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The Arctic scramble: Introducing claims in a contest model

Erik Ansink *

Institute for Environmental Studies (IVM), VU University Amsterdam, De Boelelaan 1087, 1081 HV Amsterdam, The Netherlands

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ABSTRACT

In this paper I integrate elements from the bankruptcy literature in a resource contest model. In a contest model, agents fight over a contested resource and their investment in 'guns' determines how much of the resource is secured by each agent. In a bankruptcy problem, agents claim a share of a contested resource, and their claims determine the allocation to each agent. The integrated model of this paper allows the combination of guns and claims to jointly determine the distribution of a contested resource. The relevance of such a model is motivated using the Arctic scramble as a leading example. This contest over the Arctic's oil and gas reserves involves the five coastal Arctic countries, each with its own distinct territorial claim. I propose four *contest-bankruptcy rules* that integrate the most common contest success function with four classical bankruptcy rules. These four rules are assessed and effects of integrating claims and guns in one rule are analysed for a resource contest model.

1. Introduction

Contest models are economic models that assess the outcome of a resource contest based on the level of 'guns' (or effort in general) that persons, firms, or countries invest (Garfinkel and Skaperdas, 2007; Konrad, 2009). Examples include litigation or armed conflict over a piece of land, lobbying over the outcome of a public policy, or appropriation of a jointly produced good at the cost of lower production (Corchón, 2007). In standard contest models, an implicit assumption is that all agents aspire to capture the complete resource that is at stake. This assumption is not in line with many real-life situations. Consider the example of the Arctic scramble. This recent conflict over Arctic territories and its vast oil reserves involves Russia, the United States, Canada, Norway, and Denmark (Greenland). Claims to the Arctic territories date back to the beginning of the 20th century. Recently, the struggle for this territory was renewed due to expected polar ice loss as a result of climate change, which may enable profitable extraction of oil and gas. The countries involved typically have not made territorial claims to the complete region. Instead, they claim only parts of the Arctic—those parts to which they consider to have a legitimate claim, for instance because of alleged underwater connections of continental shelves and ridges (Cressey, 2008).

This example – which serves as the leading example of this paper – features exogenous claims and illustrates the prominent role that such claims may play in a resource contest. Other examples include the river sharing problem (Ansink and Weikard, 2009), claims in fisheries resources (Bess, 2001), islands (Denoon and Brams, 1997), and territorial claims (Murphy, 1990). Two factors that may influence the impact of claims in contests are the following. First, agents may realise that the credibility of their claim is important for the outcome of the conflict, as in the Arctic scramble. Second, agents may realise that defending their

* Tel.: +31 20 598 1214; fax: +31 20 598 9553.
E-mail address: erik.ansink@ivm.vu.nl.

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secured share of the contested resource is easier for smaller shares. An open question is how claims and guns interact in a contest and, more specifically, how the presence of claims affects the outcome of a contest model.

In this paper I assess appropriate methods to model the outcome of a contest as a function of both agents' guns and their claims to the resource. Although the role of claims has been ignored in the literature on the economics of contests, there is a large literature on bankruptcy problems, in which claims play a central role. In a bankruptcy problem, agents claim a share of a contested resource, and their claims determine the allocation to each agent (Moulin, 2002; Thomson, 2003). The bankruptcy literature seeks to solve this problem using an axiomatic approach. Several distribution mechanisms from this literature – called "bankruptcy rules" – have wide theoretical and empirical support (Herrero and Villar, 2001) and are therefore suitable candidates for integration into a contest model. This integration of bankruptcy rules into a contest model brings together two so far unconnected strands of literature. There are, however, three exceptions. First, Corchón and Dahm (2009) assessed theoretical links between contest models and bankruptcy problems, interpreting the former in terms of the latter. The approach in this paper is different as I aim to integrate the two. Second, Grossman (2001) included claims in a conflict setting, with agents dividing their resource endowments over defending their own claim and contesting the other agent's claim. This implies that agents contest the resource beyond the level of their own claim, implicitly contesting (or claiming) the full resource. Again, the approach in this paper is different. The Arctic scramble illustrates that agents may not aspire to receive a share of the resource larger than their claim. Third, Welch (1997) integrated a contest into a bankruptcy model in order to explain firms' capital structure decisions. The argument is that creditors aim to minimise potential ex-post lobbying and litigation costs in case of bankruptcy. In general, banks are in a better position than public creditors to influence bankruptcy rules ex-post. Under this assumption, such wasteful rent-seeking is prevented by awarding seniority to banks ex-ante.

