



# Classic promotion tournaments versus market-based tournaments<sup>☆</sup>



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## ARTICLE INFO

Available online 21 March 2012

JEL classification:

J31

M50

Keywords:

Tournaments

Promotions

Signaling

## ABSTRACT

As initially formulated in the seminal analysis of Lazear and Rosen (1981), an important perspective for understanding the role of promotions in firms is the tournament perspective. That is, a promotion and, in particular, the wage increase associated with a promotion is a prize that serves as an incentive for workers to exert effort and take other actions beneficial to the firm such as the accumulation of human capital. In this paper I consider whether the best way to model promotion tournaments is by having firms commit to prizes ex ante as in Lazear and Rosen's initial formulation, or whether promotion prizes should be modeled as arising from the signaling role of promotions and the competition between firms for promoted workers.

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## 1. Introduction

One of the key insights in the personnel economics and organizational economics literatures is the notion of a promotion tournament. That is, as initially put forth in Lazear and Rosen's (1981) seminal analysis, promotions at firms and, in particular, the wage increases associated with promotions should be thought of as prizes that increase effort and result in other beneficial outcomes such as the accumulation of human capital. In this paper I consider how promotion tournaments should be modeled. Specifically, should they be modeled as prize structures committed to by the firm ex ante as in Lazear and Rosen's initial formulation, or should they be modeled as arising from the signaling role of promotions and the subsequent competition between firms for promoted workers?

Most of the papers in the tournament literature follow Lazear and Rosen's (1981) analysis where tournaments arise because firms commit to future levels of compensation.<sup>1</sup> In their basic analysis there is a single firm that hires two identical workers where each worker's

output depends on a stochastic term and the effort level chosen by the worker. In order to increase effort levels the firm commits to a high wage or prize for the worker who produces the higher output and a low wage for the worker who produces the lower output. Further, Lazear and Rosen show that by appropriately choosing the spread, i.e., the difference between the high and low wages, the firm can induce efficient effort levels. In this approach the worker who produces more and earns the higher subsequent wage is thought of as being promoted where the spread represents the wage increase due to the promotion.

This analysis has been extended in various ways. For example, as will be discussed in more detail later, Rosen (1986) extends the analysis by considering multi-round tournaments. In each stage of that analysis workers compete in pairs, where the winners in each stage proceed to compete in the following stage until only a single winner remains. The main result in that analysis is that the tournament prize structure is convex in the sense that the wage increase associated with winning the last round of the tournament is larger than the increases associated with winning earlier rounds. Other important extensions include Lazear's (1989) model of sabotage and wage compression, and Meyer (1992) that considers a multi-stage tournament model and shows the possibility of biased promotion contests.

All of the extensions mentioned above follow the Lazear and Rosen approach of assuming that the prize structure arises from commitment. That is, a firm setting up a promotion tournament commits to future compensation levels and also rules concerning who will be promoted. But there is a small set of papers that take a different approach. Gibbs (1995), Zabochnik and Bernhardt (2001), Ghosh and Waldman (2010), and Zabochnik, (Forthcoming) all build on Waldman (1984a) and investigate what I will call market-based tournaments. In a market-based tournament it is assumed that firms do not have the

<sup>☆</sup> I would like to thank Xin Jin for research assistance, Jed DeVaro, Bob Gibbons, Hodaka Morita, Jan Zabochnik, two anonymous referees, and seminar and conference participants at Columbia, Cornell, MIT, the University of South Carolina, the 2011 NBER Summer Personnel Economics conference, and the 2011 Tournaments, Contests and Relative Performance Evaluation Conference at North Carolina State University for helpful comments on an earlier draft, and especially Suman Ghosh and Jan Zabochnik for conversations that were helpful for the initial formulation of the paper.

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<sup>1</sup> Surveys that discuss the tournament literature include Lazear (1999), Gibbons and Waldman (1999a), Prendergast (1999), Lazear and Oyer (forthcoming), and Waldman (forthcoming).

ability to commit to future compensation levels or rules concerning who to promote. Rather, tournaments arise because the signal associated with a promotion results in potential employers willing to bid more for promoted workers which, in turn, causes the current employer to pay large wage increases upon promotion in order to reduce the probability of turnover.<sup>2</sup>

Market-based tournaments are similar to a Lazear and Rosen type tournament, hereafter classic tournament, in many ways, but there are also important differences. Just as in a classic tournament, the wage increase associated with promotion can result in higher worker effort or other actions beneficial to the firm such as the accumulation of human capital. Also, as will be discussed in more detail later, some of the predictions of classic tournaments are also predictions of market-based tournaments. For example, in a classic tournament effort is higher when the wage spread or prize is higher, while market-based tournament theory makes the same prediction. But the two theories differ in important ways including how the size of the prize is determined. In a classic tournament the firm commits to the prize early on and the magnitude of the prize is chosen with the knowledge that a higher prize induces more effort. In contrast, in a market-based tournament the effect of the prize on effort is ignored by the firm at the time the prize is chosen (because those effort choices are in the past) and rather the size of the prize is determined by expected wage offers of other firms and current turnover considerations.

In this paper I compare and contrast classic tournament theory with market-based tournament theory with a specific focus on which approach better matches the relevant empirical evidence. My conclusion is that most of the evidence does not allow us to distinguish between the theories, one important finding in the literature is more easily explained by classic tournament theory, while another finding is better explained by market-based tournaments. So, as I discuss in detail toward the end of the paper, maybe the correct approach is a hybrid approach that combines the two theories.

