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Risk preferences, risk perceptions, and risky food

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ABSTRACT

This paper presents the results of a study that tests the hypothesis that the effect of risk preference on choice is a function of the specific risk-preference measure utilized. In addition, this study tests the hypothesis that the effect of risk preference on choice depends upon its interaction with risk perceptions. I elicit three distinct measures of risk preference: a standard real-money Holt and Laury measure, a hypothetical health-variant of the Holt and Laury measure, and a non-context-specific self-assessment measure. I also elicit information regarding risk perceptions (specifically, food safety). These data are combined with choice data focused on consumer preferences for raw oysters. Results indicate that, after controlling for key oyster attributes, perceived risk perception is highly significant. Additionally, the effect of risk preference is significant, and the effect depends on whether respondents held informative or non-informative risk perceptions. In a treatment that includes only named oyster varieties, I find that although respondents generally prefer named Atlantic coast oysters to named Gulf and Pacific coast oysters, those who hold non-informative risk perceptions are even less likely to choose Gulf and Pacific coast oysters as the magnitude of risk aversion increases. In another treatment that includes a generic "commodity" Gulf coast oyster, I find that although named Gulf coast oysters are generally preferred to the commodity Gulf coast oyster, respondents with non-informative risk perceptions are significantly less likely to choose named Gulf coast oysters as the magnitude of risk aversion increases.

1. Introduction

The importance of accounting for both risk perceptions and risk preferences when analyzing risky choices has been established in the literature (Pennings et al., 2002; Lusk and Coble, 2005; Bruner et al., 2011; Petrolia et al., 2013, 2015). However, there are a variety of ways in which to elicit risk preference information (also called risk "attitudes" or risk "tolerance"). Currently, the most popular is the approach of Holt and Laury (2002, 2005), which has subjects make a series of non-hypothetical (i.e., real money) choices over pairs of lotteries where one is the "safe" and the other the "risky" lottery. The relative riskiness of the risky choice increases with subsequent choices, and the point at which the respondent switches from risky to safe lotteries is used as an indicator of the individual's relative preference for risk. This approach is very closely related to that of Binswanger (1981) and Eckel and Grossman (2008), who have subjects make one choice over multiple lotteries. But there are a variety of alternative approaches for measuring risk preferences (see Charness et al., 2013 for a detailed review), including the approach of Andreoni and Harbaugh (2010), which has subjects trade-off magnitude of payoff with probability of payoff under budget constraint; eliciting certainty equivalents (Harrison, 1986; Kachelmeier and Shehata, 1992; Pennings and Garcia, 2001); giving subjects money to invest and observing how they do so (Gneezy and Potters, 1997); inflating and popping virtual balloons, known as the Balloon Analogue Risk Task (Lejuez et al., 2002); or via simple (i.e., single-question, as in Shaik et al., 2008; Szrek et al., 2012) or more elaborate (Weber et al., 2002; Szrek et al., 2012) self-assessment questions.

With the exception of popping virtual balloons and some of the self-assessment approaches, these approaches are set in a financial context; i.e., subjects are asked to make risky choices over (real or hypothetical) monetary gains or losses. But are risk preferences consistent over different contexts? In other words, are preferences over financial risks consistent with, say, preferences over health risks?[1] And are risk preferences measured in one context good predictors of behavior in other contexts? Dohmen et al. (2011) found that a standard lottery measure had little predictive power over employment, driving, and personal health choices, and Rustichini et al. (2012) found similar deficiencies in predicting credit scores,

[1] It has already been shown that preferences may differ between low- and high-stakes gambles (Holt and Laury, 2002, 2005; Kachelmeier and Shehata, 1992; Dickhaut et al., 2013).

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job persistence, car accidents, and smoking. Anderson and Mellor (2008) report mixed results, finding that the standard Holt and Laury risk-preference measure significantly explains obesity, cigarette smoking, heavy drinking, and seatbelt non-use, but does not explain driving over the speed limit. However, their analysis fails to account for risk perceptions, so it is questionable whether these findings would stand up in the face of these likely important but omitted variables. Szrek et al. (2012) test seven different measures of risk preference and also find mixed results: they find that neither the standard Holt and Laury measure nor the balloon-popping measure significantly explain smoking, heavy drinking, seatbelt non-use, or risky sexual behavior. They find that a general (i.e., non-context-specific) self-assessment measure explains all four behaviors at various levels of significance, and also find that their health-domain-specific self-assessment measure significantly predicts three out of the four behaviors, whereas the other domain-specific measures perform poorly. However, they, too, fail to control for risk perceptions. Their failure to account for time preferences may also be a factor, given that the effects of smoking and heavy drinking may not be realized until many years later.[2] Instances where the cross-domain measure does appear to work include Lusk and Coble (2005) and Bruner et al. (2011), who, controlling for risk perceptions, use the Holt and Laury measure to explain consumer preferences for genetically-modified foods and post-harvest-treated raw oysters, respectively. Aside from these two studies, there appears to be a tendency to account for risk perceptions but not risk preferences in the case of food (Lusk et al., 2003, 2014; Goddard et al., 2013; Ortega et al., 2011; Cope et al., 2010; Teisl and Roe, 2010; Martinez-Poveda et al., 2009; Loureiro and Umberger, 2007; Marette et al., 2012; Han and Harrison, 2007; Hayes et al., 1995; Morgan et al., 2013).[3]

