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Can higher rewards lead to less effort? Incentive reversal in teams

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ABSTRACT

Conventional wisdom suggests that a global increase in monetary rewards should induce agents to exert higher effort. In this paper we demonstrate that this may not hold in team settings. In the context of sequential team production with positive externalities between agents, incentive reversal might occur, i.e., an increase in monetary rewards (either because bonuses increase or effort costs decrease) may induce agents that are fully rational, self-centered money maximizers to exert lower effort in the completion of a joint task. Incentive reversal happens when increasing one agent's individual rewards alters her best-response function and, as a result, removes other agents' incentives to exert effort as their contributions are no longer required to incentivize the first agent. Herein we discuss this seemingly paradoxical phenomenon and report on two experiments that provide supportive evidence.

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1. Introduction

Most economists would presumably agree to the statement that, basically, economics is all about incentives.[1] The statement is regularly understood to be about monetary payments, in the sense that high monetary rewards equal strong incentives, and vice versa. This simplification applies to many economic situations. However, it does not necessarily apply to environments in which individuals interact in groups and their individual rewards are affected by others' actions, e.g., in team production settings. In the context of sequential team production, incentive reversal might occur – in particular for

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[1] A statement which, for example, has been made by Aumann (2006) in his Nobel prize lecture in 2005. Aumann recounted the following story about Jim Tobin: "The discussion was freewheeling, and one question that came up was: Can one sum up economics in one word? Tobin's answer was 'yes'; the word is incentives" (p. 351).

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rational individuals whose main objective is the maximization of their own monetary income. In this paper, we illustrate under which circumstances this might happen and report corresponding experimental results.

Following Winter (2009), who introduced the theoretical foundations for incentive reversal, we consider simple strategic environments involving team production with moral hazard. In this context, incentive reversal refers to situations in which an increase of promised rewards to all team members results in fewer agents exerting effort. Incentive reversal is caused by the existence of externalities among peers that arise from the team's production technology, and builds on two properties that are descriptive of many team environments: (i) some agents have internal information about the effort level of others (which requires a certain extent of sequencing in the production process) and (ii) agents' efforts are complements in the team's production technology. Given these assumptions, the line of reasoning behind incentive reversal is straightforward. Since the underlying production technology involves complementarity in terms of team members' efforts, moderate rewards can generate an implicit threat against shirking, in the sense that agent *i* chooses to exert effort only if his peer, agent *j* (whose effort is observable by *i*) has done so as well. A substantial increase to agent *i*'s rewards may induce this agent to exert effort as a dominant strategy (regardless of what agent *j* is doing). This in turn eliminates the implicit threat that was present in the outset and induces agent *j* to shirk even though his promised reward increased as well.

Simple as it may seem, it is not clear whether the argument for incentive reversal is empirically sound for at least two reasons: cognitive limitations and other-regarding preferences. We tend to think about monetary rewards and motivation as moving in the same direction. Thus, when the rewards of all agents in a team are increased, they may respond "heuristically" with high effort to the increase in their own reward, without considering the strategic implications of the increase in their peers' rewards. Such heuristic responses might be facilitated if individuals are not able, or expect others not to be able, to follow the backward induction reasoning underlying incentive reversal.[2]

Even if cognitive limitations do not apply, other-regarding preferences (and in particular the presence of reciprocity) may eliminate incentive reversal. If an individual who detects the shirking of his peer is inclined to retaliate by shirking as well, regardless of the monetary incentives, the observed individual (anticipating reciprocal behavior) would be reluctant to shirk. In this event, incentive reversal will be washed out.[3]

Given the above considerations, whether incentive reversal in teams actually occurs or not ultimately remains an empirical question. Moreover, theoretical predictions strongly rely on having sufficiently precise knowledge about the shape of the production technology, the move structure and information set of each agent, as well as the potential rewards and individuals' costs of exerting effort. We conducted two separate experiments that allowed a sufficient degree of control over these factors to clearly test for incentive reversals. Both experiments involve teams of agents who work on a joint team project. Agents decide on their individual effort level (with effort being costly) and are paid as a function of the team's joint effort. In both experiments we look at situations that are susceptible to incentive reversal. Keeping the environment (in particular the production technology) fixed, we explore how subjects behave under high, respectively under low rewards.

The two experiments differ in several respects, allowing us to establish the behavioral validity of the incentive reversal phenomenon across specific features of the decision environment. The first experiment implemented a two-agent game in a laboratory setting using a labor framing. Subjects in this experiment were provided with the explicit payoff structure of the game and second movers made their decisions after observing the decisions of first movers. The level of incentives was manipulated within subjects between rounds by setting different reward levels, as in Winter (2009). The second experiment implemented a three-agent game in a classroom environment. The game was presented as a money game, the payoff structure of which was not explicitly provided, but could be extrapolated from the basic rules. All decisions were collected simultaneously, with second- and third-mover strategies conditional on previous movers' decisions. The incentive level manipulation was implemented by varying the costs of effort, rather than the rewards, in a between-subjects design. Put together, the two experiments provide a robust test for the existence of incentive reversal.

In order to be able to ascertain that any observed incentive reversal effect is indeed driven by the hypothesized mechanism, we take two complementary approaches. In the first experiment, we add two control treatments that correspond to the experimental treatments in all but one aspect: the subjects choose their actions simultaneously rather than sequentially. Thus, while we retain the payoff structure, the strategic structure which gives rise to incentive reversal in the sequential games is eliminated in the simultaneous games. In the second experiment, we use a strategy method instead of a direct-response method to obtain counterfactual data. By observing subjects' decisions in each node of the game tree we can test for incentive reversal by looking at behavior along and off the theoretical equilibrium path.

[2] The experimental literature casts doubts on the ability and propensity of people to follow backward induction (e.g., Binmore et al., 2002; Carpenter, 2003; Harrison and McCabe, 1996). Johnson et al. (2002) found that information gathering strategies of subjects in three-stage bargaining games reflect forward looking reasoning rather than backward induction. Game strategies did not converge to the backward induction prediction even when subjects knew that they were playing with computerized partners who follow the backward induction path. Bone et al. (2009) provide evidence that people do not use backward induction even in non-strategic risky situations.

[3] The literature on social dilemmas provides ample evidence that people choose reciprocal strategies even when those entail playing strictly dominated strategies, both within a round with sequential moves and between periods when the game is repeated (e.g., Clark and Sefton, 2001; Falk and Fischbacher, 2002; Fischbacher and Gächter, 2010; Fischbacher et al., 2001; Gächter et al., 2010; Guttman, 1986; Meidinger and Villeval, 2002; Potters et al., 2007; Varian, 1994). See, however, Glöckner et al. (2011) for an experimental study where an increase in monetary rewards weakens reciprocal reactions and reduces voluntary cooperation in a social dilemma.

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