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# Does self-control depletion affect risk attitudes?☆

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ABSTRACT

A core prediction of recent "dual-self" models is that risk attitudes depend on self-control. While these models have received a lot of attention, empirical evidence regarding their predictions is lacking. We derive hypotheses from three prominent models for choices between risky monetary payoffs under regular and reduced self-control. We test the hypotheses in a lab experiment, using a well-established ego depletion task to reduce self-control, and measuring risk attitudes via finely graduated choice lists. Manipulation checks document the effectiveness of the depletion task. We find no systematic evidence in favor of the theoretical predictions. In particular, depletion does not increase risk aversion.



## 1. Introduction

A decision maker's attitude toward risk is a core component of her "economic personality". Risk preferences are an integral part of theoretical models in virtually all domains of economics, and empirical evidence documents that risk attitudes are an important predictor of both economic and health outcomes. For instance, a higher willingness to take risks is positively correlated with being self-employed, investing in stocks, and not having insurance, as well as being a smoker, drinking heavily, and being overweight (Anderson and Mellor, 2008; Barsky et al., 1997; Dohmen et al., 2011; Kimball et al., 2008).

Given the central role of risk attitudes in economic theory and their predictive power for individual behavior, a better understanding of factors that potentially influence risk attitudes is of great importance to economists. Inspired by the difficulty of expected-utility theory to explain empirical phenomena like the Allais paradox or small-stakes risk aversion, various recently developed models build on insights from psychology and posit that risk attitudes are shaped by the inter-

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action of "dual systems" (a deliberative and an affective system, respectively; Loewenstein and O'Donoghue, 2005; Mukherjee, 2010) or of "dual selves" (a long-run and a short-run self; Fudenberg and Levine, 2006; 2011; 2012). In this framework, "self-control" amounts to the long-run self imposing restrictions on the short-run self. Consequently, a crucial determinant of a decision maker's risk attitude is her current level of self-control resources. In particular, the prominent Fudenberg–Levine model predicts that lower levels of self-control induce stronger risk aversion for stakes within a particular range.

In this paper, we derive three explicit hypotheses on the relationship between self-control and risk preferences, using the model by Fudenberg et al. (2014), a version of the Fudenberg–Levine model that is particularly well-suited to address decision making under risk in the case of pairwise lottery choice. The hypotheses refer to choices among pairs of two-outcome lotteries, choices among a safe payoff and two-outcome lotteries (all paid out immediately), and to choices among pairs of two-outcome lotteries that will only be paid out with a delay. We adopt a fourth hypothesis directly from Loewenstein and O'Donoghue (2005); their model predicts that self-control depletion leads to more pronounced probability weighting (p. 28). From the similar dual-self model by Mukherjee (2010) we derive a set of alternative predictions. We test these hypotheses in a laboratory experiment.

The purpose of the experiment is to provide causal evidence on the link between self-control and risk preferences. We exogenously manipulate the level of self-control between subjects using ego depletion, a concept from psychology (Baumeister et al., 1998). In doing so, we also provide sound empirical evidence regarding the effect of ego depletion on risk attitudes.

Our experiment uses a between-subject design with two conditions. At the beginning, subjects in the treatment group perform a so-called ego depletion task that is well-established in the literature and has been found to induce low self-control in numerous studies (see the meta-analysis by Hagger et al., 2010). Depletion tasks are based on the notion that the exertion of self-control in one activity consumes self-control resources, thereby increasing self-control costs in subsequent activities (Baumeister et al., 1998). The control group performs a similar, though nondepleting task, i.e., a task that does not reduce self-control resources.

Immediately following the respective task, we obtain precise measures of subjects' risk attitudes. Our measures are based on finely graduated choice lists, one for each of the four hypotheses derived from Fudenberg et al. (2014) and Loewenstein and O'Donoghue (2005); they also allow for testing the alternative predictions based on Mukherjee (2010). Each row of the choice lists consists of a choice between two two-outcome lotteries. Inspired by Eeckhoudt and Schlesinger (2006) and Ebert and Wiesen (2014), we chose one lottery to be a mean-preserving spread of the other, with a sure payoff (a risk premium) being added or subtracted. A noteworthy feature of this method is that it allows quantifying subjects' risk attitudes without assuming a specific utility function. This is particularly important in our case, since the Fudenberg–Levine model contains several functions of unknown parametric form as well as unobservable, difficult-to-estimate quantities.

Contrary to the predictions that we derive from the Fudenberg–Levine model, we do not find any evidence for increased risk aversion after ego depletion. For all of our four choice lists, subjects in the depletion group even exhibit a nonsignificant tendency toward less risk-averse choices, compared to the control group. Also evidence in favor of the fourth hypothesis (taken from Loewenstein and O'Donoghue, 2005) that reduced self-control leads to more pronounced probability weighting is limited at best. Neither do we find support for the alternative predictions derived from the model by Mukherjee (2010).

We do not observe that subjects behave in a more random manner under depletion. Depleted subjects also do not decide more quickly, as one would expect if they relied on heuristics to a stronger extent. Finally, self-control as a character trait (as opposed to the temporary level of self-control resources) does not explain heterogeneity of risk attitudes across individuals.

Overall, we deem our empirical results on the apparently weak link between self-control and risk attitudes informative for the future modeling of decision making under risk. In principle, we have no doubt that economics can benefit from incorporating psychological concepts in general and self-control in particular. Just as much, we acknowledge the potential of dual-self models to explain behavior in neighboring areas like intertemporal choice and economic theories of addiction. However, different levels of self-control do not seem to influence risk attitudes strongly—and if they do, the influence is primarily in the opposite direction of the prediction of the most prominent applicable model. This casts doubt on the "unified explanation" offered by Fudenberg and Levine (2006).

Taking a broader perspective, our paper adds to a recently emerging field of research that investigates whether aspects of the decision environment that go beyond incentives and constraints—such as self-control, cognitive load, emotions, or stress—influence decision making under risk.[1] A common feature of this line of research is that it challenges the standard assumption of stable preferences (which has shaped economics since Stigler and Becker, 1977). Our results provide evidence that self-control does not belong to the aspects of the decision environment that induce large variations in risk preferences; hence, the standard view of stable preferences may be adequate at least with regard to risk preferences and self-control.

[1] For instance, the results of Cohn et al. (2015), Guiso et al. (2014), Schulreich et al. (2014), and Schulreich et al. (2016) are based on emotional priming and suggest that sadness and fear induce stronger risk aversion. By contrast, the results of Conte et al. (2016) indicate that sadness, fear, anger, and joviality induce risk-seeking behavior. Benjamin et al. (2013), Deck and Jahedi (2015), and Gerhardt et al. (2016) find that cognitive load increases risk aversion. Concerning stress, Kandasamy et al. (2014) find that induced stress increases risk-averse behavior, while Buckert et al. (2014) observe stronger risk proclivity for gains, however only for a relatively small subgroup of participants.