I am aware of only two papers that implement health-context measures of risk preference, which are approximations of the certainty-equivalent approach of choosing between a risky and risk-free lottery (van der Pol and Ruggeri, 2008; Attema et al., 2013). For example, Van der Pol and Ruggeri have subjects choose between gambles involving a 50/50 chance of immediate death or living another 5 years versus living another 2.5 years for certain. Attema, Brouwer, and l'Haridon have subjects imagine living for 30 more years and then dying, then offering them the choice between two drugs, one that will extend their life for a certain number of years versus another with a 50/50 chance that it will increase their life for different numbers of years. These, too, have a time dimension that may confound identification of risk and time preferences. Furthermore, although these papers extend the experimental measure of risk preference to the health domain, these papers do not actually test whether these experimental measures are significant predictors of any behavior of interest.

In this paper, I extend the literature, primarily, by doing exactly that: I construct and implement a health-domain variant of the Holt and Laury risk preference measure that uses days spent in the hospital as the risky "payoff", and use this measure to predict consumer choice over a risky food, an application to which this adaptation for health risk is particularly relevant. I also implement a standard real-money Holt and Laury experiment such that the values and framing of the health and Holt and Laury experiments are as similar as is feasible, as well as a third measure, a simple single-question non-context-specific self-assessment measure. I then estimate models using each of the three alternative risk-preference measures, while controlling for risk perceptions, in this case, perceived food safety.

Consumption of raw oysters is associated with a certain degree of risk. Some people with certain medical conditions are at high risk for becoming seriously ill and dying from eating raw oysters. The U.S. Food and Drug Administration advises these high-risk individuals not to eat raw oysters. The primary cause is the bacterium *Vibrio vulnificus*, which occurs naturally in warm coastal areas, such as the Gulf of Mexico, although in recent years, oysters from the Pacific Coast have been found to be a source of norovirus. Additionally, oysters from the Gulf Coast have, or at least had at the time this research was conducted, to contend with the lingering effects of the Deepwater Horizon oil spill that severely depressed demand for Gulf seafood.

The effect of risk preferences on choice may be a function of the kind of risk perceptions held by the respondent.[4] Here, I distinguish between those that hold *informative* risk perceptions regarding food safety and those that hold *non-informative* risk perceptions. By i*nformative* risk perceptions, I mean those individuals that perceive differences in relative risks across alternatives, whereas those with *non-informative* risk perceptions are those who perceive no clear differences in risks across alternatives. So I extend the literature by not only controlling for both risk preferences and risk perceptions, but also by further distinguishing the effects of risk preferences based on whether respondents hold *informative* or *non-informative* risk perceptions.[5]

This analysis is conducted in the context of a choice experiment administered to U.S. households that focused on consumer preferences for raw oysters on the half-shell produced along the three U. S. coasts. To test whether the effect of risk preferences and risk perceptions are sensitive to experimental design, I carry out four independent sub-designs along two dimensions: the first dimension is the presence or absence of a fixed "status-quo" alternative: in one sub-design there is a fixed, cheaper commodity (or, "generic") oyster to which higher-priced named oyster alternatives are compared; in the other sub-design, there is no fixed generic oyster: all alternatives are named oysters. The second dimension is the number of attributes: in one sub-design, there are only two attributes: oyster harvest location/brand and price; in the other sub-design, three additional attributes describing the oyster alternatives are included: size, taste (saltiness), and production method (wild-caught or farm-raised). Under each sub-design it is possible that the effect of risk preferences and perceptions are mitigated (or accentuated) in the presence (or absence) of additional information about the alternatives (i.e., having additional attributes) or the nature of the alternatives presented (i.e., having a fixed "generic" alternative).

I find evidence that the context in which risk preferences are measured matters. Specifically, results indicate that the Holt and Laury measure of risk preference performs no better – and in some cases worse – than other measures of risk preferences. Additionally, I find evidence that the effect of risk preferences on choice depends upon the interaction between risk preferences and risk perceptions. Specifically, I find that, in some cases, changes in risk preferences (i.e., increased risk aversion) significantly affects the probability of choosing a particular alternative, but that the effect differs depending on whether respondents hold informative or

[2] See Khwaja et al. (2007) and Harrison et al. (2010), who study the relationship between time preferences and smoking, but control for neither risk preferences nor perceived risk of illness from these behaviors.

[3] Lundborg and Andersson (2008) do likewise in explaining smoking behavior.

[4] This phenomenon may be related to the concept of background risk, where risk-taking behavior is affected by the presence or absence of other independent, uncorrelated risks (see Cavatorta and Pieroni, 2013; Lusk and Coble, 2008).

[5] To some extent, this is an application of Lusk and Coble (2005). However, I elicited risk perceptions for each individual alternative in the choice sets, thus allowing for measures of relative differences in perceived risk across alternatives, and allowed for "don't know" responses, which I hypothesize to represent a distinct kind of risk perceptions, i.e., those with diffuse prior beliefs. Lusk and Coble used a more aggregate measure and may not have offered respondents a "don't know" option to identify those with diffuse prior beliefs.