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Sunk-cost fallacy and cognitive ability in individual decision-making

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ABSTRACT

This paper reports on a laboratory experiment aiming at documenting the sunk-cost fallacy in individual decision-making and at identifying the role of the cognitive ability in its manifestation. For this purpose, the design rules out loss aversion and cognitive dissonance, identified by the literature as being the main psychological drivers of the bias. The sunk-cost fallacy is identified by comparing a low and a high sunk-cost treatment, respectively, against a control group that does not incur a sunk cost. There is evidence of a weak manifestation of the sunk-cost fallacy, which is statistically significant only for the high sunk-cost treatment. However, strong evidence of the fallacy was found among the high-cognitive-ability subjects. Finally, although cognitive ability is predictive of status-quo bias, it was not found to reduce the sunk-cost bias.

1. Introduction

Normative economic theory indicates that costs incurred in the past are irrelevant for future marginal payoffs, i.e. sunk costs must be ignored. Nevertheless, there is evidence that the actual human behavior violates this normative prescription and people tend to account for historical costs. In common language, the sunk-cost fallacy (bias) is the irrational behavior of "throwing good money after bad," i.e. once found on a course of action to which they committed an investment (e.g. time, money, effort), people continue to stay on that course of action and invest even more resources despite it being unprofitable. While less discussed in the literature, the bias can also manifest into a premature abandoning of an otherwise profitable enterprise. For example, concerning firm's short versus long-run production decisions, a (competitive) firm should only exit the industry when the price is below the long-run average total cost. However, shutting down before the price falls below the minimum average variable cost in the short-run (premature exit) is a manifestation of the bias since fixed costs are sunk in this case.[1]

As Thaler (1980) points out, efforts of identifying the sunk-cost fallacy from field data are often hindered by a selection bias. Therefore, evidence of the sunk-cost fallacy has, thus far, been limited to hypothetical scenarios and field experiments, while efforts for documenting it in laboratory are still surprisingly scarce and provide mixed evidence (Ashraf, Berry, & Shapiro, 2010). On the one hand, hypothetical questions lack salience since subjects are asked to *imagine* decision scenarios

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[1] This is, probably, the most common example that microeconomics textbooks use when teaching firm's production decisions and the distinction between sunk fixed costs and non-sunk fixed costs. I thank to an anonymous referee for pointing out this instance of the sunk-cost bias.

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and *state* their decisions. On the other hand, field experiments are most of the time contextual and use real commodities (Harrison & List, 2004), which limits the validity of the findings to the particular context. Moreover, decisions in the field interfere with subjects' unobserved prior beliefs and experience in relation to the particular experimental context. At the same time, it is conceivable that (consumption) decisions in the field do not elicit individual, but rather group decisions, being, thus contaminated by the relative bargaining power within the group.[2] The latter, however, remains unobserved to the experimenter. Therefore, more controlled laboratory experiments can provide cleaner evidence for the manifestation of the fallacy in individual decision making and help identifying the roots of the bias.

In the sunk-cost fallacy literature, two main psychological mechanisms have been made responsible for the manifestation of the bias. First, Staw (1976) argues that the state of *cognitive dissonance* between one's actions and the cognition of rational behavior creates a state of mental discomfort. One common mechanism that reduces this discomfort is a post hoc rationalization of past decisions, i.e. self-justification of past decisions. In the context of the sunk costs, the best way one can justify past decisions is by continuing to pour resources into a failing course of action. Supporting this argument, the author finds that people are more committed to a previously chosen alternative if made responsible for that decision at an earlier point in time. Similarly, Bazerman, Giuliano, and Appelman (1984) find that being made responsible for the existence of a sunk cost increases the amount of resources allocated for the continuation of a project. Arkes and Blumer (1985) also discuss the cognitive dissonance theory as being related to the manifestation of the sunk-cost bias, but conclude that this explanation is insufficient for understanding the bias. Instead, the authors advocate *loss aversion* (Kahneman & Tversky, 1979) as a suitable explanation for the sunk-cost fallacy. In fact, the connection between loss aversion and the sunk-cost fallacy was firstly noted by Thaler (1980) starting right from the experiments conducted by Kahneman and Tversky (1979). The author explains that the convexity of the utility function in the domain of losses, i.e. risk-seeking behavior, is responsible for the escalation on an initial investment.

In this paper I use a laboratory experiment in which the above-mentioned psychological drivers of the sunk-cost fallacy are made impotent. Hence, the first endeavor of this study is to show that the two psychological channels of the sunk-cost fallacy are not necessary for the bias to manifest itself. Second, I investigate the potential of the *cognitive ability* to alleviate the bias. Cognitive ability was found to reduce several biases such as conjunction fallacy, base rate fallacy, conservatism bias and overconfidence (Hoppe & Kusterer, 2011; Oechssler, Roider, & Schmitz, 2009). However, virtually all the evidence relating the sunk-cost fallacy to the cognitive ability is supplied by the psychology literature (see Section 2). Although subjects in psychological experiments are paid for their participation, they are not paid in accordance to their decisions. In fact, these experiments use hypothetical-scenario tasks without economic consequences for the participants and, therefore, they do not guarantee actual behavior. Economic experiments, on the other hand, are likely to provide a more accurate measure of people's actual behavior in an economic environment. Nevertheless, I am not aware of any economic experiment in a controlled laboratory setting which investigates the relationship between cognitive ability and the decision to ignore sunk costs. I take up this endeavor in the experiment reported here. For this, I use the Cognitive Reflection Test (CRT) developed by Frederick (2005), together with three mathematical questions from Benjamin, Brown, and Shapiro (2006), as a measure of cognitive ability.

The experimental manipulation consists of one control and two treatment groups. The participants in the control group are endowed with a number of units of an asset A and an amount of cash, whereas the participants in the two treatment groups are endowed with cash and offered the possibility to purchase the same number of units of asset A as the control group. The two treatment conditions differ with respect to the price of asset A, a low sunk-cost and a high sunk-cost treatment, respectively, in order to test whether the sunk-cost fallacy is related to the size of the investment. In a subsequent stage, all participants have the possibility to trade their holdings of asset A and buy an alternative asset B that has the same redemption value but a lower ask price than asset A. For this reason, selling all the endowment of asset A is the profit-maximizing decision, though the selling price of asset A is lower than the initial purchase price, i.e. part of the initial investment remains sunk. Comparing trades in this second stage allows to identify a sunk-cost bias if participants in the treatment groups sell fewer units of asset A than those in the control group.

The experimental data indicates behavior consistent with the manifestation of the sunk-cost fallacy. The non-parametric analysis confirms the existence of a statistically significant trend across the three experimental groups, though two-by-two comparisons show a significant difference only between the control group and the high sunk-cost treatment. Similarly, regression analysis shows a significant treatment effect only for the high sunk-cost treatment. While the treatment effect in the case of the high sunk cost survives controlling for cognitive ability, the interaction between the treatment dummy and the measure of cognitive ability does not confirm an effect of the latter on the sunk-cost bias. However, cognitive ability appears to be responsible for status-quo bias.

The paper proceeds as follows. In the next section I review the existing evidence of the sunk-cost fallacy. In Section 3 I present the experimental design and I discuss how it relates to the psychological causes of the fallacy. Section 4 presents the experimental results, while Section 5 includes a discussion of the results and the limitations of the study. Section 6 summarizes the findings and concludes.

[2] See, for example, Ashraf et al. (2010) which studies consumption decisions at household level.