Incentives in Asymmetric Tournaments: Theory and Empirical Evidence from Sales Contests

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Abstract:
Whereas the theoretical literature on organizational reward systems repeatedly points to the importance of tournament models from an efficiency perspective, very few is known about the application and effectiveness of tournament structures in business organizations, especially when contestant heterogeneity is taken into account. While the distorting effects of contestant heterogeneity on tournament incentives have been theoretically analyzed in detail for the two-contestant-case, tournament incentives in a typical organizational context with more than two contestants have not at all been studied so far. In our paper, we analyze these effects theoretically as well as empirically in the context of a real business organization. We study incentive travel contests as a quantitatively important component of compensation, and we also present first empirical evidence on (successful and unsuccessful) organizational attempts to reduce contestant heterogeneity by active handicapping and league-building.

1. INTRODUCTION

AS BECKER/HUSELID outlined back in 1992, tournament models have developed into an important component of the literature on organizational reward systems. Especially when reward systems are analyzed at the level of the organization rather than the level of the individual, compensation systems providing rewards on relative performance offer a series of distinct organizational advantages as compared to reward systems based on absolute performance (e.g. lower measurement costs, elimination of common risks).

While the efficiency properties of tournaments were already analyzed by LAZEAR/ROSEN (1981), for more than a decade after publication of this seminal paper, tournament literature was still basically theoretical in nature with the incentive effects of tournaments not yet studied in the organizational context. Even today, field studies on tournaments are few and far between. Moreover, for reasons of data availability field studies are mainly based on data from sports.[3] As a result of the lack of firm data, starting with BULL/SCHOTTER/WEIGELT (1987) the

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3 See e.g. EHRENBERG/BOGNANNO (1990), BECKER/HUSELID (1992), ABREVAYA (2002), TAYLOR/TROGDON (2002), FRICK/PRINZ/WINKELMANN (2003), SUNDE (2003) or LYNCH (2005).

analysis of tournaments in experimental settings received increased attention.[4] Field studies relying on firm data almost exclusively concentrate on executives.[5] While the field studies on executive pay are – by and large – mostly consistent with the theoretical implications of tournament theory (e.g. concerning the effect of the prize spread on effort levels or the hypothesized convexity of reward structures), to the best of our knowledge there is no empirical evidence on organizational tournaments for non-executives as yet.

In what follows, we present econometric evidence drawing on field data from two case studies in German insurance firms. We study incentives provided in a sales contest for travel incentives among insurance salesmen and their supervisors. The incentive effects of sales contests in general and of incentive travel contests in particular are hardly analyzed as yet, although "an entire industry emerged as a result of their popularity" (MURPHY/DACIN 1998: 1). The literature on sales contests is largely descriptive in nature and basically concerned with estimating the size of the incentive travel market (e.g. CENTER FOR CONCEPT DEVELOPMENT 2000 for the USA or KIRSTGES 2000 for Germany) and with surveying the subjective employer motives to install sales contests and the employee motivations to participate.[6] With the notable exception of CABALLERO (1988) who is able to show that travel incentives outperform cash and merchandise incentives (in that they are able to induce higher effort levels), empirical evidence on the incentive effects of incentive travel contests is missing completely. In light of the enormous size of the market with an estimated 10 billion US-$ being spent on incentive travel by US firms in 2000 (see CENTER FOR CONCEPT DEVELOPMENT 2000: 4), this would seem rather surprising.

While our empirical analysis will be based on data from incentive travel contests, the bulk of our theoretical implications are far more general in that they apply to the general organizational practice of designing compensation systems based on relative rather than absolute performance. In our study on the incentive effects in sales contests we concentrate on one of the central problems of tournaments in the organizational reality, the problem of contestant heterogeneity. While organizations in practice are confronted with the need to provide proper incentives for *heterogeneous* employees, tournament theory (again starting with LAZEAR/ROSEN 1981: 859) has shown contests with heterogeneous participants to be generally inefficient – with the rationale of the theoretical proposition being quite straight forward: In a simple two person tournament where one contestant is of higher ability than the other (so-called asymmetric tournament) and where this difference in abilities is known to the contestants, both of them will choose a lower effort level: The lower-able contestant will know that he has no chance of

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4 See e.g. HARBRING (2004); HARBRING/IRLENBUSCH (2003, 2005); HARBRING/IRLENBUSCH/KRÄKEL (2004).

5 See e.g. O'REILLY/MAIN/CHRYSTAL (1988), LAMBERT/LARCKER/WEIGELT (1993), MAIN/O'REILLY/WADE (1993), ERIKSSON (1999), BOGNANNO (2001), CONYON/SADLER (2001).

6 See e.g. HAMPTON (1987) for a survey on employer motivs and HASTINGS/KIELY/WATKINS (1988), SHINEW/BACHMAN (1995) or MURPHY/SOHI (1995) for surveys on employees.

winning however hard he will try, and the higher-able contestant will also feel no need to choose a high effort-level as he expects to win the tournament anyway. Even though theoretical implications are clear-cut and the problem of contestant heterogeneity would seem to be highly relevant for the organizational practice, the empirical evidence on the effect of contestant heterogeneity on tournament incentives is not only rare (with field studies on asymmetric tournaments in firms missing completely) but also mixed: Concerning data from sports, SUNDE (2003) finds evidence of lower effort levels in asymmetric tennis tournaments for males, while LALLEMAND/PLASMAN/RYCX (2005) in their analysis of tennis data from women's contests do not come to this conclusion. In their experimental study, BULL/SCHOTTER/WEIGELT (1987) find that disadvantaged agents may even choose *higher* effort levels in an attempt to compensate for their disadvantage – a finding, however, which could not be replicated in a similar experiment by HARBRING/IRLENBUSCH/KRÄKEL (2003). One reason for the mixed results in the literature may be that the available studies do either not take a closer look at the specific ability distribution in the field of contestants (the examples from sports), or that they only regard very specific and idealized combinations of ability levels among contestants (the experimental studies), e.g. one "star" and two "underdogs" in a group of three contestants.

With the help of our firm data set we are not only the first to analyze the effects of heterogeneity on the provision of incentives in real life firm tournaments, but we are also able to gain qualitatively new insights on the incentive effects in asymmetric tournaments: Heterogeneous tournaments, as we will show analytically as well as empirically, will not generally be distorted if contestants are not completely homogeneous. So this may explain why organizations in reality do indeed make use of tournament structures in spite of a typically non-homogenous workforce. Whether incentives are completely distorted and if so for whom will depend on the distribution of abilities in the group of contestants and on the number of contestants and prizes awarded: For example, if there is one more prize awarded than there are unrivalled "stars" in the contest, such that there remains a sub-group of contestants that have a fair chance of winning the left over prize, incentives will not be distorted for this sub-group which is "at the threshold". With the help of our data we are indeed able to isolate these diverging effects for different sub-groups of contestants.

