

The Psychology of Sunk Cost

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The sunk cost effect is manifested in a greater tendency to continue an endeavor once an investment in money, effort, or time has been made. Evidence that the psychological justification for this behavior is predicated on the desire not to appear wasteful is presented. In a field study, customers who had initially paid more for a season subscription to a theater series attended more plays during the next 6 months, presumably because of their higher sunk cost in the season tickets. Several questionnaire studies corroborated and extended this finding. It is found that those who had incurred a sunk cost inflated their estimate of how likely a project was to succeed compared to the estimates of the same project by those who had not incurred a sunk cost. The basic sunk cost finding that people will throw good money after bad appears to be well described by prospect theory (D. Kahneman & A. Tversky, 1979, *Econometrica*, 47, 263-291). Only moderate support for the contention that personal involvement increases the sunk cost effect is presented. The sunk cost effect was not lessened by having taken prior courses in economics. Finally, the sunk cost effect cannot be fully subsumed under any of several social psychological theories. © 1985 Academic Press, Inc.

To terminate a project in which \$1.1 billion has been invested represents an unconscionable mishandling of taxpayers' dollars.

Senator Denton, November 4, 1981

Completing Tennessee-Tombigbee [Waterway Project] is not a waste of taxpayer dollars. Terminating the project at this late stage of development would, however, represent a serious waste of funds already invested.

Senator Sasser, November 4, 1981

The purpose of the present paper is to attempt to explain an irrational economic behavior, which will be termed the sunk cost effect. This effect is manifested in a greater tendency to continue an endeavor once an investment in money, effort, or time has been made. The prior investment, which is motivating the present decision to continue, does so despite the fact that it objectively should not influence the decision. We will

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provide evidence that the psychological justification for this maladaptive behavior is predicated on the desire not to appear wasteful.

As an example of the sunk cost effect, consider the following example.¹ A man wins a contest sponsored by a local radio station. He is given a free ticket to a football game. Since he does not want to go alone, he persuades a friend to buy a ticket and go with him. As they prepare to go to the game, a terrible blizzard begins. The contest winner peers out his window over the arctic scene and announces that he is not going, because the pain of enduring the snowstorm would be greater than the enjoyment he would derive from watching the game. However, his friend protests, "I don't want to waste the twelve dollars I paid for the ticket! I want to go!" The friend who purchased the ticket is not behaving rationally according to traditional economic theory. Only incremental costs should influence decisions, not sunk costs. If the agony of sitting in a blinding snowstorm for 3 h is greater than the enjoyment one would derive from trying to see the game, then one should not go. The \$12 has been paid whether one goes or not. It is a sunk cost. It should in no way influence the decision to go. But who among us is so rational?

Examples of the sunk cost effect exist in great quantity and for great quantities. During late 1981 the funding for the immensely expensive Tennessee–Tombigbee Waterway Project was scheduled for Congressional review. As the above quotes indicate, proponents of the project insisted that to stop the project after a great deal had already been spent would represent a waste of taxpayers' money. In other words, the sunk cost provided a strong impetus to continue the project.

Those who are aware of the fact that sunk costs are difficult to ignore can turn this realization to their advantage. When discussing why he thought the nuclear energy program would prevail, one nuclear industry executive explained:

When it comes down to it, no one with any sense would abort a \$2.5 billion construction project. And, by extension, no administration would abort a \$200 billion national investment in nuclear energy. So the trick for the industry is to get more new plants under construction without the (anti-nuclear) movement knowing about it. By the time they get around to demonstrating and challenging the license, we'll have a million tons of steel and concrete in the ground, and no one in their right mind will stop us (Dowie, 1981, p. 23).

The executive's final assertion may be correct if what he means by "right mind" is a typical line of reasoning. However, such reasoning is

¹ This example is adapted from Thaler (1980).

irrational, no matter how compelling it may seem. To repeat: sunk costs are irrelevant to current decisions.²

These economic examples should not obscure the fact that there are numerous nonmonetary sunk costs. Should I continue this unhappy relationship? I have already put so much into it. Should I continue with this terrible job? I spent a year in training to get this position. We suspect that many bad movies are seen to their completion simply because once the viewer realizes how poor the movie is, several minutes and dollars have already been invested. This sunk cost promotes lingering until the bitter end. During the Viet Nam War some people counseled against ending the hostilities before total victory had been achieved because to do so would have meant the waste of those lives already lost. Teger (1980) summarized this phenomenon by suggesting that we often feel we have too much invested to quit.

