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Risky sports and the value of safety information☆

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ABSTRACT

We develop a theoretical account of how athletes engaged in risky sports value safety information. Based on our model, we postulate that the demand value of such information rises with wealth and exposure and declines with the athlete's "appetite" for risk. We use survey data from a sample of backcountry skiers to empirically test these predictions. The high degree of self-control over exposure makes these athletes a well-suited population to study the demand value of safety information. Caution is warranted in the empirical analysis as unobserved factors may jointly affect the athlete's perceived risk and his willingness-to-pay for obtaining safety information. We use a recursive two-stage estimation approach to account for endogeneity concerns. The empirical results are supportive of our theoretical predictions and suggest that variations in athletes' demand for safety information can be explained by personal beliefs about risk exposure and deliberate risk taking.

"I'm not a daredevil, I'm the kind of person who really gears up for a project and I partner with the right people to learn the things that I don't know. Each jump is very well-prepared and it is only when I feel that I did my homework that I jump."
– BASE jumper Felix Baumgartner

1. Introduction

It is a paradox of modern society that some people engage in activities which involve a high chance of injury or death, although we generally agree on the intrinsic value of reducing threats to individual well-being. Death rates for risky sports are particularly startling.[1] However, this does not mean that athletes practicing high risk sports are just a bunch of daredevils. On the contrary, most of them are safety-concerned and meticulously prepare their attempts to keep the objectively high risk at a controllable level (Brymer, 2005). Recent experimental evidence supports the view that athletes engaged in risky sports behave *no* more risk seekingly than the general population (Collard and Oboeuf, 2012; Riddel and Kolstoe, 2013).

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[1] One out of 77 members of expeditions to Mount Everest does not return once they climbed higher than the base camp (Firth et al., 2008). Twenty-four of the 16,500 members of the U.S. Parachute Association died in 2014 in a skydiving accident (USPA, 2015). Among backcountry skiers in Switzerland, the athletes studied in the empirical part of this paper, the annual death rate amounts to one in 10,000 (Waeger and Zweifel, 2008).

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If one accepts that athletes who engage in high risk sports are not reckless and do care about their safety, then they should value information that helps them keeping the risk at an acceptable level. The value of safety information is readily measured by the willingness-to-pay to receive the information (Hirshleifer and Riley, 1992). In this paper, we theoretically and empirically explore how much athletes are willing to pay for safety information. We conceive of information as one input to the athlete's safety production function (Shogren and Crocker, 1991). That is, depending on his skills, information will be more or less valuable to the athlete. The tradeoff between money and information is further complicated by the fact that athletes derive some form of utility from doing risky sports—otherwise they would not engage in them (Loewenstein, 1999). Psychologists have developed several explanations for why one might want to pursue risky activities (Ariely and Norton, 2009; Figner and Weber, 2011). A popular view is that some people inherit personality traits, which drive them into risking life and limb in exchange for a thrilling experience (Zuckerman, 2007). This explanation is of some interest to economists as it suggests that risky behavior can be explained by incorporating preferences for intense feelings into the athlete's utility function.

The paper proceeds as follows. In Section 2, we build on earlier accounts of endogenous risk control (Shogren and Crocker, 1991, 1999; Viscusi, 1994; Liu and Neilson, 2006) to develop a stylized model of engaging in risky sports. We thereby extend the state-dependent utility model commonly used in the literature on the value of statistical life (Jones-Lee, 1974; Weinstein et al., 1980; Pratt and Zeckhauser, 1996) to reflect that athletes may actively reduce risk through the use of safety information. This implies that athletes consider their personal rather than the statistical risk when they evaluate different means of risk control. The main theoretical findings from our model extend the standard VSL model to the case of endogenous risk control in the spirit of Liu and Neilson (2006). Athletes are willing to pay more for safety information, the more risk they face or perceive to face and the wealthier they are. They are willing to pay less for the same piece of information, if they voluntarily take more risk.

In Section 3, we report on an empirical study designed to test these theoretical predictions. We analyze survey data from a sample of backcountry skiers who indicated their willingness-to-pay (WTP) for an improved avalanche forecasting service. These skiers have a large degree of self-control over the physical risk they face. To deal with potential endogeneity issues arising from self-control, we apply the framework that Konishi and Adachi (2011) proposed for valuing endogenous health risks. Section 4 presents the empirical results. They agree with our theoretical predictions, suggesting that variations in the value of safety information can be explained by personal beliefs about risk exposure and deliberate risk taking. In Section 5, we discuss the main insights derived from our study.

2. Theoretical background

We often hear people saying that an accident could have been avoided if only one had known. . . So what is the economic value of safety information? Information about the future is inherently uncertain and the agent encounters the problem of valuing imperfect forecasts. Assume that the agent is offered a forecast that might reduce uncertainty in future decisions. The amount he is willing to pay for receiving this information should hence depend on whether, and by how much, he believes the information will help him in making a utility-maximizing decision (Hirshleifer and Riley, 1992). It is unclear, however, whether or not such information leads to more safety. Indeed, Peltzman's seminal work (1975) on offsetting behavior suggests that athletes become more daring when they feel safer so that the risk they face would have been smaller absent the information.[2]

The interplay between the control effort and the perceived level of risk affects the athlete's demand value for safety information, resulting in a classical endogeneity problem. We therefore adopt the endogenous risk control model by Liu and Neilson (2006) to analyze the trade-off between the rewarding exposure to physical risk and the demand for safety information. In doing so, we assume that each athlete has a personal safety production function $q(R, S)$ with two inputs: the endogenous pursuit of the risky activity R and the exogenous safety provision S. The key characteristic of S is that its level is exogenous to the agent facing the risk (Liu and Neilson, 2006). In other words, if an athlete is more skilled in avoiding or reducing risk than another, as long as that skill is exogenous to the individual it can be captured by a different level of S.

The athlete determines the optimal amount of the risky activity R^* so that the probability of meeting with an accident becomes:

$$p = 1 - q(R^*, S), \tag{1}$$

where $q(R^*, S) : \mathbb{R}^+ \rightarrow [0, 1)$ is a twice differentiable function that maps the effectiveness of the self-protection technology onto the real line (Shogren and Crocker, 1991). We presume that increments in exogenous safety reduce the chance of accident ($q_S \equiv \partial q/\partial S > 0$), while more risk taking leads to a larger chance of accident ($q_R \equiv \partial q/\partial R < 0$). Non-satiation implies that the effectiveness of exogenous safety provision marginally decreases ($q_{SS} \equiv \partial^2 q/\partial S^2 < 0$). Moving along the safety production function in the opposite direction suggests that taking evermore risk results in an ever larger chance of accident ($q_{RR} \equiv \partial^2 q/\partial R^2 < 0$).

[2] Skydiving pioneer Bill Booth summarized this observation in what is known as Booth's rule #2: "The safer skydiving gear becomes, the more chances skydivers will take in order to keep the fatality rate constant."