Furthermore, as far as theoretical solutions to the problem of distorted incentives in asymmetric tournaments are concerned, starting with LAZEAR/ROSEN (1981) the literature emphasizes "splitting leagues" and "handicapping" as a means to re-install proper incentives. While "splitting leagues" in terms of organizational incentives means building sub-groups of employees of equal ability that participate in separate tournaments, "handicapping" entails active discrimination against the more able employees. Besides the obvious examples from sports (with league building in almost any type of team sport and handicapping particularly in golf) there hardly is any empirical evidence on firms using one of these instruments in their design of tournaments. LEEGOMONCHAI/VUKINA (2005), e.g. explicitly search for handicapping in contract design in broiler production, but cannot find any evidence. If at all, affirmative action programs may be interpreted as a form of handicapping in asymmetric tournaments (even though these are rather not actively chosen by firms). In that context, SCHOTTER/WEIGELT (1992: 511) derive that „equal opportunity laws … increase the effort levels of all subjects and hence the profits of the tournament administrator (usually the firm)." In our case study firms we do indeed find evidence for active handicapping in an organizational context. Hence, as a second major result of our paper, we are able to present first empirical evidence on how intelligent handicapping is working in reality. This is especially remarkable as the theoretical literature emphasizes that, in order to properly use handicapping or splitting leagues, the firm would actually need to know the ability levels of the contestants (see e.g. LAZEAR/ROSEN 1981: 861). Although it is well-known that this assumption does not generally hold in the organizational reality, there is no research on how firms manage to ensure proper handicapping or league building. Firms intending to use handicapping or splitting leagues as a means to re-install proper incentives in an asymmetric tournament, will have to find reliable instruments to uncover the ability levels of their employees. In the data we present, we find evidence for the use of an intelligent information disclosing mechanism by the firm which has neither been studied empirically nor theoretically in the tournament literature so far.

We will proceed in the following steps: In section 2 we will theoretically analyze the sales contest for travel incentives. The model presented will be based on the model specification by LAZEAR/ROSEN (1981), but will be tailored to the application of the sales contest by taking account of the particularities of the wage system applied in typical sales contests in the industry under consideration and in our case study firms. Section 3 will lay out the data. In section 4 we will confront the hypotheses derived in section 2 with our econometric evidence. Section 5 will provide a conclusion and short discussion of the main results.

2. INCENTIVES TRAVEL CONTESTS WITH HOMOGENEOUS AND HETEROGENEOUS CONTESTANTS: THEORY

Modelling incentive travel contests: The two agent-framework with homogeneous contestants

Beginning with LAZEAR/ROSEN (1981) the incentive properties of asymmetric tournaments have repeatedly been analyzed: While the earlier papers (LAZEAR/ROSEN 1981, O'KEEFFE/VISCUSI/ZECKHAUSER 1984, MCLAUGHLIN 1988) are mainly concerned with the problem of adverse selection of contestants in a basic model setting, more recent papers model contestant heterogeneity in specific contexts (e.g. in sequential-move tournaments; see JOST/KRÄKEL 2006) or they include other choice variables of the employees besides their effort levels (e.g. the amount of risk-taking; see KRÄKEL/SLIWKA 2004).

In what follows, we intentionally build on the simple, yet fruitful model specification by LAZEAR/ROSEN (1981) to highlight the adverse incentive effects of asymmetric tournaments and to derive implications for our empirical analysis. The model presented is tailored to our application in section 4 by taking account of the particularities of the wage system applied in typical sales contests in the industry under consideration and in our case study firms. In analogy to the model setting by LAZEAR/ROSEN (1981) it is assumed that employers and employees are both risk-neutral.

In a first basic model, there are only two homogeneous employees i $(i = j, k)$ in the tournament. Both employees independently choose an effort level e_i which is not observable by the employer and only known by the respective employee. The worker's output q_i is observable and verifiable.[7] A worker's output q_i is a function of his effort level e_i and an error term x_i with: $q_i = e_i + x_i$. The error terms x_i are assumed to be stochastically independent with $x_i \sim N(0, \sigma^2)$. If $q_j > q_k$, employee j is awarded a travel incentive t and vice versa. As in a typical incentive travel contest the cash value of the travel incentive is generally not disclosed to the employees, it is the value of the travel incentive as *perceived* by the employees v(t) that enters the wage function.

Apart from the chance of winning the travel incentive, a typical wage scheme in the industry under consideration also incorporates a fixed base pay α and a variable payment depending on the employee's absolute output level q_i. Hence, total wages are given by:

$$w_i(e_i) = \alpha_i + f(q_i) + p_i \cdot v(t) \tag{1}$$

where p_i denotes the probability of winning the tournament for employee i and where $f(q_i)$ may represent any kind of variable payment scheme based on employee output q_i with $f'(q_i) > 0$, i.e. a sales commission fee and/or a linear bonus payment.

In his choice of effort, each employee individually maximizes his expected utility:

$$\max EU_i(e_i) = \alpha_i + f(q_i) + p_i \cdot v(t) - c(e_i) \tag{2}$$

where $c(e_i)$ denotes the costs of effort with $c(0) = 0$, $c'(e_i) > 0$ and $c''(e_i) > 0$.

For employee j the probability of winning the tournament p_j is equal to:

$$p_j(e_j e_k) = \Pr\{q_j > q_k\} = \Pr\{e_j + x_j > e_k + x_k\} = \Pr\{e_j - e_k > \xi\} = G(e_j - e_k) \tag{3}$$

where ξ is the composed error term $\xi = x_k - x_j$ and $G(\cdot)$ denotes its cumulated distribution function. Note that the random variable ξ is again normally distributed with $\xi \sim N(0, 2 \cdot \sigma^2)$.

Solving the maximization problem in equation (2) for employee j and substituting for p_j, one arrives at the following reaction function for employee j:

$$c'(e_j^*) = f'(q_j) + p_j'(e_j^*, e_k) \cdot v(t) = f'(q_j) + g(e_j^* - e_k) \cdot v(t). \tag{4}$$

Employee j will hence choose an effort level such that his marginal costs of effort $c'(e_j)$ are equal to his marginal returns that take the form of (a) a higher variable wage payment $f'(q_j)$ and (b) an increased chance of winning the tour-

7 In a pure tournament model output must only be observable on an ordinal scale and not verifiable. In the sales contest we study output is observable and verifiable even in absolute terms. Nevertheless the tournament incentive accounts for a large share of the incentive pay component.

nament $p_j'(e_j, e_k)$ and receiving v(t), where $p_j'(e_j, e_k)$ may be written in terms of the density function $g(\cdot)$ of the composed error term ξ evaluated at $\xi = e_j * - e_k$.

Symmetry implies that if a NASH-equilibrium exists, we have $e_j* = e_k*$, i.e. equation (4) can be rewritten as:

$$c'(e_j*) = f'(q_j) + g(0) \cdot v(t). \tag{5}$$

With an analogous formulation holding for employee k, we may hence generalize: The effort level chosen by employee i in a symmetric two-person tournament will depend on his marginal costs of effort $c'(e_i)$, on the marginal returns of effort resulting from the variable payment scheme based on absolute performance $f'(q_i)$, on the amount of noise in the tournament $g(0)$ (with more noise leading to a lower $g(0)$ and a lower effort level chosen by the employee) and on the size of the travel incentive as valued by the employees v(t). While some of these implications correspond to those of the standard model by LAZEAR/ROSEN (with the size of the travel incentive representing the prize spread), there are two implications that go beyond the original LAZEAR/ROSEN-framework:

- The incorporation of the additional variable payment scheme based on absolute performance $f(q_i)$ secures incentives even in situations were g(0)=0, a case in which incentives are distorted in the LAZEAR/ROSEN-world. Since in real-life sales contests we typically observe these additional payment schemes based on absolute performance, their presence may in fact mirror the organizational attempt to compensate for one of the well-known weaknesses of rank order tournaments: their sensitivity to the presence of idiosyncratic risk in the production processes of individual employees: While in a pure tournament structure it may well be that someone does not receive a reward for his effort simply because the other one was very lucky (which may e.g. be the case in a promotion tournament), payments based on own absolute performance at least filter the idiosyncratic risks in the other contestants' output production (while common risks are still included). More than that, the additional provision of variable bonus payments based on absolute performance may also help to overcome problems related to collusive behavior and hence be apt to reduce some of the major adverse side effects of tournament incentives. Given the positive properties of tournament structures (e.g. their ability to filter common risks), the observed organizational practice of *combining* incentives based on absolute and relative performance, may represent an attempt to combine the advantages of both systems.

