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Framing manipulations in contests: A natural field experiment

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ABSTRACT

Exploiting findings that losses loom larger than gains, studies have shown that framing manipulations can increase productivity of workers. Using a natural field experiment that exogenously manipulates wage bonuses within contests in a Chinese high-tech manufacturing facility, we show that how loss aversion affects worker behavior critically depends on the incentive scheme as well as the framing manipulation. Four sets of two identical teams competed against each other to win a bonus given to the team, within a set, with the higher average hourly productivity over the week. In each set, the bonus was framed as a *reward* or *gain* for one team and as a *punishment* or *loss* for the other. Average weekly productivity was slightly higher under the *loss* treatment, but this increase was statistically insignificant. However, the team under the *loss* treatment was at least 35% more likely to win the contest. As teams' payoffs are based on relative productivity under a contest, framing effect is much stronger in terms of relative productivity. Finally, workers seemingly responded to the bonus by increasing the quality of production as well as quantity—defect rate fell as productivity increased.

1. Introduction

Loss aversion, which suggests that losses loom larger than gains, is one of the central features of prospect theory proposed by Kahneman and Tversky (1979). Exploiting loss aversion, Hossain and List (2012) recently showed that framing manipulations can be used to increase productivity of workers even in the field with regular workers under long-term contracts. Specifically, incentive schemes that are framed as punishments increase productivity over isomorphic schemes framed as rewards. While that and other studies present ample evidence of factory and farm workers, students, teachers, and laboratory subjects being loss-averse, there is relatively little work on how variations in the incentive schemes interact with framing manipulations designed to exploit loss aversion. In this paper, we ran a natural field experiment in a Chinese high-tech manufacturing facility where sets of two identical teams competed against each other to win a bonus given to the team with the higher average hourly productivity. The bonus was framed as a *reward* or *gain* for one team and as a *punishment* or *loss* for the other. While productivity increased by a greater degree under the latter framing, this effect was

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statistically insignificant. However, framing the incentive scheme as loss made a team at least 35% more likely to produce at a level of productivity higher than that of a team whose incentive was posed as gain. This contrasts Hossain and List's finding that similar framing manipulations, but with bonuses based on absolute productivity, resulted in a significant framing effect in terms of absolute, but not relative, productivity. This suggests that the type of incentive scheme seems to matter as much as framing in determining how incentive contracts affect worker behavior.

A central question in industrial organization is how incentive contracts can be used to affect agents' effort choice. Standard literature typically focuses on the economic contents of an incentive contract rather than the language of the contract[1]. Evidence from laboratory experiments regarding the power of framing—however, suggest that even apparently innocuous differences in the presentation of a contract may significantly affect agents' behavior. In recent years, work has begun to extend the empirical results from the lab to the field, although most studies focus on individual outcomes[2]. In line with this strand of literature, we are particularly interested in the following first-order question: what are the effects of simple exogenous framing manipulations among competing teams of workers? Difficulties in answering this question are associated with implementing a clean empirical test of such phenomena, and separating out the consequences of factors of primary interest from the host of simultaneously occurring stimuli.

Rather than relying on observational data, we approach this question by executing a natural field experiment in partnership with the Wanlida Group Company, a large-sized Chinese manufacturing company based in the Fujian province of China. With more than 20,000 employees, it produces a variety of consumer electronics and ranks as one of the "top 100 electronics enterprises" in China. We use a subset of Wanlida employees in their production center in Nanjing in the Fujian province. The goal of our experiment is twofold. First, we aim to analyze how simple framing manipulations of a bonus scheme influence productivity of *competing teams of workers*. Second, comparing our results with that of Hossain and List (2012), we can investigate how the impact of an incentive contract on worker behavior depends on the interaction of the economic (financial incentive) and noneconomic (framing manipulation) contents of the contract.

During our 8-week long experiment, subjects engaged in their regular tasks and work schedules within their normal work environments. Our experiment included four different sets of work with each set consisting of two teams of workers of identical composition. For each set of work, we provided a weekly bonus to the team with the higher per-hour productivity. The bonus depended only on relative performances of the two competing teams. The team under the positively framed reward treatment was notified that for each week in which the team's per-hour production was higher than that of the competing team, a bonus of RMB 80 would be paid at the end of a 4-week long pay period. The team under the negatively framed punishment treatment was promised a *provisional* bonus of RMB 320 before the 4-week long pay period began, but was notified that for each week in which its per-hour production was lower than that of the competing team, the bonus at the end of pay period would be reduced by RMB 80.

In contrast with studies like Dickinson (2001) where the underlying incentive schemes for the reward and punishment treatments within a laboratory experiment were different, the two schemes in our experiment were isomorphic, except for the frame[3]. Unlike Lazear (2000), we do not compare inherently different types of incentive schemes in this paper and restrict attention to contests between two teams. While standard theory suggests that these incentive contracts should lead to identical outcomes, insights gained from Kahneman and Tversky's (1979) prospect theory suggest otherwise. If losses loom larger than gains to our factory workers, as prospect theory conjectures, the punishment treatment should outperform the reward variant. Alternatively, if workers get more invigorated by positive incentive schemes, the reward treatment should lead to a higher level of productivity. This experiment provides us with insights on how productivity, both in absolute and relative sense, of teams competing in a contest is affected by framing of the incentive scheme.

In our experiment, we find that framing effects display different and more subtle patterns compared to those found in Hossain and List. Furthermore, an additional psychological effect from the framing manipulation might arise due to the competitive nature of the game. First, both bonus schemes succeeded in increasing productivity just as Dickinson (2001) and Hossain and List (2012) found. Average weekly productivity increased by almost 14% across the four sets. We find some more interesting data patterns on the impact of framing of the schemes. There is no statistically significant evidence that teams competing under the punishment frame outperform teams competing under the reward frame in terms of average weekly productivity. Yet, the result on which team wins the contest is very robust. The team in the punishment treatment is at least 35% more likely to produce at a rate higher than the team under the reward treatment. Hence, while framing has a very strong effect in determining the winner of the contests, the variance in absolute productivity is too large leading to a statistically insignificant framing effect in terms of productivity. These results contrast Hossain and List's (2012) findings. They may have resulted from the fact that winning or losing, not the absolute productivity level, is the sole determinant of the bonus under our incentive scheme. Workers may focus their efforts and adjust it inter-temporally to win the contests most number of times instead of maximizing their productivity. These insights are important for the design of incentive

[1] Prendergast (1999) presents an excellent survey of the literature on incentives to agents in firms.

[2] For an extensive survey on evidence of framing effects from the field, see DellaVigna (2009), especially Section 4.1. For a recent illustration, see Hossain and Li (2014).

[3] For some other examples of field experiments comparing economically different incentive schemes, see Bandiera et al. (2005) and Shi (2010). Our paper is closely related to recent work by Armantier and Boly (2013) who, using laboratory and framed field experiments, show that bonus schemes that combine reward and punishment conditional on exogenously set targets increases effort provision.