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Introduction to Symposium on Innovation and
Research Contests

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Introduction to Symposium on Innovation and Research Contests

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Throughout history, contests have been used as a tool for spurring innovation. In 1714, the British Parliament offered a prize for anyone who could devise a method suitable for measuring longitude at sea. The French government offered a prize in 1795 for preserving food during military campaigns. The Kennecott Mill in Alaska offered a \$1 million (in 1913 dollars) prize for a process that would almost completely separate copper from limestone. In 1927, Charles Lindberg claimed the Orteig Prize for transatlantic flight. More recently, the nonprofit XPRIZE Foundation has been offering multi-million dollar prizes for innovation in a wide range of fields, including space travel, carbon reduction, deep water exploration, women's safety, and adult literacy. The modern Longitude prize is offering £10 million to combat the increase in antibiotic resistant bacteria. By leveraging the incentives created by competition and rewarding successful innovation, the payoff from the resulting research and development investments often dramatically exceeds the value of the prize and may have unanticipated positive economic spillovers.

The potential for contests to spur innovation has received increased attention in resource dependent states such as Alaska. About 90% of Alaska's budget comes from volatile oil revenues, and with the recent decline in oil prices, the state now faces a \$4 billion budget

deficit and is seeking ways to diversify the economy. Given its economic situation, the state has been grappling with a variety of approaches to spur economic activity in the state. In an effort to increase awareness of the potential for contests to spur innovation, the University of Alaska Anchorage, the International Foundation for Research in Experimental Economics (IFREE), and the Rasmuson Foundation hosted a two day workshop that convened a group of academics and policy makers to discuss contests as a means of encouraging research and innovation. This symposium includes some of the papers presented at that meeting.

One feature of innovation is that success is not guaranteed. According to Taylor (1995), innovation contests differ from research tournaments in that innovation contests have a fixed threshold for success whereas research tournaments determine success based on relative performance. The first two papers in this symposium, Chowdhury (this issue) and Deck and Kimbrough (this issue) thus deal with innovation contests, whereas the paper by Mago and Sheremeta (this issue) is a more traditional research contest.

Chowdhury (this issue) models innovation using an all-pay auction framework where a player's R&D investment can be thought of as an expected quality. In order to be successful this quality has to not only be higher than that of a rival, it must be greater than an exogenous threshold that is unobservable *a priori* to the innovator. The threshold can be thought of as the minimum quality that the contest holder is willing to accept. Such a setup results in a winning payoff function that is non-monotonic. This theoretical paper characterizes the equilibria when there are two potential innovators. The results provide potential explanations for patterns that are sometimes observed in practice such as why parties may opt to not participate in an innovation contest or why entrants are typically of high quality.

Deck and Kimbrough (this issue) use laboratory experiments to test the optimal contest design model of Halac et al (forthcoming). Here, R&D success is stochastic with the likelihood of success depending upon the unobserved state of the world. The holder of the contest has two levers: a prize allocation rule and a policy of disclosing successes of contestants. Whereas,

Halac et al conclude that in some situations a winner-take-all with public disclosure encourages the most innovation while in other situations a shared prize with no disclosure is optimal in others, Deck and Kimbrough (this issue) provide evidence that a shared prize with no disclosure is uniformly behaviorally dominant. This finding is driven by the strong discouragement effect from the disclosure of the failure by one's rival as this decreases the likelihood of successful innovation being possible.

Mago and Sheremeta (this issue) also report the results from laboratory experiments. The authors consider a framework where two contestants compete in three separate R&D all pay auctions. The overall contest winner is the party who wins a majority of the subcontests. Such a situation can be thought of as innovators competing for component patents, where one needs a combination of patents in order to be able to gain market power over the resulting innovation. The experiments compare the case of simultaneous and sequential subcontests. While this distinction has a substantial effect on investments in theory, the results suggest that in practice this distinction is not so great.

The three papers in this symposium are part of a growing literature in economics on contests and innovation (see Dechenaux et al 2015 for a survey). This academic attention parallels what is occurring in practice. In addition to the examples of contests discussed above, section 105 of the American COMPETES Reauthorization Act of 2010 deals specifically with the use of contests to foster innovation (<https://www.govtrack.us/congress/bills/111/hr5116/text>). We hope that this this symposium helps encourage even more scholars to attempt innovative research on innovation contests.

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