- Furthermore, in our model where the cash value of the travel incentive is not known to the employees, it is its value as *perceived* by the employees which determines effort levels. It may hence be conjectured that as long as an increase (or decrease) of the cash value of the travel incentive is not actually *obvious* to the employees, this will not affect their effort levels – leaving a substantial range of discretion for the cash value of the travel incentive. If an organization succeeds in convincing its employees that the travel incentive it offers is indeed sufficiently exclusive and desirable, then its exact cash value may in fact not play a role (as long as it is within a reasonable range where the feeling of exclusiveness and luxury may be generated).

The framework extended to more than two homogeneous contestants

Unlike modelled above, however, real-life sales contests typically include more than two contestants competing for a travel incentive, and the award of more than one prize; e.g. out of a group of 30, the best 10 may win a luxurious trip to Paris. In a homogeneous group of contestants, hence, the ratio of winners to contestants will also be critical for the provision of incentives. As GIBBS (2001: 14) shows, incentives will be low both when the ratio of winners to contestants is particularly low (e.g. close to zero) or when it is particularly high (close to one). Incentives will be highest when the ratio is 0.5. The effect of an increase in the winner to contestant ratio will hence depend on its value: above a ratio of 0.5, efforts will be reduced when the ratio is increased, whereas below a ratio of 0.5 an increase in the ratio will increase efforts.[8] The fact that in promotion tournaments where the typical ratio of winners to contestants will be below the critical value of 0.5, a lower ratio of winners to contestants is compensated by a larger prize spread (see e.g. ERIKSSON 1999 or BOGNANNO 2001) hints at the empirical validity of this conjecture. Thus, depending on whether the level of the winner to contestant ratio is above or below 0.5, we expect lower or higher efforts if the number of winners is increased.

Incentive travel contests with heterogeneous contestants: The two-contestant-framework

In what follows, we introduce heterogeneity on the part of the employees. In accordance with the bulk of the literature (e.g. LAZEAR/ROSEN 1981; MCLAUGHLIN 1988; HARBRING/IRLENBUSCH/KRÄKEL 2004) contestant heterogeneity is modeled by assuming that employees vary in their marginal costs of effort. Let employee j be characterized by generally lower marginal costs of effort than employee k such that $c_j'(e) < c_k'(e)$ for all effort levels $e \neq 0$. Note that a lower marginal cost of effort may either hint at a lower innate ability or at less favorable conditions in the individual production process (i.e. one sales person may be responsible for a region with a comparatively low purchasing power, another one may highly profit from a wealthy region allocated to him).

The reaction function of employee j will then take the following form:

$$c_j'(e_j^*) = f'(q_j) + g(e_j^* - e_k) \cdot v(t) \qquad (6)$$

Analogously, the reaction function of employee k is given by:

$$c_k'(e_k^*) = f'(q_k) + g(e_k^* - e_j) \cdot v(t) \qquad (7)$$

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8 Moreover, incentives will also depend on the number of contestants for any given ratio of winners to contestants. In a larger contest, incentives are higher ceteris paribus than in a smaller one (GIBBS 2001: 15).

As $g(\cdot)$ is symmetric, in a Nash equilibrium we have $g(e_j * - e_k *) = g(e_k * - e_j *)$. If the variable wage payment based on absolute performance does not discriminate between the agents (i.e. if $f'(q_j) = f'(q_k)$), the right hand side of equation (6) is equivalent to the right hand side of equation (7). With $c_j'(e) < c_k'(e)$ for all effort levels $e \neq 0$, employee j will choose a *higher* effort level than employee k. I.e., unlike is the case with homogeneous agents, the two employees will not display the same effort level, but we will observe $e_j * > e_k *$.

As $g(\cdot)$ is not only symmetric, but also non-uniform, we can further write:

$$g(e_j * - e_k *) = g(e_k * - e_j *) < g(0) \tag{8}$$

I.e., in an asymmetric tournament, *both employees* will choose *lower* effort levels than in a symmetric tournament with identical employees. The intuition for the effort levels being generally lower in an uneven tournament than in a symmetric one is straight forward: For both employees, the marginal effect of a higher effort level on the probability of winning the tournament is reduced compared to the symmetric tournament where the ex ante [and ex post] chances to win the tournament are identical for the two contestants.

Depending on the size of the differential in effort costs between the two employees, the incentives from the sales contest may even be completely distorted: If $|e_j * - e_k *| \to \infty$, then $g(e_j * - e_k *) \to 0$, and the incentive effect of the sales contest is reduced to zero. The same is true if there is next to no noise in the tournament ($g(0) \to 1$).[9] Whenever noise in the contest is sufficiently low – as is the case in our industry – incentives from the sales contest are highly distorted: both employees will choose effort levels close to zero.[10] However, the variable payment scheme based on absolute performance secures that employees have an incentive to provide positive effort levels even if $g(0) \to 1$. Again, the general practice of including a variable payment scheme based on absolute performance in a typical sales contest guarantees that incentives are never completely distorted. As far as the size of the travel incentive is concerned, it is again its value as perceived by the employees which is relevant here. The larger contestant heterogeneity, however, the lower its effect on effort levels.

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9 To be more specific, the incentive effect of the sales contest depends on the interplay of contestant heterogeneity and noise: If the two contestants differ largely in their marginal costs of effort, the incentives from the sales contests will be low, but will generally increase with the noise of the tournament. If the two contestants hardly differ in their marginal costs of effort, the incentives from the sales contest will be high, but will be weakened by an increase in noise.

