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Putting free-riding to work: A Partnership Solution to the common-property problem

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ABSTRACT

The common-property problem results in excessive mining, hunting, and extraction of oil and water. The same phenomenon is also responsible for excessive investment in R&D and excessive outlays in rent-seeking contests. We propose a "Partnership Solution" to eliminate or at least mitigate these excesses. Each of N players joins a partnership in the first stage and chooses his effort in the second stage. Under the rules of a partnership, each member must pay his own cost of effort but receives an equal share of the partnership's revenue. The incentive to free-ride created by such partnerships turns out to be beneficial since it naturally offsets the excessive effort inherent in such problems. In our two-stage game, this institutional arrangement can, under specified circumstances, induce the social optimum in a subgame-perfect equilibrium: no one has a unilateral incentive (1) to switch to another partnership (or create a new partnership) in the first stage or (2) to deviate from socially optimal actions in the second stage. The game may have other subgame-perfect equilibria, but the one associated with the "Partnership Solution" is strictly preferred by every player. We also propose a modification of the first stage which generates a unique subgame-perfect equilibrium. Antitrust authorities should recognize that partnerships can have a less benign use. By organizing as competing partnerships, an industry can reduce the "excessive" output of Cournot oligopoly to the monopoly level. Since no partner has any incentive to overproduce in the current period, there is no need to deter cheating with threats of future punishments.

1. Introduction

In some fisheries in Japan, fishermen from several vessels share their catch. Their pooled output is sold through a common outlet and members of each partnership divide equally the resulting gross revenue, no matter how little someone has contributed. Such egalitarian catch-sharing among vessels is a prescription for free-riding. Multiple partnerships compete for the catch, or the induced free-riding would be even greater.

Received economic theory cannot account for such partnerships. They do not appear to be a response to uncertainty or asymmetric information. Catch-sharing partnerships must have *some* advantage, however, since as of the census of 1988, 147 different fishing groups in Japan were engaging in such income pooling. To understand why such partnerships arise,

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Platteau and Seki [24] interviewed skippers in the glass-shrimp industry in Japan and, when feasible, used more objective measures to validate their responses. They concluded that "The most prominent result emerging from this exercise is certainly the fact that stabilization of incomes was not mentioned a single time." Instead, the main motive appeared to be the reduction of congestion: "The desire to avoid the various costs of crowding while operating in attractive fishing spots appears as the main reason stated by Japanese fishermen for adopting pooling arrangements."[1]

These Japanese fishermen appear to have rediscovered an ancient solution to the common-property problem. According to anthropologists, hunter–gatherer cultures that have survived to the modern era typically share their kill and work short hours; moreover, they consume enough quantity and variety to be characterized by one distinguished anthropologist as the "Original Affluent Society" [25]. These phenomena, which have been studied extensively but separately, may be connected: those hunter–gatherer cultures surviving to modern times may owe their success to their practice of sharing the fish and game caught by groups of hunters since extensive sharing dulls hunting effort sufficiently to protect common property from overexploitation.[2]

At the opposite end of the technological spectrum, individuals who form research joint ventures to share revenue from their discoveries may have hit upon the same solution. Without joint ventures, individuals vying for a patent awarded to the best innovation will invest too much even taking account of the fact that the expected value of the winning patent grows with aggregate investment [4]. Such innovation tournaments are strategically equivalent to rent-seeking contests where the value of the prize increases with the total outlay. So, in the absence of prize-sharing within interest groups, rent-seeking outlays are also excessive [12].[3]

Common property extraction provides a particularly relevant illustration of the same strategic considerations. In the absence of sharing, fishing effort is excessive [16] even when account is taken of the fact that aggregate catch grows with aggregate effort. Sharing arrangements promote free-riding and, when effort would otherwise be excessive, this constitutes a social improvement. We investigate the circumstances when sharing agreements can be used to restore the social optimum in extraction from common properties. As we make clear, however, our conclusions apply equally to (1) innovation tournaments and (2) rent-seeking contests.

Besides these beneficial uses, partnerships can also be used for a more sinister purpose. In the absence of partnership agreements, service providers in an industry can be expected to reap at most oligopoly profits. But if they can organize themselves into a collection of competing revenue-sharing partnerships (a common organizational form in some service industries), they can potentially reap monopoly profits.[4] There is no need for interactions to be ongoing so that the prospect of a price war in the future deters the current temptation to expand output. The revenue-sharing inherent in a partnership structure *eliminates* the current temptation to expand output. Antitrust authorities should be aware that in industries where partnerships predominate, prices may approach monopoly levels even though competition among these partnerships is vigorous.

We consider a two-stage game where individuals choose their partnerships at the first stage and their effort levels at the second stage. If every individual chooses in the first stage to work in a different partnership as its sole "partner," aggregate effort in the second-stage equilibrium will exceed the social optimum. At the other extreme, if every player joins the same grand partnership, aggregate effort in the second stage will be inadequate due to free-riding. As we show, aggregate effort is a strictly increasing function of the number of partnerships formed at the first stage.[5] Socially optimal effort can, therefore, be induced (or approximated if there are integer problems) if the N players partition themselves into an intermediate number of partnerships in such a way that each agent's tendency to work too hard is exactly offset by his tendency to free ride. We refer to this as the "Partnership Solution."

In reality, of course, the Partnership Solution is viable if and only if each person in a given partnership has no incentive to switch to some other partnership (pre-existing or new). We refer to such partnerships as "stable." We refer to each

[1] A similar arrangement seems to have been adopted by some groups of New Jersey fishermen as well [15]. A more traditional society in Tonga also has features of the partnership arrangement we explore here [5].

[2] "The literature on traditional hunter–gatherers provides ample evidence that work effort is extremely low in traditional societies and that natural resources are not overexploited but rather under-exploited" [20, p. 45]. "We do not know whether traditional societies have introduced sharing consciously…Once introduced (or chosen by accident), however, it appears to be a stable means to regulate resource use." [20, p. 67].

[3] In a contest for a fixed prize among rent-seeking individuals exogenously allocated to partnerships, Nitzan showed that aggregate rent-seeking outlays decline because of free-riding [21]. Each partnership is assumed to use the same exogenous sharing rule (of which our egalitarian rule is a special case). In other cases, the rule partially rewards an individual for making larger effort relative to other members of his group, which implicitly requires that group members costlessly monitor each other's efforts. We extend Nitzan's original insight and show its implications for the common property and cartel problems. The case we examine is isomorphic to a rent-seeking contest where the prize is a strictly increasing function of aggregate outlays and where groups form endogenously (see footnote 7). Since the prize in Nitzan is fixed, the partition generating the highest social welfare occurs when every player is in a single group [21]. In our variable-prize case, putting every player in one group induces too little extraction effort and the social optimum instead occurs at an "interior" solution with the correct number groups. In Section 5, we show how our Partnership Solution easily generalizes when groups share according to Nitzan's rule provided the weight on relative effort is not excessive. Baik and Lee extend the group rent-seeking model with a fixed prize by endogenizing group formation and the choice of the sharing rule [3]. However, our analyses are quite different because there is no variable prize (the counterpart to our production) in their application. Consequently, it is efficient for everyone to join a single group, make no rent-seeking outlay, and share the fixed prize; in our context, the "prize" (production) would completely vanish in the absence of outlays (effort). Another key difference arises because we consider the role of team production.

[4] Law firms, medical firms, and consultancies are some examples.

[5] For experimental confirmation of this prediction, see [27].