Our analysis of the sunk cost effect will be presented in three stages. First, demonstrations of the effect will be presented. Second, some possible explanations of the effect will be offered. Third, the relation between the sunk cost effect and several areas of social psychological research will be examined.

DEMONSTRATIONS OF THE SUNK COST EFFECT

All of our questionnaire studies were done with Ohio and Oregon college students as subjects. No subject responded to more than one question. The number of subjects giving each answer is indicated after every question.

Experiment 1

Assume that you have spent \$100 on a ticket for a weekend ski trip to Michigan. Several weeks later you buy a \$50 ticket for a weekend ski trip to Wisconsin. You think you will enjoy the Wisconsin ski trip more than the Michigan ski trip. As you are putting your just-purchased Wisconsin ski trip ticket in your wallet, you notice that the Michigan ski trip and the Wisconsin ski trip are for the same weekend! It's too late to sell either ticket, and you cannot return either one. You must use one ticket and not the other. Which ski trip will you go on?

\$100 ski trip to Michigan	33
\$50 ski trip to Wisconsin	28

² We are aware that the senators who supported the Tennessee-Tombigbee Waterway Project and those who supported or opposed nuclear power may have had motives other than sunk cost considerations. It is instructive that Senators Denton and Sasser used sunk cost arguments in defending the project's continuation. Apparently they felt that sunk cost was a more compelling rationale than others that might have been offered.

An axiom of traditional economic theory is that decisions should be based on the costs and benefits that are expected to arise from the choice of each option. Based on this axiom we would expect everyone to choose the trip thought to be more enjoyable—the trip to Wisconsin. However, only 46% of the subjects chose the Wisconsin trip. The 99% confidence interval around this datum is 30 to 62%. We therefore conclude that the prediction of traditional economic theory that 100% of the subjects would choose the Wisconsin trip is disconfirmed. Obviously the larger sunk cost of the Michigan trip is influencing many subjects' choice.

Experiment 2

Experiment 1 was a questionnaire study. Actual money was obviously not involved. While a number of experiments have shown that the results of questionnaire studies replicated when real monetary stakes were introduced (e.g., Grether & Plott, 1979; Lichtenstein, 1973), we felt it would be desirable to demonstrate the sunk cost effect in a more realistic setting. We decided to provide discounts to some subscribers to a theater series. We predicted that those who paid less for the privilege to see as many plays as they liked would choose to see fewer plays than those who had paid more. Those who had paid more would have a greater sunk cost.

Method. The first 60 people who approached the ticket window to purchase season tickets to the Ohio University Theater's 1982–1983 season were included in the experiment. After the person announced his or her intention to buy a season ticket, the ticket seller sold the purchaser one of three types of tickets, which had been randomly ordered beforehand. One type was the normal price ticket (\$15); the second was a ticket selling at a \$2 discount; the third was selling at a \$7 discount. The seller explained to the latter two groups that the discount was being given as part of a promotion by the theater department.

As we sold the three types of tickets, we immediately decided not to use the forthcoming data from three \$7 discount subjects, one \$2 discount subject, and two no-discount subjects. This was because these six people were buying tickets as couples. If the two members of a couple had tickets with different discounts, their joint decision whether or not to attend a play would render their data nonindependent. Our final sample thus had eighteen no-discount, nineteen \$2 discount, and seventeen \$7 discount subjects. Since the ticket stubs were color coded, we were able to collect the stubs after each performance and determine how many persons in each group had attended each play. Each season ticket package contained one ticket labeled with the name of one play plus two unlabeled extra tickets which could be used to bring a guest to any play.