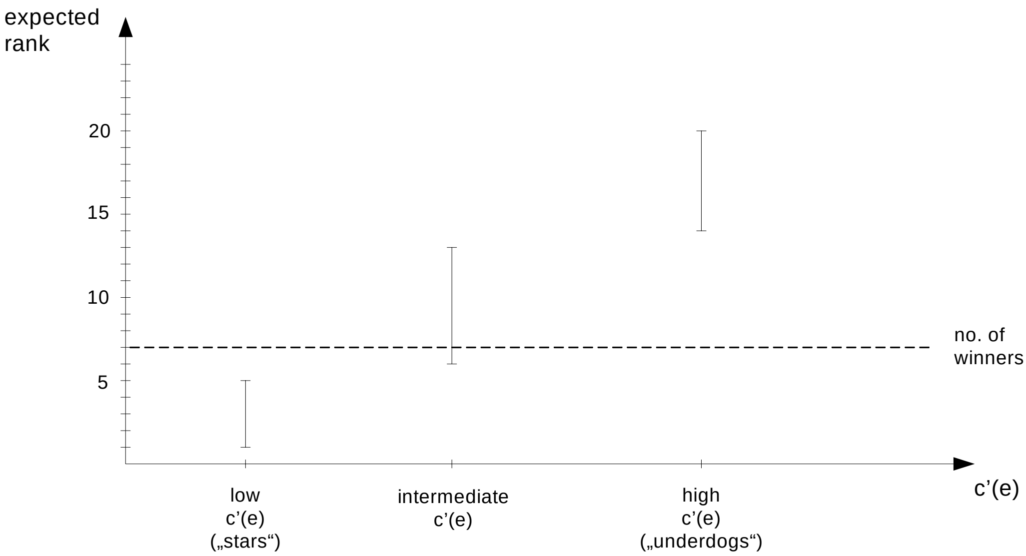
10 While this implication may also be derived from the LAZEAR/ROSEN-framework, LAZEAR/ROSEN (1981) themselves do not specify the reaction functions of two heterogeneous contestants in a mixed tournament and do not discuss the role of noise in asymmetric tournaments.

The framework extended to more than two heterogeneous contestants

However, as noted above, in a real world sales contest, typically more than two contestants compete for more than one travel incentive. In general, this will lead to a situation where incentives are not distorted for all contestants alike. Instead there may be groups of contestants where incentives are fully intact and others where they are completely distorted. While the literature has not yet discussed the effects of a variation of the number of contestants and winners on the incentive effects of *asymmetric* tournaments, intuition would seem to tell us the following: If there are several contestants in a tournament, there may well be sub-groups of contestants of equal ability, e.g. there may be a group of "stars" followed by a group of equally strong intermediate contestants and a further group of a priori clear losers or "underdogs". If the number of prizes awarded is smaller than the number of "stars" in the sales contest, then even the stars and only the stars will compete for the prize. For the rest of contestants, incentives from the sales contest will be distorted. If, however, the number of prizes awarded exceeds the number of stars, stars will not compete for the prize and incentives from the sales contest will shift to the group of employees of intermediate quality who may compete for the remaining prize(s). Hence, in real life sales contests where there are various sub-groups of contestants of similar ability or – to be more specific – where there are sub-groups of contestants that have an equal (lower than 100%) chance of winning one or more of the announced prizes, incentives from the sales contest will typically not be distorted for all contestants. There may well exist a sub-group of contestants for which the incentives of the sales contest are fully intact. The position of this sub-group of contestants in the ability distribution and its size will depend on the number of winners and the number of contestants in the different ability groups.

Figure 1 highlights this conjecture: On the x-axis, contestants are sorted according to their marginal costs of effort, starting with the "stars" (lowest marginal costs of effort) on the left. On the y-axis, the expected ranks in the tournament for each sub-group of homogeneous contestants (as mirrored by their marginal costs of effort) are displayed. In our simple example, there are 5 "stars", 8 contestants of intermediate ability and 7 "underdogs". If there are 7 winners in the contest, incentives will be distorted for the "stars" and the "underdogs", but they will still be present for the group of intermediate contestants. In what follows we will call this group of contestants for whom incentives are still at work, the "threshold group". Applying the argument by GIBBS (2001) rendered above, incentives for this particular threshold group will be highest if there are exactly 4 remaining prizes for the threshold group of 8 (=1:2) after the "stars" have been served, meaning that there would be 9 winning positions in this contest. The "locally optimal" winner-contestant ratio in this example would be 0.45 (=9:20). A lower or a higher number of winners (ranging from only 5 to a maximum of 13 winners all in all) will reduce incentives for the threshold group – with no incentives provided at the extreme positions. While for a given threshold group, incentives are highest when the number of prizes "reserved" for this group is half the contestants in the particular sub-group, the critical question from the organizational perspective will be which sub-group of contestants to put at the threshold. Generally, the answer to this question will depend on (1) the number of contestants in the sub-groups and (2) the degree to which the contestants in the sub-groups will increase their effort levels when they are put at the threshold. The latter will be a function of individual effort-cost functions. While the intermediate contestants in our numerical example represent the largest sub-group in the contest, it may still not be the optimal threshold group as the degree to which the individual members of this group will increase their effort levels as a result of being put at the threshold may be too low to be compensated by the larger number of contestants as compared to putting the "stars" at the threshold. Hence, unlike it is the case in symmetric tournaments no clear implications on the effort-maximizing ratio of overall winners to overall contestants in an asymmetric tournament can be derived. Moreover, it will depend on the particular ability distribution in the contest and could e.g. be 0.2 as well as 0.7.

Figure 1: Contestant heterogeneity and number of prizes



Solving heterogeneity problems

Since in reality, organizations will generally be confronted with heterogeneous employees, it will pay to find ways to completely avoid the distorting effects of contestant heterogeneity. While optimizing the ratio of prizes to contestants will only allow to induce incentives for a sub-group of contestants, creating fully homogeneous groups will instead induce incentives for all contestants. To this end, the literature has basically proposed two measures: splitting leagues and handicapping (see already LAZEAR/ROSEN 1981). However, there is hardly any literature on how these measures work in real organizations. Theoretically, league splitting aims at grouping employees of equal ability in separate tournaments (i.e. symmetric tournaments are created by separating heterogeneous contestants), whereas handicapping implies that high ability and low-ability contestants remain in one contest, but that high-ability employees are systematically disadvantaged by the tournament sponsor, i.e. by the firm.

In a two-person-contest, this disadvantage may take the following simple form:[11] When awarding the tournament prize, a handicap h ($h > 0$) is subtracted from the output of the more able employee, such that employee j receives the prize if and only if: $q_j - h > q_k$. The reaction function of employee j then becomes:

$$c_j'(e_j^*) = f'(q_j) + g(e_j^* - h - e_k) \cdot t \tag{9}$$

Analogously, the reaction function of employee k is given by:

$$c_k'(e_k^*) = f'(q_k) + g(e_k^* - e_j + h) \cdot t \tag{10}$$

Again, because of the symmetry of $g(\cdot)$ and assuming $f'(q_j) = f'(q_k)$, in a NASH equilibrium the right hand side of equation (9) is equivalent to the right hand side of equation (10). With $c_j'(e) < c_k'(e)$ for all effort levels $e \neq 0$, employee j will hence still choose a *higher* effort level than employee k. Compared to the situation in a symmetric tournament, effort levels displayed by the two contestants in an uneven tournament with handicapping will be *lower* than in the symmetric tournament – except for the case where $h = e_j^* - e_k^*$, i.e. where the handicap exactly offsets the difference in effort levels (the "full handicap" as termed by LAZEAR/ROSEN 1981: 868). Compared to the situation in an uneven tournament without handicapping, however, for any given level $0 < h < 2 \cdot (e_j^* - e_k^*)$, effort levels in an uneven tournament with handicapping will be higher than those in an uneven tournament without handicapping. Consequently, in real life sales contests with typically heterogeneous employees we would expect to observe attempts of handicapping by firms where the more able contestants are systematically disadvantaged.