In my proposed integrated approach, it is important to realise that the bankruptcy literature, with few exceptions, treats claims as exogenous to the problem at hand. Because of this exogeneity, a solution to a bankruptcy problem is not based on strategic considerations or optimisation on the part of the agents. Rather, the focus in this literature is on the construction of attractive rules to allocate the resource. In the current paper, we allow investments in guns to affect such allocations.

In a contest model, the distribution of the resource is determined by a contest success function (CSF) (Skaperdas, 1996). In a bankruptcy problem, this distribution is determined by a bankruptcy rule. I propose four *contest-bankruptcy rules* that integrate the most common CSF (the ratio CSF) with four classical bankruptcy rules (proportional rule, constrained equal awards, constrained equal losses, and the Talmud rule). Like the four bankruptcy rules that they are based on, each of these rules satisfies specific properties. My aim in this paper is not to propose one specific rule. The choice for one of the rules depends on the characteristics of the contest to which the rule is applied.

The results of this paper allow a better understanding of the particular role of claims in contests; improving existing knowledge on the causes of conflicts, their expected outcome, and possible factors that may prevent conflict. Specifically, I find that the inclusion of (exogenous) claims in a two-agent contest model leads to the following differences to the benchmark model without claims. First, equilibrium levels of guns are weakly lower than the benchmark, and more so for higher asymmetry in claims. Second, equilibrium payoffs are not unequivocally higher than in the benchmark, though higher claims lead to higher equilibrium payoffs. Third, due to weakly lower investments in guns, the cost of conflict in equilibrium is also weakly lower than in the benchmark. Although the costs of contests may still be significant, this result shows that costs may be lower when claims play a role in conflict.

I proceed as follows. In Section 2, contests and bankruptcy problems are briefly introduced. In Section 3, I apply classical bankruptcy rules from the bankruptcy literature in order to adjust contest success functions for the agents' claims. In Section 4, I analyse a two-agent resource contest model and assess how standard results are affected by introducing claims. In Section 5, results are applied to the Arctic scramble and in Section 6, I provide some final remarks.

2. Contests and bankruptcy problems

Consider the set of agents $N=\{1, 2, \ldots, n\}$ who are competing for a resource R. The agents have claims to the resource, and have the option to invest in guns. This situation can be modelled both as a contest and as a bankruptcy problem. I will briefly introduce notation and solution concepts for both approaches, before introducing the combined approach in Section 3.

2.1. Contest

In a contest model, agents fight over a resource or prize. The value of the resource is assumed to be public information (cf. Ryvkin, 2010). The agents can invest in guns, at a certain cost, as an input to the contest. The distribution of guns over the agents determines how much of the resource is secured by each agent. Formally, a contest is a pair (R, g). Each agent $i \in N$ invests in guns g_i, $g=(g_1, \ldots, g_n)$ in order to secure a portion of R, as determined by a CSF.

Contest success function. A contest success function is a mapping G: $g \rightarrow p$ that assigns to every contest a probability vector $p=(p_1, \ldots, p_n)$, $p \in R_+^n$, such that (a) $\sum_{i \in N} p_i = 1$, and (b) $p_i(g) \geq 0 \, \forall \, i \in N$.

The allocation of resources to agent i is $G_i(R, g) = p_i R$. This allocation is according to winning probabilities so that $G_i(R, g)$ is the share of R secured by agent i (Garfinkel and Skaperdas, 2007). Requirement (a) of the CSF imposes efficiency. Requirement (b) says that agents secure a non-negative portion of R. Because it fits the example of the Arctic scramble, I employ a non-probabilistic