Results. We divided the theater season into halves—the first five plays and the last five plays—because we felt that the experimental manipu-

lation might be of different strength during the two halves of the season. We performed a 3 (discount: none, \$2, \$7) \times 2 (half of season) analysis of variance on the number of tickets used by each subject. The latter variable was a within-subjects factor. It was also the only significant source of variance, $F(1,51) = 32.32$, $MS_e = 1.81$, $p < .001$. More tickets were used by each subject on the first five plays (3.57) than on the last five plays (2.09). We performed a priori tests on the number of tickets used by each of the three groups during the first half of the theater season. The no-discount group used significantly more tickets (4.11) than both the \$2 discount group (3.32) and the \$7 discount group (3.29), $t = 1.79$, 1.83, respectively, p 's $< .05$, one tailed. The groups did not use significantly different numbers of tickets during the last half of the theater season (2.28, 1.84, 2.18, for the no-discount, \$2 discount, and \$7 discount groups, respectively).

Conclusion. Those who had purchased theater tickets at the normal price used more theater tickets during the first half of the season than those who purchased tickets at either of the two discounts. According to rational economic theory, after all subjects had their ticket booklet in hand, they should have been equally likely to attend the plays. Since the discounts were assigned randomly, the groups should not have differed on the costs and benefits they could have anticipated by attending each play. The groups did differ, however, because they had different sunk costs.³

We consider this demonstration of the sunk cost effect to be particularly noteworthy, because the effect lasted for 6 months following the purchase of the tickets. The effect was not manifested, however, during the second half of the theater series (6 to 9 months following the purchase).

Experiments 1 and 2 are relatively pure examples in that other explanations of the results are not readily available. Many of the following studies are less pure. They involve much more complex economic decisions than are required in the first two experiments. As a result of using more complex stories, we are creating a stimulus situation in which some explanations of the data other than the sunk cost effect may exist. It is virtually impossible to rule out every alternate explanation in every such story. However, the consistent pattern of results found in all of the stories plus the demonstration of the sunk cost effect in the purer stories lead us to feel confident in our explanation of the data.

³ In this analysis we are ignoring "income effects." While it is true that the discount groups had more disposable income with which to seek nontheater entertainment during the year, we contend that this extra income was not the reason they attended fewer plays. The \$2 discount group, whose members manifested the sunk cost effect, had only an extra 6¢ of disposable income per week during the course of the experiment.

The next three experiments differ from the prior two in that pairs of scenarios are presented in each experiment. One member of each pair is as similar to the other member in as many financial aspects as possible. They differ, however, in that only one member of each pair has a sunk cost. In this way we can assess the impact of the sunk cost component of the scenario.

Experiment 3

Question 3A. As the president of an airline company, you have invested 10 million dollars of the company's money into a research project. The purpose was to build a plane that would not be detected by conventional radar, in other words, a radar-blank plane. When the project is 90% completed, another firm begins marketing a plane that cannot be detected by radar. Also, it is apparent that their plane is much faster and far more economical than the plane your company is building. The question is: should you invest the last 10% of the research funds to finish your radar-blank plane?

Yes	41
No	7

Question 3B. As president of an airline company, you have received a suggestion from one of your employees. The suggestion is to use the last 1 million dollars of your research funds to develop a plane that would not be detected by conventional radar, in other words, a radar-blank plane. However, another firm has just begun marketing a plane that cannot be detected by radar. Also, it is apparent that their plane is much faster and far more economical than the plane your company could build. The question is: should you invest the last million dollars of your research funds to build the radar-blank plane proposed by your employee?

Yes	10
No	50

Question A vs B: $\chi^2(1, N = 108) = 50.6, p < .001$.

The difference between these stories is that in question A millions have already been invested, while in question B nothing has been invested yet. Whereas the large majority of the question B respondents think the project is a bad idea, question A respondents overwhelmingly endorse continuing construction. There is no obvious economic reason to complete the project. Yet there appears to be a compelling psychological one: sunk cost.

While 3A respondents thought that continued spending was a much better idea than 3B respondents did, we did not know if this would be accompanied by an inflated certainty among 3A respondents that a completed project would be a financial success. It may be that 3A respondents grimly decide to spend despite desperate odds. On the other hand, perhaps their willingness to throw good money after bad is due to the fact that they do not perceive the situation as a lost cause. In Experiment 4 we sought the answer to this question.