Besides the obvious examples from sports, to the best of our knowledge there is no empirical evidence on firms using handicapping (or splitting leagues) as a means to re-install incentives in asymmetric tournaments. In what follows, we will present empirical evidence on both. As far as league splitting is concerned, in our case study we find evidence for successful league-building as well as for unsuccessful league-building, giving us the opportunity to compare the incentive effects of tournaments among heterogeneous contestants and tournaments among homogeneous contestants. Concerning handicapping, we present case study evidence, where the firm under consideration does not only successfully re-install incentives in an uneven tournament, but it does at the same time apply a mechanism to disclose information on the (*a priori* unknown) ability levels of employees. Before we proceed, we summarize our theoretical implications that present the basis for our empirical analysis.

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11 The handicapping mechanism chosen by the case study firm is actually more complicated. It will by commented on in more detail in section 4.

Hypotheses for the empirical analysis

(H1) *In a sales contest with heterogeneous contestants, incentives will be reduced on average as compared to a sales contest with homogeneous contestants.*

(H2) *In a sales contest with heterogeneous contestants, incentives may be kept intact for a "threshold group".*

(H3) *In order for organizations to successfully apply tournament incentives in practice, firms need a reliable mechanism to disclose (privately held) information on ability levels of employees in order to set proper incentives. If such a mechanism is not applied, output levels will generally be lower.*

(H4): *While in a sales contest with homogeneous contestants, effort levels will be highest if the ratio of winners to contestants is 1:2, in a sales contest with heterogeneous contestants the effort-maximizing ratio of winners to contestants will depend on the ability distribution among contestants.*

(H5): *Concerning incentive travel contest the absolute cash value of the travel incentive may not play a role for the provision of incentives as long as it is perceived to be sufficiently luxurious. The cash value of a travel incentive may be changed without any effect on effort.*

3. METHOD AND DATA

Sample

Our sample consists of two sales contests of a medium size insurance company in Germany. The insurance company in the sample (in what follows "**u**nderwriting **i**nsurance **c**ompany" – UIC) does not employ its own front desk sales force but uses the front desk sales people of other insurance companies as their agents. We have data for one of these **p**artner **i**nsurance **c**ompanies, which we call PIC in the following. This particular organizational form of the distribution system induces an incentive problem since the front desk sales people of the PIC are not integrated in the UIC organization, so they are socialized and selected according to another company's needs, and they are not on the UIC payroll. They only receive a minor sales commission for selling the UIC products. To make things even worse, the PIC front desk sales people do not only sell UIC products but other underwriters' products as well. Hence, it is crucial for UIC to have an effective incentive system to motivate the PIC front desk sales people to sell their product. Since UIC does not have a direct access to the PIC front desk sales people, it approaches the supervisors at PIC and attempts to motivate these to set the right incentives for their subordinates. Additionally, UIC itself employs a number of sales directors whose task it is to motivate the PIC supervisors and to keep them informed about the insurance products (see figure 2 for an overview of the structure of the workforce). In this situation, UIC uses two types of sales contests as an incentive device: Firstly, it organizes a sales contest with travel incentives for the PIC supervisors (PIC Supervisor-Incentive), and secondly, it employs a travel incentive sales contest for the UIC sales directors (UIC Sales Director-Incentive).

Figure 2: The structure of the workforce at UIC and PIC

Partner Insurance Company (PIC)			**Underwriting Insurance Company (UIC)**
Hierarchical Relation in PIC and Market Relation with UIC		*Incentive Link*	*Market Relation with UIC*
Front Desk Sales Person	**Supervisor**		**Sales Director**
♟♟♟♟♟	Supervisor 1	}	Sales Director 1
♟♟♟♟	Supervisor 2		
♟♟♟♟♟♟♟	Supervisor 3		
♟♟♟♟♟♟	Supervisor 4	}	Sales Director 2
♟♟♟♟	Supervisor 5		
♟♟♟♟♟♟	Supervisor 6	}	Sales Director 3
♟♟♟♟♟	Supervisor 7		
♟♟♟♟	Supervisor 8		
…	Supervisor 9		
…	Supervisor …		Sales Director …

Structure of Data and Measures

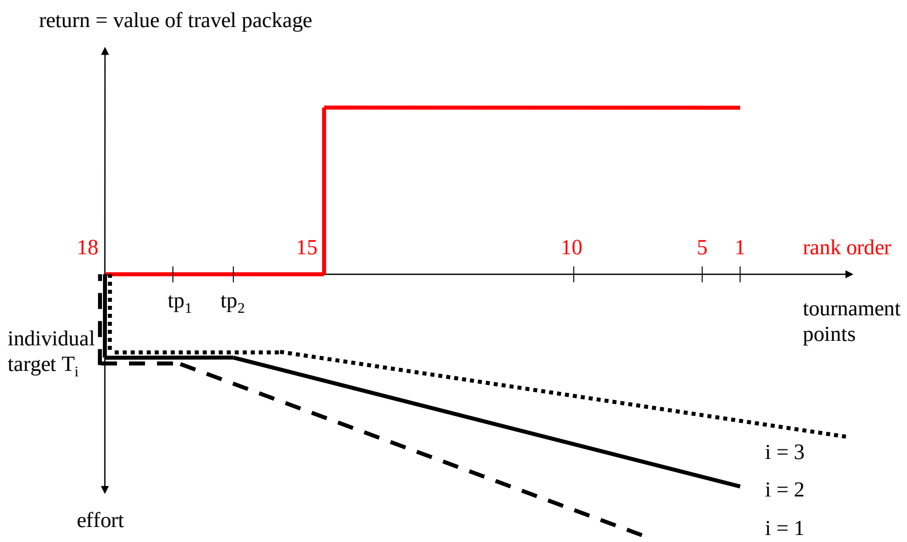
In our study we have access to the full personnel records including output and pay for all sales directors taking part in the UIC Sales Director-Incentive from 1996-2003. Further, we have access to the output data for all supervisors taking part in the PIC Supervisor-Incentive from 2001-2004. Thus we have a panel of 8 years for the UIC data and a panel of 4 years for PIC data. Being administrative in nature, our data always cover the full population (which only slightly varies over the years) of supervisors and directors and we are not confronted with a sample selection or non-response bias. For both sales contests we also have detailed information on the structure of the tournament, i.e. on the number of winners and contestants, the value of the prizes, the measures used to rank the contestants and the total value of sales of each of the supervisors' and sales directors' front desk sales force. Both, the UIC and the PIC contests are launched with a kick-off event at the end of the preceding year rendering all the relevant information to the contestants, e.g. where the trip is going to, what the hotel looks like, what the goodies will be, who will be participating, how many of winners will go on the trip and which criteria have to be met in order to be among the winners (supplemented with a detailed written description). This ensures that all contestants are informed about all the details of the respective tournament so that we do not have to worry about information shortages or asymmetries in general. The only figure, however, which is never disclosed to any of the contestants is the cash value of the travel incentive.

The UIC data set contains 85 sales directors with 435 observations. The PIC data set contains 65 supervisors with 352 observations. In both sales contests some of the characteristics have been repeatedly changed over the years, rendering our data set quasi-experimental and giving us the opportunity to study the effects of a number of crucial variables on the incentives provided in tournaments.

