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Group incentives or individual incentives?
A real-effort weak-link experiment

Stefania Bortolotti [a,*], Giovanna Devetag [b], Andreas Ortmann [c]

[a] Department of Economics, University of Cologne, Germany
[b] Department of Business and Management, Luiss Guido Carli, Italy
[c] UNSW Australia Business School, University of New South Wales, Australia

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ABSTRACT

Motivated by previous research on coordination problems and incentive design in organizations, we compare group incentives and individual incentives in a new experimental test-bed: a real-effort task embedding a weak-link technology. Comparing group-incentive and individual-incentive treatments, we find that the observed dynamics of both individual errors and worst performances within firms, after a phase of learning, are largely indistinguishable. Importantly, and possibly explaining our finding, more than 80% of our laboratory firms, notwithstanding initially widespread inefficiency, were eventually able to achieve and sustain efficient coordination despite the presence of an unforgiving payoff structure. This result, which may be due to the reduced strategic uncertainty so characteristic of chosen-effort weak-link game experiments, stands in stark contrast to standard results in the coordination game literature and provides an interesting challenge to test-beds currently used.

1. Introduction

The question of how to adequately motivate employees is an issue of fundamental interest to both economists and management scholars (see, for instance, Gibbons, 2005; Gibbons & Roberts, 2010; Pfeffer, 1998). A variety of theoretical models have been proposed to explain, among other things, the efficiency of fixed and piece-rate salaries (e.g., Holmstrom & Milgrom, 1987), different tournament formats (e.g., Lazear & Rosen, 1981; Milgrom & Roberts, 1988; Ryvkin & Ortmann, 2008), optimal incentives in presence of career concerns (e.g., MacLeod & Malcomson, 1988), and conditions under which group incentives are optimal (e.g., Kandel & Lazear, 1992). However, the practical relevance of theoretical results in this area has gone largely untested (e.g., Hamilton, Nickerson, & Owan, 2004; Prendergast, 1999).[1] Specifically, evidence on incentive provision when production is based on teamwork seems insufficient (Akerlof, 1982; Kretschmer & Puranam, 2008; Rankin, 2004; van Dijk, Sonnemans, & van Winden, 2001) notwithstanding its obvious relevance, given that over 50% of large US firms

* Corresponding author.
E-mail addresses: stefania.bortolotti@uni-koeln.de (S. Bortolotti), mdevetag@luiss.it (G. Devetag), a.ortmann@unsw.edu.au (A. Ortmann).

[1] For a notable exception see Lazear (2000).

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use some form of teamwork (Dumain, 1994; Ostermann, 1995). Whereas incentives targeting individuals have been, by and large, considered more effective by practitioners, Pfeffer (1998) argues that this belief is one of the most dangerous myths about pay. Indeed, group-based incentives have rapidly grown in actual firms in recent years (e.g., DeMatteo, Eby, & Sundstrom, 1998; Romn, 2009); for examples of firms using group-based incentives, see Che and Yoo (2001) and Barnes, Hollenbeck, Jundt, DeRue, and Harmon (2011).[2] Despite group-based incentives being generally regarded as generating widespread free-riding, factors such as peer pressure, mutual monitoring (Kandel & Lazear, 1992; Lawler, 1971) and group norms (Akerlof, 1982; Barnes et al., 2011; Rankin, 2004), have been documented to have the potential to significantly reduce free-riding, and by doing so to render group-based incentives more efficient than individual-based incentives.

The difficulty of collecting field data is due to lack of control for confounds such as self-selection and heterogeneity (Falk & Fehr, 2003; Hamilton et al., 2004). As a result, effort provision under different types of incentives has been investigated in several lab and field experiments (for a review, see Camerer & Weber, 2010). Specifically, individual incentives, such as fixed wages (i.e., gift-exchange),[3] and group incentives, such as tournaments,[4] have attracted a great deal of attention among experimentalists. In addition, some experiments have directly juxtaposed group and individual incentives (Erev, Bornstein, & Galili, 1993; van Dijk et al., 2001); for example, production levels under three incentive schemes were compared: piece-rate, group revenue sharing, and group competition (either within-group or between-group competition). While group competition has been found to induce higher levels of effort, results for piece-rate and revenue sharing are mixed. van Dijk et al. (2001) have found that subjects exert similar levels of effort both under individual and under team-based incentives; on the contrary, Erev et al. (1993) have found that revenue sharing leads to lower levels of effort than piece-rate.