Experiment 4

Questions 4A and 4B were identical to questions 3A and 3B. At the end of each story subjects were told "Use the following 0 to 100 scale. Write in the box the number between 0 and 100 that reflects what you think your plane's chance of financial success really is. You can use any number." The scale had five likelihood labels varying from "no chance" at 0 to "sure thing" at 100.

The seventy-six 4A subjects' mean probability estimate was 41.0. The eighty-two 4B subjects' mean probability estimate was 34.0, $t(156) = 2.02$, $p < .05$. We conclude that subjects in a sunk cost situation have an inflated estimate of the likelihood that the completed project will be a success. We do not know if this inflated estimate helps foster continued investment, is a consequence of the decision to continue investing, or both.

A possible flaw in Experiments 3 and 4 is that in questions 3A and 4A the completed plane would be a 10 million dollar product. In questions 3B and 4B the plane would cost only 1 million. Perhaps 3B respondents were unwilling to spend because they knew that a 1 million dollar plane was likely to be a cheap, inferior product. Question A respondents would not have such fears and therefore would be more likely to continue. In Experiment 5 we tested this explanation of Experiments 3 and 4 by changing the plane in question B to a 10 million dollar product.

Experiment 5

The story used in Experiment 5 was identical to that used in question 3B except that "1 million" was changed to "10 million." Respondents' decisions whether or not to build the plane were

Yes	10
No	50

Since the data from Experiment 5 were identical to those of 3B, we conclude that the overwhelming decision not to build the radar-blank plane in question 3B was not due to the smaller final price of the plane compared to the price in 3A. We conclude that the critical difference in questions 3A and 3B was that in the former the investor had incurred a sunk cost.

EXPLANATION OF THE SUNK COST EFFECT

Thaler's (1980) explanation of the sunk cost effect is based on prospect theory (Kahneman & Tversky, 1979). Two features of prospect theory seem particularly pertinent to the analysis of the sunk cost effect. The first of the features is depicted in Fig. 1, which contains prospect theory's value function. This function represents the relation between objectively

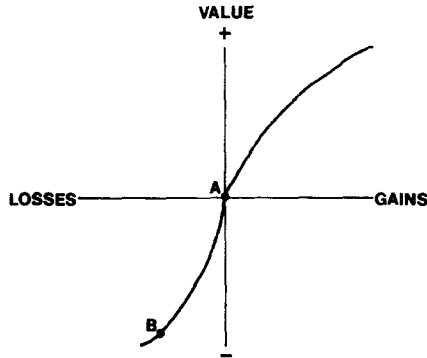


FIG. 1. The value function of prospect theory (Kahneman & Tversky, 1979).

defined gains and losses (e.g., measured in dollars) and the subjective value a person places on such gains and losses.

When an initial investment is being considered, the investor is at point A. After a substantial unsuccessful investment has been made, the investor is at point B. At point B further losses do not result in large decreases in value; however, comparable gains do result in large increases in value. Therefore an investor at point B in Fig. 1 will risk small losses in order to obtain possible large gains. Point B is the location of a person who has paid a sunk cost. Compared to a person at point A, a person at B is more likely to make a risky investment, i.e., to continue adding funds to the sunk cost. This analysis is consistent with a finding by McGlothlin (1956) that long shots at a race track are most popular during the final race of the day. At that time many bettors are at point B and are more risk prone than they were before any losses occurred.

Thaler (1980) has used prospect theory's value function (Fig. 1) to explain the snowstorm example presented earlier. The value of going to the game is $v(g)$. The value of losing \$12 is $\bar{v}(-12)$, where \bar{v} is the value function for losses. The cost of enduring a snowstorm is c . We set the enjoyment of the game equal to the cost of enduring the snowstorm, i.e., $v(g) = -\bar{v}(-c)$; therefore someone who received the tickets for free would be indifferent about going to the game in a snowstorm. However, the person who has already paid \$12 will want to go since

$$v(g) + \bar{v}(-(c + 12)) > \bar{v}(-12).$$

The terms to the left of the "greater than" sign represent the net gain/loss should the person go to the game. The term to the right of the "greater than" sign represents the loss of \$12—the result of not going to the game. Call the ticket price p . Due to the convexity of \bar{v} , the second term in the equation ($\bar{v}(-(c + p))$) will always be smaller (i.e., closer to

zero) than $(\tilde{v}(-c) + \tilde{v}(-p))$ for all $p > 0$. Thus the person who had paid for the ticket will want to go.

