

Human capital investments in asymmetric corporate tournaments

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Abstract

We consider a tournament between two workers of different abilities who choose both human capital investment and effort. The employer can influence the workers' behavior by determining the sequence of human capital investments, i.e. the training design. The workers can either invest simultaneously or sequentially with the favorite being the first mover or sequentially with the underdog as first mover. The results show that the outcome of the tournament crucially depends on the employer's choice of training design and on the ability difference between the workers. If the two workers clearly differ in their abilities the employer will prefer simultaneous human capital accumulation. However, if the abilities of the two workers are rather similar the employer optimally chooses sequential human capital accumulation with the underdog being the first mover.

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1. Introduction

In a corporate tournament, workers choose efforts to compete for given prizes. Since only the winner – i.e. the worker with the highest output – receives the highest prize, tournaments play an important role in inducing incentives to workers (e.g. Lazear & Rosen, 1981; Nalebuff & Stiglitz, 1983). Often the employer cannot directly observe the workers' efforts and sometimes only has an

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unverifiable performance signal for each worker. Whereas in such situations individual incentive schemes like piece rates or bonuses do not work, tournaments can create efficient incentives for the workers (Malcomson, 1984, 1986).

In practice, there are many examples for corporate tournaments. Often salesmen compete for bonuses of different size (e.g. Mantrala, Krafft, & Weitz). In hierarchical firms, workers compete for job promotion; here the winner prize consists of the wage increase following promotion and the increase of power and reputation (e.g. Baker, Gibbs, & Holmström, 1994a,b; Treble, van Gameren, Bridges, & Barmby, 2001). There is also relative pay for top managers who compete in the same firm or in the same industry (e.g. Gibbons & Murphy, 1990). Finally, corporate tournaments will always be created if relative performance evaluation is linked to monetary consequences for the employees. Hence, forced-ranking systems, in which supervisors have to rate their subordinates according to a given number of different grades, also belong to the class of tournament incentive schemes. Boyle (2001) reports that about 25% of the so-called Fortune 500 companies use forced-ranking systems to tie pay to performance (e.g. Intel, General Electric). An extreme variant of a forced-ranking system is given when layoffs are tied to the lowest grade. The most prominent advocate of such layoff tournaments is the former General Electric CEO Jack Welch whose incentive philosophy demands dismissal of the bottom 10% of employees each year.

In this paper, we combine human capital investment with effort choice in corporate tournaments. In the standard tournament model, players only decide on effort in order to win the competition. However, in practice workers do not only choose efforts but also long-term investments in their human capital. These investments have an impact on the outcome of the tournament since a worker's productivity typically increases in training or human capital intensity. This productivity effect can be modelled in two different ways—via the production function or via the cost function. First, a worker's effort and his human capital investments are complements in the sense that a higher investment makes a given effort more productive. Technically, a worker's effort variable in his production function is multiplied by a positive weight which is an increasing function of human capital investment. Second, effort and human capital investment can be complementary in the sense that a worker with more human capital may find it easier to fulfil a given task so that a worker's marginal costs of effort are a decreasing function of human capital investment. In this paper, we have chosen the second possibility since we do not discuss individual production functions of the workers but individual performance signals which are not identical with output.

We model the interaction of human capital investment and effort choice in a multiple-stage game where heterogeneous workers first choose human capital investments and then their efforts. Heterogeneity between workers refers to different abilities *ex ante*, i.e. we have a more able worker (the "favorite") who competes against a less able one (the "underdog"). We differentiate between simultaneous and sequential investment decisions in order to allow the employer to choose the timing of worker training. Hence, we focus on the question how human capital accumulation should be organized from the employer's viewpoint. The underlying presumption is that the employer regulates training and further education of his workers as part of his personnel policies. For example, he can decide on whether an individual worker has to register for the present training course or another course in the future. Alternatively, the employer may leave the workers the freedom to choose their own training courses. In that situation, he only has to fix in the labor contract that each worker has to register for exact one training course within a certain time.

Our results show that the outcome of the tournament crucially depends on the employer's choice of training scenario – simultaneous versus sequential – as well as on the decision whether, in case of sequential human capital investment, the underdog should follow the favorite or vice versa. In particular, we can show that if the ability difference between the favorite and the underdog is not

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