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Excludability: A laboratory study on forced ranking in team production☆

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ABSTRACT

Exclusion has long been employed as a common disciplinary measure against defectors, both at work and in social life. In this paper, we study the effect of excludability – exclusion of the lowest contributor – on contributions in three different team production settings. We demonstrate theoretically and experimentally that excludability increases contributions. Excludability is particularly effective in production settings where the average or maximum effort determines team production. In these settings, we observe almost immediate convergence to full contribution. In settings where the minimum effort determines team production, excludability leads to a large increase in contributions only if the value of the excluded individual's contribution to the public good is redistributed among the included individuals.

1. Introduction

The social and economic success of organizations and societies depends on the cooperative interactions of motivated individuals. In organizations, teams are often employed in traditional management functions because they can execute tasks better, learn faster, and change more easily than traditional structures. In societies, cooperation in groups can yield

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efficiency and flexibility. However, teams and groups face the free rider problem: individual incentives are often at odds with efficient actions. Much research has focused on how to overcome or alleviate this problem.[1]

In this paper, we focus on a novel institution designed to alleviate the free rider problem: excludability.[2] Excludability combines two incentives that have been identified in the literature as being crucial for motivation on the job: *competition* and *exclusion*. Nalebuff and Stiglitz (1983) note that "one of the dominant characteristics of modern societies is the important role played by competition; competition is the force providing work incentives. Rewards within a firm (. . .) are at least partially based on relative performance" (p. 21). Similarly, exclusion is a common disciplinary measure against defectors both at work and in social life. For example, shirking workers are fired (Shapiro and Stiglitz, 1984); uncooperative neighbors are not invited to neighborhood parties and other social events; societal defectors are incarcerated or expelled (Hirshleifer and Rasmusen, 1989); and countries that violate international conventions are boycotted.

A combination of competition and exclusion is utilized in many organizations as an implicit or explicit incentive mechanism. Jack Welch of GE famously fired the bottom 10% of employees each year, thus implementing *competition* among employees to stay in the top 90% and *exclusion* of the bottom 10%. An estimated 20% of US firms utilize some sort of forced ranking, including Ford, Sun and Microsoft. Although common, this method has met with much controversy, and the evidence supporting its practice is somewhat mixed. The *stack ranking* mechanism employed by Microsoft is a notorious example. By utilizing this incentive system, managers are requested to rank their employees in three categories and distribute bonuses accordingly. Given that the proportion of workers in each category is fixed, the system relies entirely on the relative performance of employees rather than on absolute levels of productivity.

While the benefits of competition as suggested in Nalebuff and Stiglitz (1983) have been repeatedly documented (see Knoeber and Thurman, 1994; Nalbantian and Schotter, 1997; Blanes i Vidal and Nossol, 2011), the flip side of competition in organizations has received attention only more recently. Competition may discourage teamwork and become detrimental in very different ways. Charness et al. (2013) and Berger et al. (2013) observe the emergence of disreputable behavior in two experiments in which participants sabotage others' work to increase their chances of winning the competition. Bandiera et al. (2013) find strategic partner selection when rank incentives are introduced, as workers choose to be part of teams with other workers of similar ability to avoid competition, leading to substantial drops in performance.

We design an experiment to examine exclusion of the lowest-contributor under three production functions: the standard voluntary contribution mechanism (VCM) where individual contributions are averaged to create team production, the weakest link mechanism (WLM) where the lowest contribution determines the team production level, and the best-shot mechanism (BSM) where the highest contribution determines the team output.[3,4] Our experiment includes a baseline treatment without and two treatments with excludability. In the treatments with excludability, if all players contribute the same amount, then no one is excluded. In the first excludability treatment, the excluded party's value from the team production is simply lost from the perspective of the team. This corresponds to a situation in which, for example, in a social setting of the neighborhood, the value of the noncontributing neighbor from attending the party is not captured. In the second excludability treatment, the value of the excluded party's consumption of the public good is redistributed among the included members. For example, when a low-contributing employee is excluded from the bonus pool, the remaining members get larger bonuses. In an organizational perspective, *exclusion* generates savings for the employer (as she keeps some team benefits or bonuses), while *redistribution* is neutral relative to the baseline condition in the sense that all of the team output remains within the team, and incentives for those not excluded increase.

Excludability is an attractive incentive institution for at least two reasons. First, it involves lower informational requirements than does exclusion without competition and with externally fixed threshold level. The mechanism designer does not need to determine in advance the threshold below which contributors will be excluded (how low is too low?). In addition, it involves lower information requirements for implementation. Participants do not need to know exactly how much each of their team members has contributed (a cardinal measure), only the ordering of contributions (an ordinal measure). These lower informational requirements are most likely the reason that excludability has been observed in the field. Second, it taps into the forces of competition and allows these competitive forces to work in favor of increasing contributions. In contrast, exclusion without competition has more of a contractual structure; everyone knows in advance how much they

[1] Laffont (1987) is the classic reference reviewing theoretical proposals. Ledyard (1995) summarizes early findings of the experimental literature in his well-known review. More recent surveys are offered in Keser (2002), Zelmer (2003), Kosfeld and Riedl (2004) and Chaudhuri (2011).

[2] The term excludability is a reference to the public goods literature to which our study links. Public goods are characterized by non-excludability from consumption and non-competition in consumption. Our institution excludability implies the possibility of immediate exclusion of the worst free rider from the consumption of the public good. If contributions are the same across contributors, however, no exclusion takes place. Our institution redistribution that we explain in detail below implies both a possibility of exclusion and also a competition in consumption.

[3] Classic examples of the WLM involve meetings that can begin only when all participants arrive or joint production tasks in which each member's contribution is critical to producing the output. A typical example of the BSM is the volunteer's dilemma, where one individual's contribution is sufficient to create joint benefit, such as one employee stopping the assembly line to prevent the firm from producing more defective goods. An extreme example occurs when soldiers in a trench at wartime face a live grenade, and one soldier jumps on the grenade and loses their own life but saves the lives of all of their comrades.

[4] Hirshleifer (1983) and Hirshleifer and Harrison (1989) first analyzed these production functions in a two-player setting. While many studies examined the weakest link game (Van Huyck et al., 1993; Cachon and Camerer, 1996; Bornstein et al., 2002), the best-shot mechanism has previously only been studied as a sequential game in a two-player setting (Hirshleifer and Harrison, 1989; Prasnikar and Roth, 1992; Duffy and Feltovich, 1999; Carpenter, 2002). Thus, we will over-sample this treatment in our experimental design.