for flexibility should be insensitive to the options' initial state. We keep these opportunities for future work open.

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Table 1: The distributions of payment in the three doors across the five experiments.

Study # (clicks)	Manipulation		Door 1	Door 2	Door3[1]
Study 1 (100)	Option - Availability	Distribution	Normal	Normal	Chi-Square
		Average / Variance	3¢ / 2.25	3¢ / 0.64	3¢ / 10
		Min / Max	0 / 7	1 / 5	- 2 / 10
Study 2 (50)	Information Level	Distribution	Normal	Normal	Chi-Square
		Average / Variance	6¢ / 9	6¢ / 2.25	6¢ / 16
		Min / Max	0 / 14	2 / 9	-4 / 19
Study 3 (100)	Saliency of the Cost	Distribution	Normal	Normal	Chi-Square
		Average / Variance	10¢ / 9	10¢ / 2.25	10¢ / 20
		Min / Max	4 / 18	6 / 13	0 / 20
Study 4 (100)	Saliency of the Loss of Potential	Distribution	Normal	Normal	Chi-Square
		Average / Variance	6¢ / 9	6¢ / 2.25	6¢ / 10
		Min / Max	0 / 14	2 / 9	-4 / 19
Study 5 (50)	Level of Regret	Distribution	Normal	Normal	Chi-Square
		Average / Variance	6¢ / 9	6¢ / 2.25	6¢ / 16
		Min / Max	0 / 14	2 / 9	-4 / 19

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[1] Door 3 was a Chi square distribution with 8 degrees of freedom where we subtracted 2 cents from the distribution. This was done in order to keep the same average but have a few negative outcomes.

Figure 1: A schematic illustration of the "door game." Respondents first encountered three doors to three rooms. Clicking on any door opened the door allowing the respondent to either click within that room or move to another room. Clicking in a room awarded the respondent a payoff randomly sampled from the distribution of that room. Moving to a different room cost respondents a click. Respondents were given a total click budget and the experiment was over when the click budget was depleted.
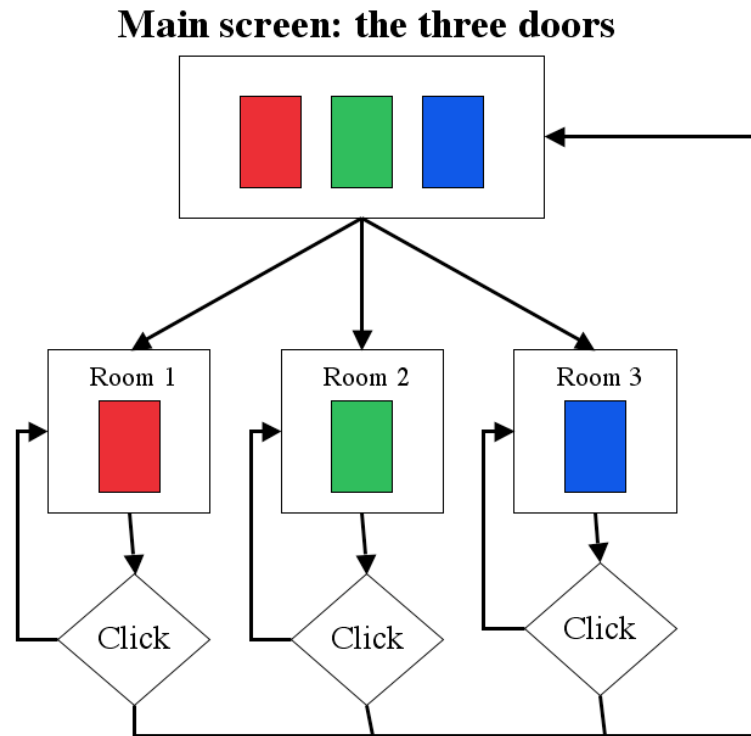