A second feature of prospect theory pertinent to sunk costs is the certainty effect. This effect is manifested in two ways. First, absolutely *certain* gains ($p = 1.0$) are greatly overvalued. By this we mean that the value of certain gains is higher than what would be expected given an analysis of a person's values of gains having a probability less than 1.0. Second, certain losses ($p = 1.0$) are greatly undervalued (i.e., further from zero). The value is more negative than what would be expected given an analysis of a person's values of losses having a probability less than 1.0. In other words, certainty magnifies both positive and negative values.

Note that in question 3A the decision not to complete the plane results in a certain loss of the amount already invested. Since prospect theory states that certain losses are particularly aversive, we might predict that subjects would find the other option comparatively attractive. This is in fact what occurred. Whenever a sunk cost dilemma involves the choice of a certain loss (stop the waterway project) versus a long shot (maybe it will become profitable by the year 2500), the certainty effect favors the latter option.

However, prospect theory does not specify the psychological basis for the findings that sure losses are so aversive and sunk costs are so difficult to ignore. One reason why people may wish to throw good money after bad is that to stop investing would constitute an admission that the prior money was wasted. The admission that one has wasted money would seem to be an aversive event. The admission can be avoided by continuing to act as if the prior spending was sensible, and a good way to foster that belief would be to invest more. Staw (1976) showed that when business school students felt responsible for a financially unsuccessful prior decision, they continued to invest more money into that option than if their prior decision was successful. This result seems to contradict the commonsense notion that negative consequences will cause a change in one's course of action. Instead, Staw showed that negative consequences fostered further commitment to the chosen alternative. This unusual behavior is consistent with our own notion that sunk costs are difficult to write off because to do so would appear wasteful.

We examined this proposed explanation in Experiment 6—another of our relatively pure cases.

Experiment 6

On your way home you buy a tv dinner on sale for \$3 at the local grocery store. A few hours later you decide it is time for dinner, so you get ready to put the tv dinner in the oven. Then you get an idea. You call up your friend to ask if he

would like to come over for a quick tv dinner and then watch a good movie on tv. Your friend says "Sure." So you go out to buy a second tv dinner. However, all the on-sale tv dinners are gone. You therefore have to spend \$5 (the regular price) for the tv dinner identical to the one you just bought for \$3. You go home and put both dinners in the oven. When the two dinners are fully cooked, you get a phone call. Your friend is ill and cannot come. You are not hungry enough to eat both dinners. You can not freeze one. You must eat one and discard the other. Which one do you eat?

\$3 dinner	2
\$5 dinner	21
No preference	66

Since the costs and benefits of choosing either dinner are precisely equal, we would expect, based on traditional economic theory, that everyone would choose "no preference." Sunk cost considerations, however, heighten the attractiveness of the \$5 dinner. Since the choice of the \$3 dinner is based on unknown factors, we deleted these respondents. Of the remaining 87 subjects, 76% chose "no preference." The 99% confidence interval around this datum is 64 to 88%. We therefore conclude that the prediction of traditional economic theory that 100% of the subjects would have no preference is disconfirmed. We suggest that the choice of the \$5 dinner is made by many subjects because discarding it would appear more wasteful than discarding the \$3 dinner.

Another way to examine the role of wastefulness in the psychology of sunk cost would be to write two stories that differ in that further expenditures would appear to be wasteful in only one of the two stories. Subjects should then demonstrate a greater willingness to spend in the other story. For example, to buy a new printing press that is far better than one's present press would seem to be an excellent choice. But what if one's present press is rather new? To purchase another press—no matter how superior—might then seem wasteful. Would the excellent choice therefore be forsaken?

Experiment 7

Question 7A. As the owner of a printing company, you must choose whether to modernize your operation by spending \$200,000 on a new printing press or on a fleet of new delivery trucks. You choose to buy the trucks, which can deliver your products twice as fast as your old trucks at about the same cost as the old trucks. One week after your purchase of the new trucks, one of your competitors goes bankrupt. To get some cash in a hurry, he offers to sell you his computerized printing press for \$10,000. This press works 50% faster than your old press at about one-half the cost. You know you will not be able to sell your old press to raise this money, since it was built specifically for your needs and cannot be modified. However, you do have \$10,000 in savings. The question is should you buy the computerized press from your bankrupt competitor?