The UIC Sales Director-Incentive

In the UIC contest all sales directors receive an individual target at the beginning of each year. Depending on how well they meet their individual target they collect tournament points: If they do not meet their target, they do not receive any points; if they meet and surpass their individual target, they collect tournament points which translate into a rank order position which directly determines whether a contestant belongs to the losers with zero return or to the winners who earn the value of the travel package as a return (see figure 3). Since the company uses handicapping in this tournament, 100% target accomplishment is reached at different individual sales outputs as measured in Euros. Furthermore, depending on how high the individual sales target is, the marginal increase of additional points is varied (for more details see the section on information disclosure). In figure 3, we present the tournament point functions of three individuals i=1,2,3.

Figure 3: Individualized Targets and Marginal Returns to Effort in UIC Contest



The rank order in the UIC contest is directly derived from the tournament points, i.e. the more points a sales director collects relative to the other sales directors, the higher (s)he climbs in the rank order. In each year, the top 15 sales directors receive the travel incentive, i.e. these top 15 go on a luxurious tour and all receive the same tour package. All sales directors ranked below do not receive the travel incentive. With varying numbers of contestants, the ratio of winners to contestants ranges from 0.259 in 2000 to 0.319 in 1997. The cash value of the incentive trip (not known to participants) amounts to on average between 20% and 42% of yearly income. Table 1 summarizes the major tournament characteristics for the UIC contest.

Table 1: Major characteristics of UIC contest

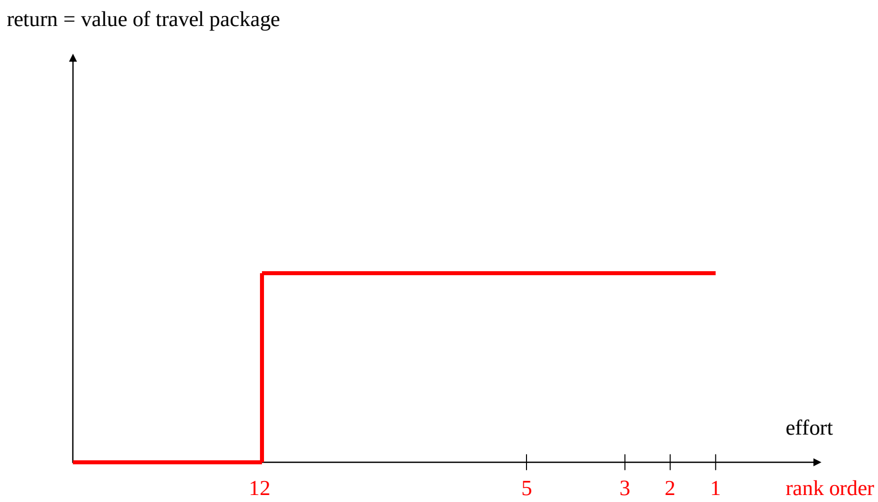
UIC Contest		
Year	**Winner-contestant-ratio**	**Cash value of the travel incentive per participant (in €)**
1996	0.268 =15 : 56	7'833
1997	0.319 =15 : 47	9'254
1998	0.278 =15 : 54	13'081
1999	0.283 =15 : 53	11'821
2000	0.259 =15 : 58	18'880
2001	0.254 =15 : 59	15'660
2002	0.259 =15 : 58	13'990
2003	0.300 =15 : 50	10'933

The PIC Supervisor-Incentive

In the PIC 2002-2004 contest, supervisors are ranked according to total annual sales (total insured sum of all new contracts) of their front desk sales people (see figure 4). Unlike it is the case in the UIC contest, in the PIC 2002-2004 contest there is no base target (neither individual nor collective) which has to be met before tournament points are awarded.

However, in the PIC 2001 contest, the 65 supervisors were split in 8 regional leagues where the top two in each league received the travel incentive. Supervisors ranked 3rd and lower received nothing. Unlike in the PIC 2002-2004 contests, individual ranking positions were awarded according to the individual target accomplishment (actual output compared with target output). In addition to the position in the regional league, target accomplishments were compared on a national level and supervisors were ranked accordingly. In this so called Joker part of the contest two more winners were determined according to their level of target accomplishment. So if someone did not make it in his own league because for example his league was too strong, he could still make it to the top two of the remaining supervisors in the national league (Joker) and win a prize.

Figure 4: Marginal Returns to Effort in the PIC Contest



The league system was abolished in 2002 and replaced by a national league only. Since then, the top 12 supervisors on the national level received the travel incentive, supervisors ranked 13 and lower received nothing. However, due to the special economic conditions in East Germany, an additional "East Germany-Joker" was introduced as a (negative) handicap to favour those confronted with the more challenging economic conditions: Among those not qualifying for the travel incentive the best two supervisors from East Germany were also awarded the travel incentive. In 2004, PIC carried out a major restructuring program and almost cut the number of supervisors in half during the year, which dramatically increased the chances of the remaining supervisors to win the contest who were now in charge of 1-3 additional regions. Depending on how many regions the remaining supervisors had to supervise, their individual (numerical) chances to win the contest (winner contestant ratio) now ranged from 57,6% to 96,8%. For more details and for an overview of the tournament structure in the PIC contest see table 2.

Econometric Method

Since the changes in UIC and PIC tournaments occurred gradually they provide an excellent opportunity for us to study the effects of changes in the crucial tournament variables for which we derived hypotheses in section 2 above. Because we are interested in identifying the effect of tournament characteristics we have to control for unobserved differences in individual ability, in sales talent or in social intelligence etc. to isolate the tournament effects. Fortunately, we have panel data so we are able to remove such unobserved heterogeneity by applying Fixed Effects (FE) estimations, i.e. we use OLS estimators based on time-demeaned individual variables. A Hausman test comparing fixed effects and random effects estimators also suggests to use fixed effects estimators. Before we present the FE estimation results we will present descriptive statistics which vividly demonstrate some effects we will see later on in the FE-coefficients and which allow us to go a little more into detail in the interpretation.

Table 2: Major characteristics of PIC contest

PIC Contest		
Year	**Winner-contestant-ratio***	**Cash value of the travel incentive per participant (in €)**
2001	League type 1: 0.357 League type 2: 0.329 League type 3: 0.307	8’656
2002	0.303 / 0.514 0.403 / 0.643	5’912
2003	0.313 / 0.527 0.411 / 0.653	5’910
2004	0.576 / 0.820 / 0.924 / 0.968 0.636 / 0.868 / 0.952 / 0.983	5’000

*: Higher winner-contestant-ratio for East German supervisors (2002-2004) and for supervisors with more than one region (2004).

