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Contests as selection mechanisms: The impact of risk aversion

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ABSTRACT

We investigate how individual risk preferences affect the likelihood of selecting the more able contestant within a two-player Tullock contest. Our theoretical model yields two main predictions: First, an increase in the risk aversion of a player worsens her odds unless she already has a sufficiently large advantage. Second, if the prize money is sufficiently large, a less able but less risk averse contestant can achieve an equal or even higher probability of winning than a more able but more risk averse opponent. In a laboratory experiment we confirm both, the non-monotonic impact and the compensating effect of risk aversion on winning probabilities. Our results suggest a novel explanation for the gender gap and the optimality of limited monetary incentives in selection contests.

1. Introduction

Contests are situations in which participants compete for some exogenous rent (prize) by spending non-refundable effort which determines their likelihood of winning (see e.g. Konrad, 2009). Effort choices and, thus, success usually depend on various individual characteristics such as the contestants' productive abilities (skills), available resources (initial endowments), motivations (valuations of winning), or attitudes towards risk. In environments where these characteristics are not directly observable or verifiable, contests are frequently employed as mechanisms to select the most appropriate candidate. Examples from all areas of life abound. To mention only a few, think of promotion contests in business, election campaigns in politics, or qualifying races in sports. It is well accepted that such contests involve a certain element of randomness (or "luck"). However, as the saying "May the best man win!" illustrates, employing contests as a selection device relies on the estimation that the best fitting contestant wins most of the time.

Who is considered most appropriate or best fitting depends on the particular task the candidate is selected for. Sometimes this post-selection task coincides with the task the candidates are confronted with during the selection contest, e.g. if the selected candidate is supposed to compete in a (by and large) identical subsequent contest. In such cases, like in consec-

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utive rounds of a sports tournament, the selected candidate will, statistically, exhibit the combination of individual characteristics which promises greatest success in fulfilling the post-selection task. Often, however, the post-selection task differs from the selection task during the contest and primarily requires one particular characteristic such as productive abilities. The objective of the contest designer is then selecting the most able candidate, e.g. in a recruitment test or assessment centre in human resource management.[1]

The estimation that the most able has the highest winning probability is well-founded if contestants differ only in abilities (Tullock, 1980). With additional heterogeneity between candidates, however, it becomes questionable whether the most able still wins most of the time. For example, Leininger (1993) and Baik (1994) show that a better motivated contestant may have better odds than a more able opponent. Similarly, we may ask whether higher readiness to assume risk can compensate for lower ability: Is the president-elect indeed best suited for holding office or just the candidate who had the courage to invest more money into the campaign? Is the winner of the famous Tour de France really the most talented cyclist or simply the athlete who fears least the negative health effects of high-performance sport? And (how) does it depend on the compensation scheme for managers whether promotion contests select competent experts or fearless gamblers, women or men?

In this paper, we aim to shed light on such questions, both theoretically and experimentally. To this end, we investigate the relative impact of individual abilities and risk preferences on the winning probabilities in simple two-person Tullock contests. Our experimental results confirm two theoretical predictions that are of particular interest. First, we observe that the impact of risk preferences on winning probabilities is non-monotonic: an increase in the risk aversion of a player worsens her odds unless her advantage (due to higher abilities or lower risk aversion) is sufficiently large. Second, we find a compensating effect: a less able but less risk averse contestant can achieve an equal or even higher probability of winning than a more able but more risk averse opponent if the prize is sufficiently large. The crucial role of the prize, i.e. the rent from winning, has been largely neglected by the related literature so far but is intuitive: risk assessment plays a bigger role for higher stakes, and stakes increase in the prize.

In theory, the impact of risk preferences on the behaviour in contests is generally ambiguous (see e.g. Konrad and Schlesinger, 1997). This general ambiguity stems from two opposing effects induced by risk aversion (see e.g. Skaperdas and Gan, 1995): According to the *gambling effect*, a more risk averse participant has an incentive to invest less in the contest since doing so reduces his safe payment. On the other hand, investing more reduces the probability of losing which is why a more risk averse participant also has an incentive to invest more. This has been termed the *self-protection effect*. In general, it is not clear which of the two effects dominates. Moreover, the behaviour of risk averse contestants usually depends also on higher order risk attitudes like *prudence* (also referred to as *downside risk aversion*, see e.g. Treich, 2010). Empirical studies, however, find a positive correlation between prudence and risk aversion (see e.g. Noussair et al., 2014).

We thus restrict our theoretical analysis to examples from the class of preferences which exhibit such positive correlation. Specifically, we focus on contests with linear production functions for lotteries and participants with constant absolute risk aversion (CARA). This enables us to derive closed-form expressions for both, equilibrium efforts and winning probabilities, and to formally separate between the gambling effect and the self-protection effect.

Our model yields the following comparative statics: First and very intuitive, an agent's probability of winning increases in his own ability level and decreases in his opponent's ability level. Second, an agent's probability of winning is either decreasing or inverted U-shaped (increasing or U-shaped) in his own (his opponent's) degree of risk aversion. The potential non-monotonicity stems from the two opposing effects described above. The gambling effect, however, dominates the self-protection effect whenever the player's advantage (due to higher abilities or lower risk aversion) is not too large. As this is, ceteris paribus, never the case if the player's degree of risk aversion (and hence prudence) is sufficiently high, pronounced (downside) risk aversion always lowers the chance of winning.

Third, we characterise the Nash winner, i.e. the player with the higher probability of winning. As known from the literature, if participants only differ with respect to ability (risk preferences), the more able (less risk averse) participant has the higher probability of winning (see Baik, 1994; Cornes and Hartley, 2003; Skaperdas and Gan, 1995). It is then straightforward to see that the more able participant will always have the higher probability of winning if he is also less risk averse. However, in a contest between two participants, one of which has a higher ability (the *gifted*) while the other is less risk averse (the *venturesome*), two cases have to be distinguished. If differences in ability are predominant, the *venturesome* will never be the Nash winner and his winning probability decreases in the prize money. Intuitively, with predominance of differences in ability, risk considerations do not play a prominent role and, hence, participants behave as if they differed with respect to abilities only. By contrast, if differences in risk preferences are predominant, the *venturesome* is the Nash winner if and only if the prize money is sufficiently high. Moreover, his winning probability is U-shaped in the prize money. To gain some intuition for this result, note that risk considerations are not a big issue if stakes are low. Hence, for low rents, participants behave as if there was predominance of differences in abilities. However, as the prize money increases, the predominance of differences in risk preferences becomes the decisive factor: Both participants increase their investments, but this increase is bigger for the less (downside) risk averse participant.

[1] Notice that the selection motive does not need to be the only objective of the contest. A promotion contest, for example, may aim at both, selecting a candidate and incentivising working effort. We discuss such examples below illustrating that our analysis also helps revealing a possible tradeoff between potentially conflicting objectives.