Yes	49
No	15

Question 7B. As the owner of a printing company, you must choose whether to modernize your operation by spending \$200,000 on a new printing press or on a fleet of new delivery trucks. You choose to buy the press, which works twice as fast as your old press at about the same cost as the old press. One week after your purchase of the new press, one of your competitors goes bankrupt. To get some cash in a hurry, he offers to sell you his computerized printing press for \$10,000. This press works 50% faster than your new press at about one-half the cost. You know you will not be able to sell your new press to raise this money, since it was built specifically for your needs and cannot be modified. However, you do have \$10,000 in savings. The question is should you buy the computerized press from your bankrupt competitor?

Yes	43
No	38

Question A vs B: $\chi^2(1, N = 145) = 7.51, p < .01$.

Despite the fact that buying the printing press would result in the same proportion of improvement in printing capability in questions 7A and 7B, subjects in 7A were significantly more likely to buy the press. When asked at the bottom of their questionnaires to give reasons for their choice, the subjects in 7B who opted not to buy the press gave such remarks as "I already have a good, new press that costs a lot of money." Subjects were less likely to buy if the purchase appeared to duplicate an immediately prior one and therefore appeared to render it wasteful.⁴

Our explanation based on the appearance of wastefulness has an interesting implication: if one's own money is at stake or if one is personally responsible for the initial investment (Staw, 1976), then wastefulness should be more aversive than if someone else's money is involved or if someone else was responsible for the original investment decision. In support of this conjecture Staw (1976) and Staw and Fox (1977) found that personal responsibility for the situation did tend to increase further financial allocations to a floundering investment.

In Experiment 8 we modified the questions used in Experiment 3 in order to examine the role of personal involvement. In Experiment 3 *you* are the president of an airline company. In Experiment 8 we described a company in the third person.

Experiment 8

Question 8A. The Acme Airline Company has invested 10 million dollars of the company's money into a research project. The purpose was to build a plane that would not be detected by conventional radar, in other words, a radar-blank plane.

⁴ A possible problem with Experiment 7 is that even though the purchase of a press would result in an increase of 50% in printing capability in both stories, the purchase in 7A would result in a slower machine than would the corresponding purchase in 7B. We ran another experiment in which this difference in absolute printing speed was eliminated. The results of this study replicated the results of Experiment 7.

When the project is 90% completed, another firm begins marketing a plane that cannot be detected by radar. Also, it is apparent that their plane is much faster and more economical than the plane Acme is building. The question is should Acme Airlines invest the last million dollars of its research funds to finish the radar-blank plane?

Yes	37
No	21

Question 8B. The Acme Airlines Company has received a suggestion from one of its employees. The suggestion is to use the last 1 million dollars of research funds to build a plane that would not be detected by conventional radar, in other words, a radar-blank plane. However, another firm has just begun marketing a plane that cannot be detected by radar. Also, it is apparent that their plane is much faster and far more economical than the plane your company could build. The question is should you invest the last million dollars of your research funds to build the radar-blank plane proposed by your employee?

Yes	2
No	35

Answers to question 8A differed significantly from those in 3A, $\chi^2(1, N = 106) = 5.25, p < .05$. When you were the president of the company, you were more likely to be a victim of the sunk cost effect than if you were rendering judgment in general. Even when one's general opinion was solicited, however, the sunk cost effect was still very powerful (8A vs 8B: $\chi^2(1, N = 95) = 29.5, p < .01$).

In Experiment 9 we attempted to manipulate the personal involvement present in Experiment 1. In the original experiment, you had paid for the Michigan and Wisconsin ski trips. Would the sunk cost effect be diluted if you had paid for neither trip?

Experiment 9

As you are listening to the radio one morning, the disk jockey from 95XIL⁵ calls you. He informs you that you have won a free ski trip to either Michigan or Wisconsin the last weekend of skiing season (which happens to be next weekend). You think you will prefer the trip to Wisconsin rather than the trip to Michigan. You call a travel agent and find out that the value of the Michigan ski trip is \$100, and the value of the Wisconsin ski trip is \$50. You must decide which trip to take. Which trip will you go on?