Despite the recent surge of experimental studies on incentive provision, to our knowledge, there is no evidence so far on the relative effectiveness of group incentives and individual incentives when coordination problems are present; all previous experiments, indeed, focused on situations characterized by free-riding problems or competition (see Dutcher, Salmon, & Saral, 2015, and reference therein). We consider instead coordination problems commonly arising from the need to integrate different interdependent activities. Successful coordination among team members, or among different teams, is pivotal to sustaining competitiveness (e.g., see March & Simon, 1958; Schelling, 1960). Camerer and Knez (1996), in a critical assessment of the organizational literature argue that, given some conditions that are often satisfied within organizations (such as social pressure or norms of reciprocity), most interactive problems that are wrongly thought of as involving issues of altruism and free-riding are instead coordination problems that first and foremost require group members to coordinate expectations toward an outcome that is both collectively and individually optimal (Knez & Camerer, 1994). Since employees often fail to match the expectations and actions of co-workers (Camerer, 2003; Devetag & Ortmann, 2007; Heath & Staudenmayer, 2000), research on effective mechanisms to enhance integration of specialized activities seems warranted.

In a lab experiment, we study group-based and individual-based incentives for a well-known and widely studied set of coordination problems that arise when firms use weak-link production technologies: "unless each performs adequately, the total organization is jeopardized: failure of anyone can threaten the whole and thus the other parts" (Thompson, 1967, p. 54). This production technology was studied, among many others, by Cooper (1999) and is commonly believed to capture both macro-economic situations (see Bryant, 1983; Van Huyck, Battalio, & Beil, 1990) and a variety of organizational situations (Knez & Camerer, 2000; Weber, 2000). The take-off of airplanes is a prototypical example of weak-link production technologies (e.g., Knez & Simester, 2001) since airplanes cannot depart before all operations (e.g., fueling, security checks, loading of luggage, boarding of passengers, etc.) have been completed. On-time departure depends on the slowest operation: a unilateral increase in the level of effort is likely to be wasted if it is not matched by an increase in effort of complementary activities. Thus, a firm's production depends critically on the worst performance among the firm's employees, i.e., the "weak link".

Production technology of the weak-link type have attracted major attention in the experimental literature and have been studied by way of so-called minimum-effort or "weak-link" game, which features multiple Pareto-ranked pure-strategy Nash equilibria: the minimum effort supplied by a member of a group of employees determines the outcome of the organization and, consequently, everybody's payoff. Van Huyck et al. (1990) were the first to demonstrate the speedy downward drift to the minimum effort for this game (a process commonly called "coordination failure", even if subjects manage to coordinate on the worst equilibrium), a result that – ceteris paribus – has been replicated consistently.[5] A plethora of organizationally relevant aspects, such as communication, competition, leadership, group commitment, and incentives, have been shown to be efficiency-enhancing for this class of games (for reviews, see Camerer & Weber, 2010; Devetag & Ortmann, 2007). Experiments on incentive provision for this game class focused on group incentives (e.g., Brandts & Cooper, 2006a; Hamman, Rick, & Weber, 2007), a mix between individual and group incentives (Fatas, Neugebauer, & Perote, 2006), and relative performance (e.g., Bornstein, Gneezy, & Nagel, 2002; Myung, 2008); however, to the best of our knowledge, none of the previous experimenters studied group incentives and individual incentives at the same time (Dutcher et al., 2015).

Using a standard chosen-effort weak-link game would not allow us to study the issue of interest – achieving efficiency under individual incentives would be trivial in the standard set-up: we therefore had to depart from the literature on weak-link games by employing a real-effort task. Our design was also motivated by the concern that chosen effort may

[2] For instance, Brown and Armstrong (1999) report that over 50% of major US and EU firms adopt some form of group-based incentives.

[3] For reviews of the gift-exchange literature, see Engelmann and Ortmann (2009) and Camerer and Weber (2010).

[4] See Bull, Schotter, and Weigelt (1987) for an early example of tournament experiments and Niederle and Vesterlund (2007) for prominent evidence on the topic.

[5] Engelmann and Normann (2010) is the only exception that we are aware of.