The outline for the paper is as follows. Section 2 presents a basic classic tournament model taken from Lazear and Rosen (1981), derives results from this model that will be useful for the later discussion of the empirical evidence, and also discusses relevant extensions and related analyses. Section 3 presents a market-based tournament model from Ghosh and Waldman (2010) and then presents extensions and related analyses that are useful for considering the empirical evidence. Section 4 first discusses the literature that tests predictions of the classic tournament approach, then discusses the empirical literature on asymmetric learning in labor markets, and ends with an overview and synthesis. Section 5 presents concluding remarks.

## 2. The classic tournament approach

In Section 2.1 I present the basic model in Lazear and Rosen (1981) and derive and discuss some standard results from that model. In Section 2.2 I discuss a few extensions of the classic tournament approach and related analyses, where the main paper emphasized is Rosen (1986) because that paper provides a prediction that is useful for distinguishing between classic and market-based tournaments.

### 2.1. The basic Lazear and Rosen (1981) model

In the basic Lazear and Rosen (1981) model there are two identical workers and a single firm, where the output of worker  $i$  is given by  $y_i = e_i + \varepsilon_i$ . In this equation  $e_i$  is worker  $i$ 's effort level and  $\varepsilon_i$  is the realization of a stochastic term drawn from the density function

$f(\varepsilon)$  which has zero mean. There is a disutility for effort given by  $c(e_i)$ ,  $c' > 0$  and  $c'' > 0$ , and each worker has a reservation utility level  $U_0$ . Further, in their most basic model everyone is risk neutral.

The compensation rule used by the firm is quite simple. There are two wages,  $w_H$  and  $w_L$ , where the worker who produces the higher output is paid  $w_H$  and the worker who produces the lower output is paid  $w_L$ . One can interpret the worker producing the higher output as receiving a promotion and the difference in wages,  $w_H - w_L$ , sometimes referred to as the spread, is the prize associated with being promoted. Note that one feature of this compensation scheme is that the firm does not need to observe the exact output levels produced, but instead only needs to observe which worker produces more.

Each worker chooses the effort level that maximizes the worker's utility which means that the effort level chosen equates the marginal benefit of additional effort with its marginal cost. Let  $e_j^*$  denote the equilibrium effort level of worker  $j$ . Then worker  $i$ 's effort choice satisfies Eq. (1).

$$(w_H - w_L) \left( \frac{\partial \text{Prob}\{y_i(e_i) > y_j(e_j^*)\}}{\partial e_i} \right) = c'(e_i), \tag{1}$$

where  $\text{Prob}\{y_i(e_i) > y_j(e_j^*)\}$  is the probability  $i$ 's output exceeds  $j$ 's output given  $i$  chooses effort level  $e_i$  and  $j$  chooses  $e_j^*$ . Focusing on symmetric Nash equilibria, (1) reduces to (2).

$$(w_H - w_L) \int_{e_j} f(\varepsilon_j)^2 d\varepsilon_j = c'(e_j^*) \tag{2}$$

Eq. (2) tells us that an increase in the spread causes the equilibrium effort choice to rise since  $c'(e_j^*)$  must rise and  $c'' > 0$ .

Given risk neutrality, the firm chooses the spread that yields first-best effort. That is, given the production function is  $y_i = e_i + \varepsilon_i$ , the spread is chosen so that  $c'(e_j^*) = 1$ . If, on the other hand, the workers were risk averse, then the firm would reduce the spread which would provide partial insurance and the result would be an equilibrium effort level below the first best.

In addition to analyzing how a promotion tournament works, Lazear and Rosen compare the optimal tournament compensation scheme with the optimal piece-rate or linear contract. They find that in the case of risk neutrality the two compensation schemes are equally efficient since they both result in first-best behavior. In the case of risk aversion they show that in some cases tournaments are superior while in others linear contracts are more efficient. Mookherjee (1984), however, allows for non-linear contracts and shows that the optimal non-linear contract is typically superior to the optimal tournament.<sup>3</sup> Although, consistent with an earlier point, one reason tournaments may be used despite Mookherjee's result is that tournaments require only ordinal information, while Malcomson (1984) makes the related point that tournaments may be used when output is not verifiable because tournaments are feasible in such a setting while standard output-based contracts are not.

One final point concerning the classic tournament model concerns the issue of commitment. If we think of the classic tournament model as a model of promotions, then it makes most sense to envision the model as a reduced form version of the following two-period model. In period 1 the workers choose effort levels, outputs are produced, and the workers are paid some fixed wage independent of output. In period 2 workers again choose effort levels, produce outputs, and are paid wages. Lazear and Rosen's analysis can be thought of as investigating the ability of the firm to induce high period-1 effort levels by paying a higher period-2 wage to the period-1 worker who produces the higher output.

<sup>2</sup> In addition to Waldman (1984a), other theoretical papers that have investigated the signaling role of promotions without incorporating a tournament perspective include MacLeod and Malcomson (1988), Ricart i Costa (1988), Waldman (1990), Bernhardt (1995), Owan (2004), and Golan (2005).

<sup>3</sup> Green and Stokey (1983) and Nalebuff and Stiglitz (1983) also compare tournaments and contracts but are subject to the same criticism that they do not focus on optimal contracts.

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