\$100 ski trip to Michigan	44
\$50 ski trip to Wisconsin	42

The χ^2 test comparing Experiment 1 (personal money at stake) to Experiment 9 (no personal money at stake) did not approach significance.

⁵ 95XIL is a local radio station.

The analogous comparison between 8A and 3A had been significant. In questionnaire studies such as these it is difficult to manipulate personal commitment. Since in Experiments 8 and 9 we detected only equivocal support for the hypothesis that personal involvement heightens the sunk cost effect, we can draw no firm conclusions as yet on this point.

Experiment 10

We made one effort to ascertain whether economically sophisticated subjects are less susceptible to the sunk cost effect. Fischhoff (1982) has concluded that many attempts to debias people of their judgment errors have not been successful. However, some of these debiasing efforts have been of rather short duration, such as one experimental session. We sought to determine if a college level economics course (or two) might prove to be of value in lessening the sunk cost effect.

Method. One hundred twenty introductory psychology students were divided into two groups based on whether or not they had ever taken a college economics course. Fifty-nine students had taken at least one course; sixty-one had taken no such course. All of these students were administered the Experiment 1 questionnaire by a graduate student in psychology. A third group comprised 61 students currently enrolled in an economics course, who were administered the Experiment 1 questionnaire by their economics professor during an economics class. Approximately three fourths of the students in this group had also taken one prior economics course. All of the economics students had been exposed to the concept of sunk cost earlier that semester both in their textbook (Gwartney & Stroup, 1982, p. 125) and in their class lectures.

Results. Table 1 contains the results. The χ^2 analysis does not approach significance. Even when an economics teacher in an economics class hands out a sunk cost questionnaire to economics students, there is no more conformity to rational economic theory than in the other two groups. We conclude that general instruction in economics does not lessen the sunk cost effect.

TABLE 1
FREQUENCY OF CHOOSING EACH TRIP AS A FUNCTION OF ECONOMICS BACKGROUND

	Student characteristic		
	Economics students	Psychology students with no economics	Psychology students with economics
\$100 trip	20	22	19
\$50 trip	41	39	40

RELATION TO OTHER THEORIES

Cognitive Dissonance Theory

The sunk cost effect would appear to be related to cognitive dissonance theory (Festinger, 1957). Numerous studies have shown that once a subject is induced to expend effort on an onerous task, the task is revalued upward (e.g., Aronson & Mills, 1959). Such revaluation would presumably result in increased willingness to expend further resources on the task compared to the resources which would be voluntarily allocated by a subject not having made a prior expenditure. This generally corresponds to the sunk cost effect.

There are differences, however, between dissonance experiments and the research presented here. First, in dissonance research subjects who have no sufficient justification for performing an onerous task improve their attitude toward the task. In the sunk cost situation, on the other hand, it is unlikely that investors begin to enjoy their floundering investments. Investors may pour good money after bad, but it is doubtful that the bad money engenders positive feelings. Poor investments typically engender substantial distress.

Second, cognitive dissonance theory would predict that a person who endures suffering in order to attend the football game will enjoy the game more than those who do not suffer. However, cognitive dissonance theory does not predict who will be more motivated to *attend* the snowy game (the contest winner or the ticket purchaser) unless we assume that the act of paying for the ticket engendered suffering. This is most unlikely. A more sensible assumption is that a person who has paid for the ticket goes to the game because one knows that if one does not go, one will *later* suffer. The reason suffering will later occur if one does not go to the game is that one will feel regret for having wasted the admission price. The cognitive dissonance analysis is mute on the question, "What causes the later suffering," which is answered directly by our wastefulness explanation. We therefore feel that cognitive dissonance theory adds little to our understanding of the sunk cost effect.

Entrapment

Another area that would seem to be relevant to the sunk cost effect is the research on entrapment (e.g., Brockner, Shaw, & Rubin, 1979). Subjects in entrapment situations typically incur small, continuous losses as they seek or wait for an eventual goal. Brockner *et al.* cite the example of waiting for a bus. After a very long wait, should you decide to take a cab, thereby nullifying all the time you have spent waiting for the bus? This is analogous to a sunk cost situation: time already spent waiting is the sunk cost. Reluctance to call a cab represents the desire to invest further in waiting.