Main screen: the three doors

Figure 2: Average number of door switches for the decreased and constant availability conditions within each block of 10 clicks in Experiment 1.
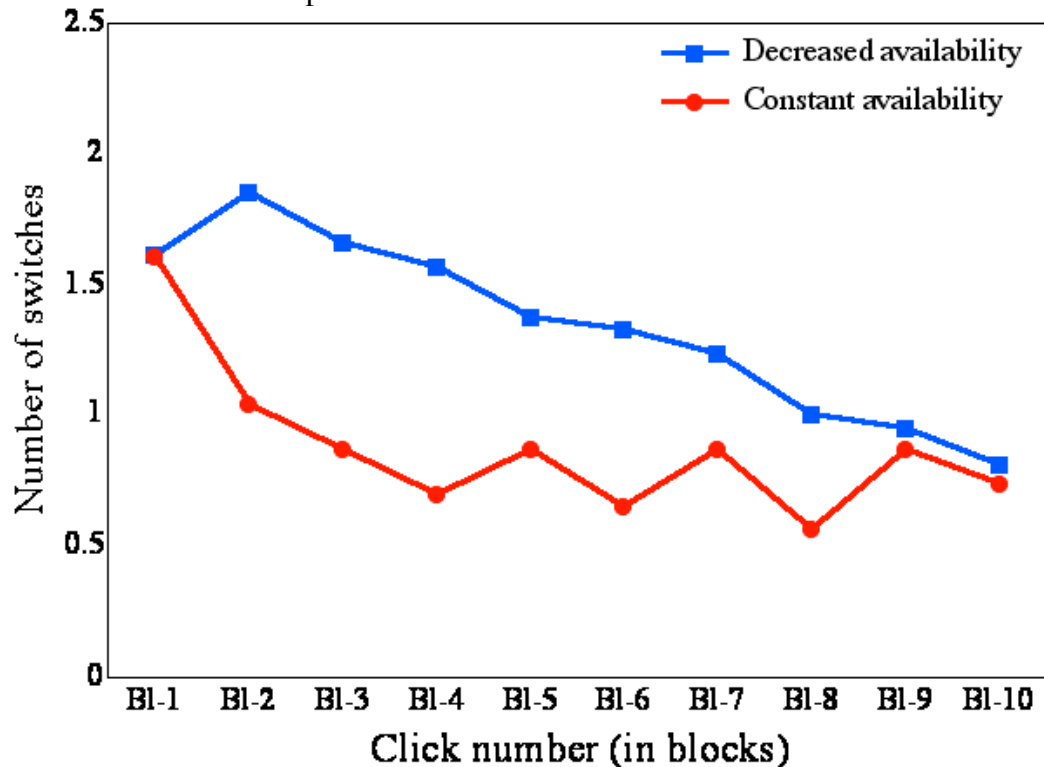
Figure 3: Panel (a) shows the average number of door switches in the two option-availability and three information conditions in Experiment 2. Error bars are based on standard errors. Panel (b) shows the average Elimination Point in the two option-availability and three information conditions in Experiment 2. Error bars are based on standard errors.
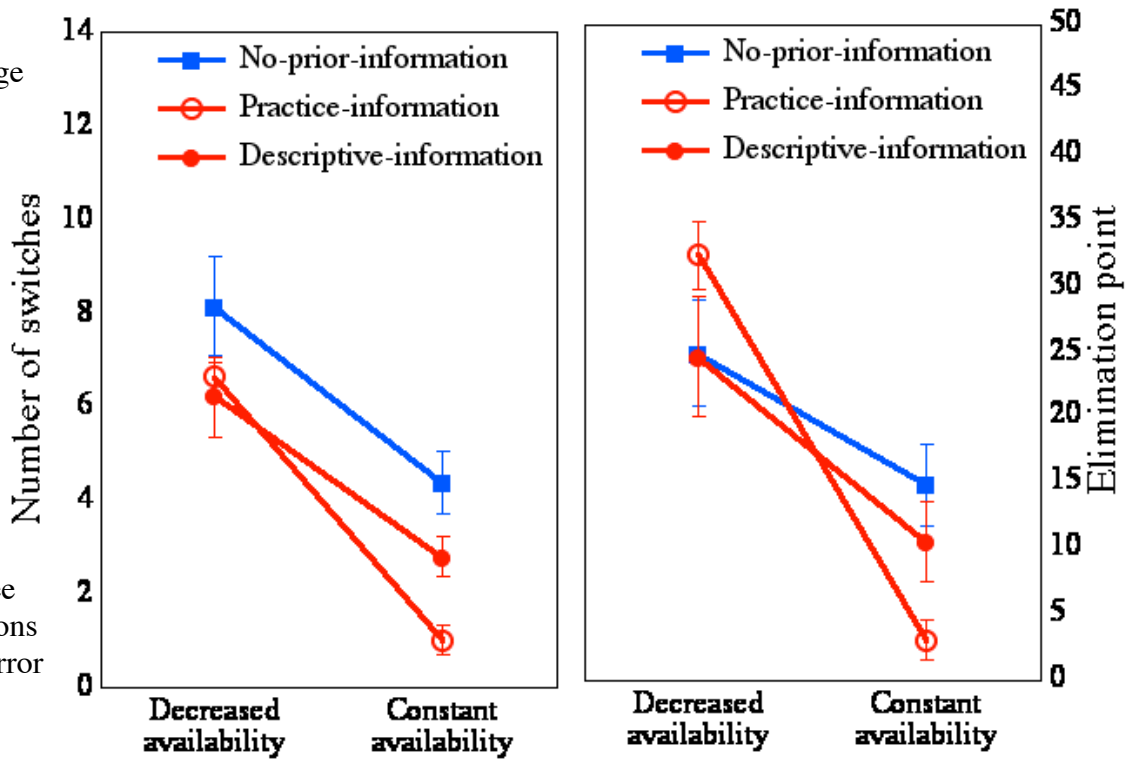

