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Information feedback and contest structure in rent-seeking games

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ABSTRACT

We investigate the effects of information feedback in rent-seeking games with two different contest structures. In the share contest a contestant receives a share of the rent equal to her share of rent-seeking expenditures, while in the lottery contest a contestant wins the entire rent with probability equal to her share of rent-seeking expenditures. In share contests average expenditures converge to equilibrium levels when subjects only get feedback about own earnings, and additional feedback about rivals' choices and earnings raises average expenditures. In lottery contests information feedback has an opposite, and even stronger, effect: when subjects only get feedback on own earnings we observe high levels of rent dissipation, usually exceeding the value of the rent, and additional feedback about rivals' choices and earnings has a significant moderating influence on expenditures. In a follow-up treatment we make information feedback endogenous by allowing contestants in a lottery contest to make public or private expenditures. Subjects make the vast majority of expenditures privately and overall excess expenditures are similar to the lottery contest with own feedback.

1. Introduction

Tullock's (1980) seminal model of rent-seeking is widely used to model a variety of contests in economics and political science. For example, in a recent review Konrad (2009) discusses applications ranging from lobbying and patent races to litigation lawsuits and sporting contests. In this paper we examine, using laboratory methods, how feedback on contest choices and outcomes can affect contestants' behavior in a repeated setting.

This is an important issue because in practice many contests are repeated, and information about rivals' choices and outcomes can vary. In some settings the amount of resources spent in a contest can relatively easily be observed. For example, in advertising competition the amounts spent on adverts is, due to the nature of the expenditure, usually visible to all competitors and information on outcomes in terms of market shares is commonly available. In other settings, information on rent-seeking expenditures is less evident. For example, contestants competing for research grants typically do not observe the amount of costly effort put in by rivals and often only learn whether their own bid was successful.

In some cases the availability of information about competitors' expenditures and payoffs is regulated by legal or institutional rules. In the US, for example, the financing of electoral campaigns is regulated by law which requires disclosure of the funds candidates or parties raise and spend and this information is made publicly available. Similarly, lobbying

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activities in the US are subject to legal disclosure rules. Such disclosure obligations are absent in many other countries where lobbying activities are not governed by formal regulations. Understanding how different information conditions affect contest outcomes is therefore important for regulators or policy makers in considering the appropriate degree of information transparency.

Information feedback can matter for a variety of reasons. Stigler (1964) argued that information about competitors' choices can facilitate collusion in oligopolistic markets; on the other hand, competitors may react to one another's choices in ways that lead to more competitive outcomes. For example, in quantity-setting homogeneous goods markets if competitors myopically best respond to their rivals' previous outputs this process converges (under suitable assumptions) to a Cournot-Nash equilibrium (Theocharis, 1960, Fisher, 1961), while if competitors imitate the most profitable rival the dynamic processes converges to the Walrasian outcome (Vega-Redondo, 1997). These arguments can be extended to contest settings. In general, different forms of information feedback facilitate different kinds of learning and different learning rules can have sharp implications for contest outcomes. Moreover, the way in which learning can affect outcomes depends on contest structure.

For these reasons the design of our experiment varies both information feedback and contest structure. We consider two different contest structures: a *share* and a *lottery* contest. In the *share* contest contestants compete for a rent and each receives a share of the rent equal to the share of rent-seeking expenditures, while in the *lottery* contest one contestant wins the entire rent, and each contestant's probability of winning is her expenditure divided by aggregate expenditures. For each type of contest we study two information feedback conditions. In our *own* feedback condition subjects are only informed of their own choice and earnings at the end of a contest. In our *full* feedback condition subjects are additionally informed of the choices and earnings of their rivals. In order to study the effect of information feedback in environments where learning dynamics may take time to converge (if at all), in all treatments we have participants play a sequence of 60 contests.

In share contests we find that information feedback increases expenditures in later periods. With own information feedback average expenditures in later periods are close to equilibrium levels, while with full feedback average expenditures converge to a significantly higher level – about 20% above equilibrium. We find no evidence of collusive behavior in either treatment and from analysis of individual level data we find support for imitative learning to explain the difference between treatments.

In lottery contests the effect of information feedback is even more marked, and is *reversed*. With full feedback expenditures stabilize in later periods around 13% above equilibrium levels. In lottery contests with own feedback expenditures begin high and remain high; even in later periods group expenditures exceed the rent in the majority of games and on average are 67% above equilibrium levels. It is striking that in this low information environment subjects do not reduce their expenditures despite the persistent losses that they experience.

One key finding from these treatments is that when subjects can observe or infer the actions of others, they have a tendency to best respond, and this has a significant moderating impact on rent-seeking. In lottery contests, in the absence of information that allows them to best respond, subjects' rent-seeking expenditures remain stubbornly high, even after considerable experience.

Given the pronounced impact of information feedback on expenditures in lottery contests, we were interested in whether the low information feedback environment could emerge endogenously. In many naturally-occurring contest settings contestants are able to choose whether and to what extent they reveal to other contestants how much they invested into a contest. To investigate if subjects take advantage of an option to reveal their contest expenditures we ran a follow-up lottery contest treatment where contestants can choose to make contest expenditures either in public or in private. Interestingly, we find that the vast majority of expenditures are made privately. Thus, subjects in the follow-up treatment learn little about the expenditures of rivals, and this reduces the possibility of learning from feedback about others' choices. It turns out that expenditures in this treatment closely resemble excessive rent-seeking levels observed in the lottery contest with own feedback.

The remainder of the paper is organized as follows. In Section 2 we summarize related rent-seeking experiments. Section 3 discusses how different learning rules affect contest outcomes. Section 4 describes the design of our main experiment, and Section 5 presents the results. In Section 6 we present our follow-up treatment. In Section 7 we discuss our findings and offer concluding comments.

2. Related rent-seeking experiments

Numerous experiments have been conducted using the framework of Tullock's (1980) rent-seeking model (for an extensive survey of these and related contest experiments see Dechenaux et al., 2012). These experiments usually consist of multiple periods where each period has the following structure. There are N contestants, each with endowment e, who compete for a rent of size V by simultaneously choosing rent-seeking expenditures. Let $x_i \in [0, e]$ denote contestant i's expenditure and $X = \sum_{j=1}^{N} x_j$ denote aggregate expenditures. In a *lottery contest* one contestant wins the entire rent, and the probability that contestant i wins is given by her expenditure relative to aggregate expenditure, so that i's payoff is:

$$\pi_i = \begin{cases} e - x_i + V & \text{with probability} \frac{x_i}{X} \\ e - x_i & \text{with probability} 1 - \frac{x_i}{X} \end{cases}$$