In a recent analysis of entrapment experiments, Northcraft and Wolf (1984) concluded that continued investment in many of them does not necessarily represent an economically irrational behavior. For example, continued waiting for the bus will increase the probability that one's waiting behavior will be rewarded. Therefore there is an eminently rational basis for continued patience. Hence this situation is not a pure demonstration of the sunk cost effect.

However, we believe that *some* sunk cost situations do correspond to entrapment situations. The subjects who "owned" the airline company would have endured continuing expenditures on the plane as they sought the eventual goal of financial rescue. This corresponds to the Brockner *et al.* entrapment situation. However, entrapment is irrelevant to the analysis of all our other studies. For example, people who paid more money last September for the season theater tickets are in no way trapped. They do not incur small continuous losses as they seek an eventual goal. Therefore we suggest that entrapment is relevant only to the subset of sunk cost situations in which continuing losses are endured in the hope of later rescue by a further investment.

Foot-in-the-Door and Low-Ball Techniques

Freedman and Fraser (1966) demonstrated that a person who first complies with a small request is more likely to comply with a larger request later. When the large and small requests are for *related* activities that differ in their cost to the complying person, the phenomenon is called the foot-in-the-door technique. An example would be first having people sign a petition to encourage legislators to support safe driving laws. Later, the petition signers are asked to display on their lawn a large sign that reads, "Drive safely."

When the small and large requests are for the *same* target behavior, the technique is called the "low-ball" procedure (Cialdini, Cacioppo, Bassett, & Miller, 1978). An example would be getting someone to agree to buy a car at a discounted price and then removing the discount. The initial decision to buy heightens willingness to buy later when the car is no longer a good deal.

Both the foot-in-the-door and low-ball techniques bear some similarity to the sunk cost phenomenon in that an investment which is unlikely to be made (question 3B) will be more likely if a prior commitment has occurred (3A). A major difference between the sunk cost effect and the two techniques is that compliance is the dependent variable with the two techniques. Compliance typically plays no role in the sunk cost effect.

Most explanations of the foot-in-the-door technique are couched in terms of self-perception theory (Bem, 1967). A person observes himself or herself complying with a request to support good driving or a charitable

organization. The person then concludes, "I'm the sort of person who supports that cause." This conclusion based on self-observation then results in a high level of compliance when the larger request is made later (Snyder & Cunningham, 1975).

We do not see how a self-perception explanation could readily be applied to the sunk cost effect. We very much doubt that people continue investing because they conclude they are the sort of person who continues some particular investment. We suggest that the foot-in-the-door technique applies largely to compliance and not the domain of the sunk cost effect.

We believe that the low-ball procedure bears even less similarity to the sunk cost effect. In the latter, a prior investment has occurred. In the low-ball procedure, no prior investment has occurred, only a verbal commitment. The buyer has not actually paid money to obtain the discounted car. Therefore, in the sunk cost situation, an investment can be lost, while in the low-ball procedure, there are no funds to be forfeited.

EPILOGUE

We have presented evidence which suggests that the sunk cost effect is a robust judgment error. According to Thomas (1981), one person who recognized it as an error was none other than Thomas A. Edison. In the 1880s Edison was not making much money on his great invention, the electric lamp. The problem was that his manufacturing plant was not operating at full capacity because he could not sell enough of his lamps. He then got the idea to boost his plant's production to full capacity and sell each extra lamp below its total cost of production. His associates thought this was an exceedingly poor idea, but Edison did it anyway. By increasing his plant's output, Edison would add only 2% to the cost of production while increasing production 25%. Edison was able to do this because so much of the manufacturing cost was sunk cost. It would be present whether or not he manufactured more bulbs. Edison then sold the large number of extra lamps in Europe for much more than the small added manufacturing costs. Since production increases involved negligible new costs but substantial new income, Edison was wise to increase production. While Edison was able to place sunk costs in proper perspective in arriving at his decision, our research suggests that most of the rest of us find that very difficult to do.

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