Figure 4: Average number of door switches in the two option-availability and two cost conditions in Experiment 3. Error bars are based on standard error.
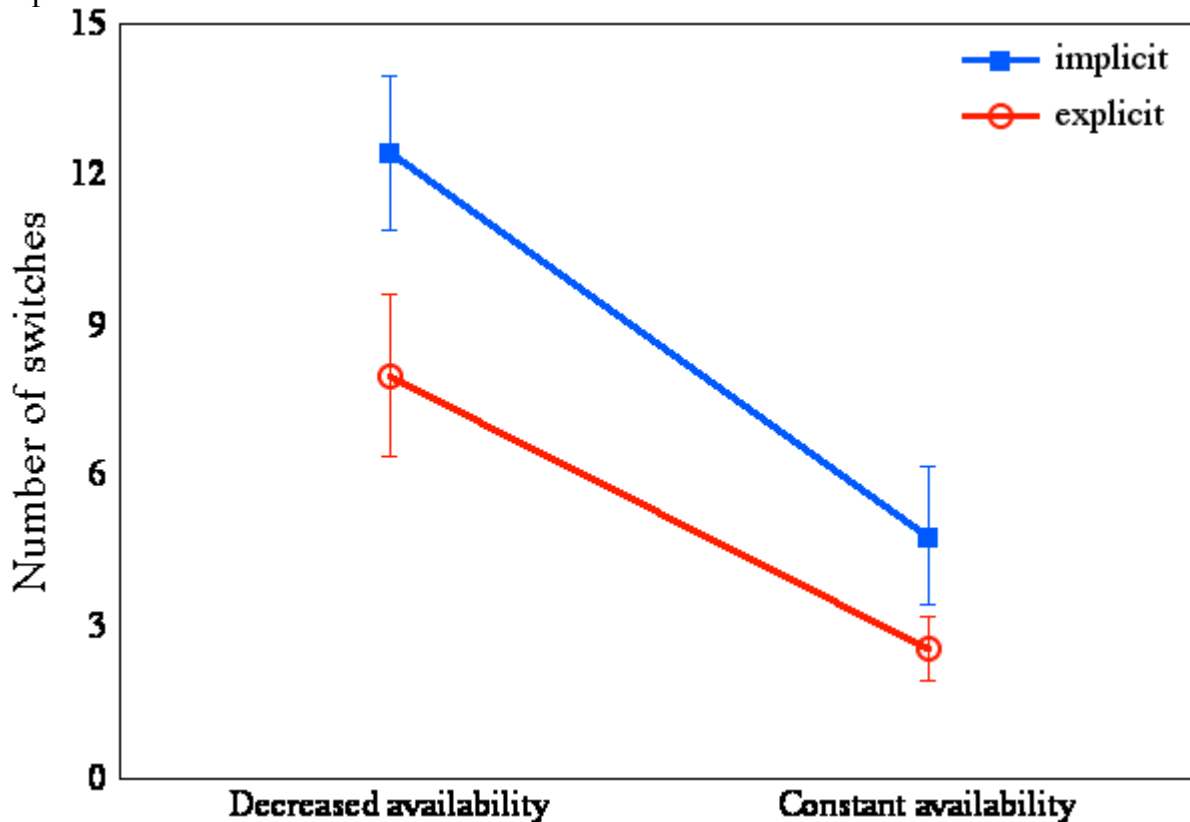
Figure 5: Average number of door switches in the two replication conditions (left), and the three counterfactual conditions in Experiment 5. Error bars are based on standard errors.