4. RESULTS

The Effects of Contestant Heterogeneity on Incentives (*H1*, *H2*)

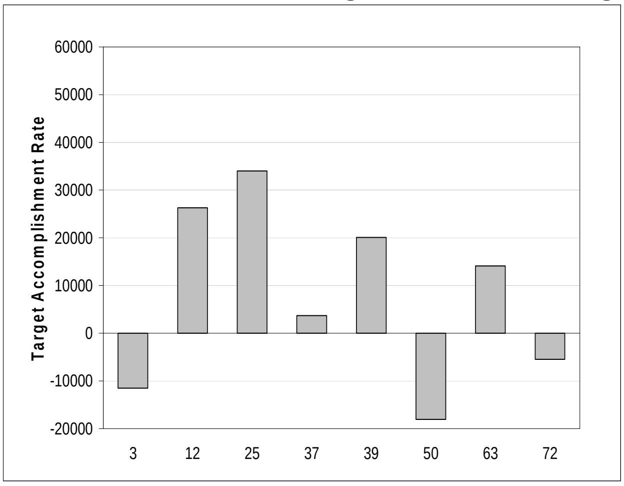
Regarding our hypotheses on the effect of contestant heterogeneity on effort levels in general (*H1*) and on the threshold group in particular (*H2*), we start with an illustrative example taken from the PIC contest in 2001 (see figure 5). While from 2002 to 2004, neither individual nor collective targets were set, in 2001, supervisors were given *individual targets*. As these targets typically vary among contestants, we see an active attempt of handicapping in the PIC contest 2001. Furthermore, the contestants were grouped in regional clusters, i.e. they were split up in separate leagues. In each region or league, only the two top contestants as measured by target over-accomplishment (actual sales output in 2001 as compared to individual target output) received the travel incentive, all other contestants had to stay at home. Hence, the PIC contest 2001 is characterized by a combination of the two measures proposed by theory when it comes to reducing contest heterogeneity: handicapping and league-building. As we will see, however, the created leagues of handicapped contestants in the PIC contest 2001 were hardly ever characterized by homogeneity – hinting at the fact that a reliable information disclosing mechanism concerning the ability levels of employees was not available in the PIC contest.

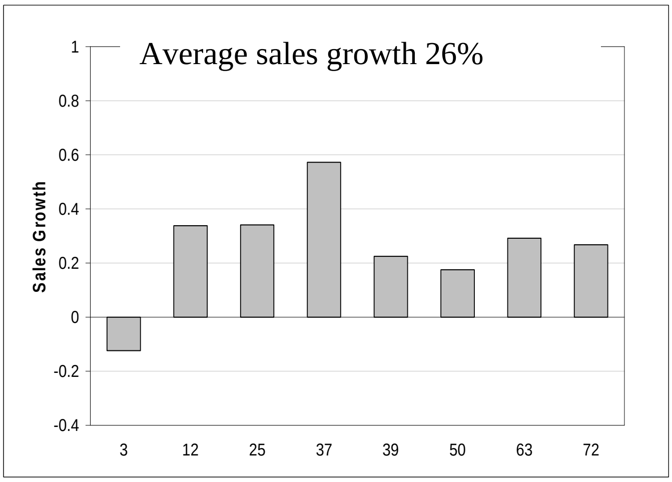
Figure 5: Heterogeneity of Regional Leagues (Panel 1) and Sales Increases (Panel 2)

Panel 1:
Target (over)accomplishment in € (2001)

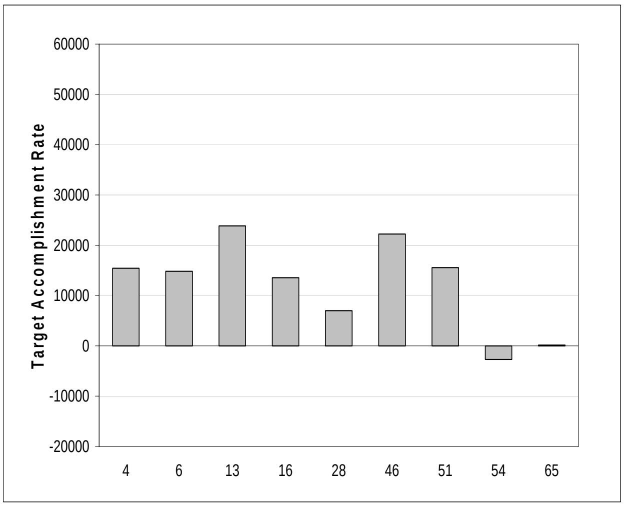
Panel 2:
Output Increase (Sales 2000 to 2001)

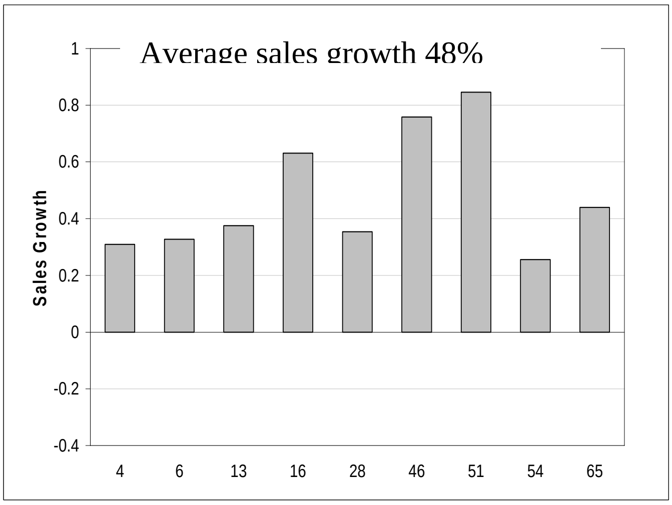
Region ONE: Heterogeneous League



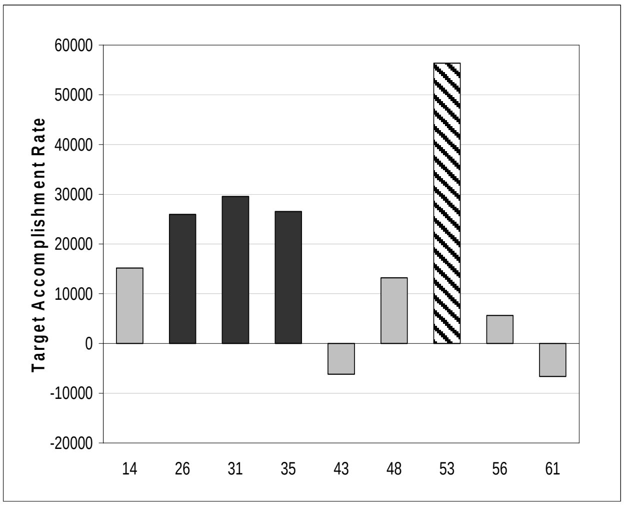


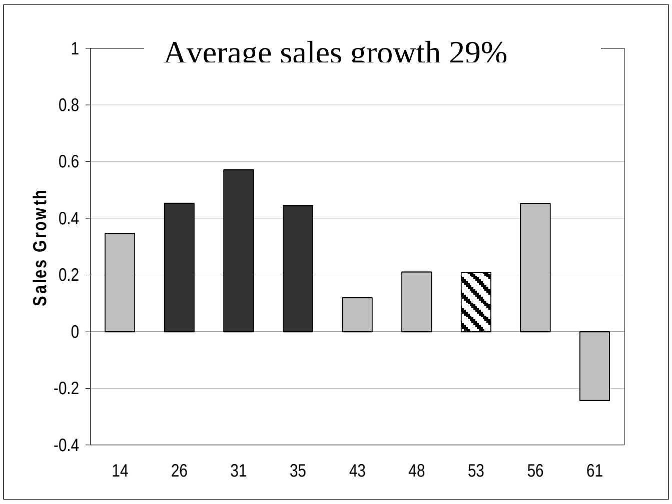
Region TWO: Homogeneous League





Region THREE: Star + Threshold Group





If we first take a look at the league built by region ONE, this league is characterized by considerable contestant heterogeneity with respect to accomplishing the target or not (at least as compared to the other two leagues): The degrees to which contestants in 2001 were able to outperform their individual sales targets varied distinctly (panel 1), i.e. contestants in that league were very heterogeneous with respect to their likelihood of being among the winners of the tournament by exerting additional effort. Correspondingly and as theoretically expected, individual sales increases from 2000 to 2001 (panel 2) were comparatively low (with on average 26%). Hence, neither league-building nor handicapping through individualized targets were successful in creating a homogeneous group of contestants for this league, and efforts were low as expected. The league built by region TWO, however, is characterized by comparative homogeneity (either *a priori* or created with the help of individual targets). As expected, we find indeed considerable output increases from 2000 to 2001, ranging between +25% and more than +80% and reaching 48% on average. Hence, the illustrative data hints at the validity of *H1* postulating on average lower incentive effects in tournaments with heterogeneous contestants.

As far as *H2* on the particular role of threshold groups is concerned, a closer look at region THREE hints at its plausibility: Supervisor #53 seems to be what may be called a “lonely star” (at least as measured by the over-accomplishment of his individual target) who can obviously not be beaten by the other contestants. At the same time supervisors #26, #31 and #35 are obviously almost equally strong with respect to outperforming their individual targets. According to our theoretical analysis we do not expect the “lonely star” #53 to exert too much effort to increase his output because he knows for sure that he will win one of the two winning positions. At the same time we expect the second best group with #26, #31, #35, the “threshold group”, to fight hard for the remaining winning position. The results in panel 2 clearly support this hypothesis: We see that the “lonely star”, contestant #53, only realized an output increase of +20%, whereas the contestants in the “threshold group”, #26, #31, #35, realized much higher output increases of more than +45%. We also see that those contestants whose position is obviously too bad to reach the second winning rank (#14, #43, #49, #56, #61), “the underdogs”, mostly realized much lower output increases.

While the evidence presented so far basically underlines the empirical validity of our conjectures (*H1* and *H2*), it is rather illustrative and descriptive in nature. In what follows, we supplement this illustrative evidence by statistically analyzing the effect of contestant heterogeneity on effort levels.

In a first step we have to find a way to measure the heterogeneity in a particular contest. If we think about the essence of the heterogeneity problem in tournaments, any heterogeneity measure should indicate whether winning (or losing) the tournament can be forecasted with certainty *a priori*, e.g. whether a “lonely star” knows he wins without doubt and whether an “underdog” knows he will definitely lose. In this situation, incentives will be totally destroyed. Hence, a good indicator for a situation where incentives are destroyed would be whether being among the winners of the tournament in one particular year is strongly (or in the extreme case fully) predictable by having been among the winners in the previous year. In this case contestants *a priori* know without any doubt if they will be among the winners or not. Hence, there is no need to exert *additional* effort to win the tournament because contestants know they either are not really challenged by another candidate or are without any chance. If we think about a soccer or basketball tournament for a moment the argument becomes quite obvious. When is it that winning a match without doubt can be forecasted by past results? Only if contestants are way too heterogeneous. If on the other side a league is very homogeneous, it is almost impossible to predict the winning team by past results. Thus we use the predictability of winning in one year by the wins in previous years to identify whether the UIC and PIC contests are more or less heterogeneous. In a next step we use these results to conclude in which league we would expect lower or higher effort levels. Table 3 provides the respective results for the PIC contest and table 4 for the UIC contest.

Table 3: Winnings regressed on past winnings: PIC contest

Dependent Variable: Dummy Variable Winning in period t	**2002**		**2003**		**2004**	
	Probit coeff. MFX	(p-value)	Probit Coeff. MFX	(p-value)	Probit Coeff. MFX	(p-value)
Dummy Variable Winning in t-1	1.0570*** 0.3815***	(0.003)	1.6086*** 0.5460***	(0.000)	0.7001** 0.2417**	(0.028)
Dummy Variable: East-Germany	-0.6303 -0.1809	(0.190)	-0.1204 -0.0374	(0.794)	0.5149 0.1866	(0.172)
Constant	-0.7569***	(0.000)	-1.1626***	(0.000)	-0.9548***	(0.000)
Observations		75		75		75
Chi2-Test (p-value) =		0.0000		0.0000		0.0488
Log Likelihood =		-39.70		-33.75		-33.75
Pseudo R2 =		0.1253		0.2564		0.0702

Table 3 clearly shows that being among the winners in the PIC tournament in one year correlates positively and statistically highly significantly with having been among the winners in the previous year. According to the marginal effects, the chances of being among the tournaments in 2002 are 38 percentage points higher if the contestant has been among the winners in 2001. In 2003, the effect is even larger: chances of being among the winners in 2003 are 55 percentage points higher for contestants who were among the winners in 2002. In 2004, chances to be among the winners are – due to the heavy restructuring activities in that particular year – a little less predictable. Hence, except for 2004 contestants in the PIC contest know their position well in advance. Exerting extra effort on average does not really pay. As a consequence most of the people never get the chance to win the tournament while some people always win, which is also confirmed by personal interviews stating that “everybody knows who will win because they are always the same”.

On the other side, if we look at the results of the UIC tournament in table 4 we clearly see that winning the UIC contest in one year is not correlated with winning the tournament in the previous year. Hence, in the UIC tournament contestants usually cannot tell who will win the tournament. Winning is not restricted to a small group of people but is highly likely for almost everybody. Accordingly, a large fraction of the population won at least once in one point of time. The image of homogeneity is again also confirmed by personal interviews showing that contestants themselves believe that "everybody has a fair chance to win".

Table 4: Winnings regressed on past winnings: UIC contest

Dependent Variable: Dummy Variable Winning in period t	Probit Coeff. MFX	(p-value)
Dummy Variable Winning in t-1	0.1651 0.0563	(0.255)
Constant	-0.6670***	(0.000)
Observations =	435	
chi2-Test (p-value) =	0.969	
Log Likelihood =	-255.10	
Pseudo R2 =	0.0043	

So, if we compare the UIC and PIC tournament with respect to heterogeneity, incentives should be much higher in the UIC tournament then in the PIC tournament. Hence, according to *H1*, outputs should be higher in the UIC than in the PIC tournament. Since we cannot directly compare absolute levels of sales of the two very different employee groups and contests, we have to find a different measure to compare effort levels. We argue that a good indicator for differences in effort are differences in sales growth: If UIC sales directors work comparatively harder over time and strongly motivate and control their sales force, their yearly sales should grow more than the yearly sales of the PIC sales people who are expected to exert lower effort levels. Since both, the UIC and the PIC contest refer to the same product and are hence confronted with the same overall market conditions and potential for growth, this measure would seem particularly adequate. At the same time, sales growth figures in the two contests are sufficiently independent and not necessarily highly correlated because UIC sales directors do not only supervise PIC sales people but also sales people from other partner companies and PIC sales people do not only sell products from UIC but also their own and other companies' products. Hence, differences in the sales trend should be a valid indicator of differences in effort. The respective figures are given in table 5.

We find that average annual growth of UIC sales is positive over the whole period and particularly high in the period 2001-2003 despite overall economic conditions having not been very favourable. On the other side, average annual growth of PIC sales in the period 2002-2004 was strongly negative, which indicates that incentives to sell UIC products were obviously much weaker in the PIC contest than in the UIC contest. Hence, we conclude in accordance with *H1*, that the heterogeneous PIC contest induces on average lower efforts than the homogeneous UIC contest.

Table 5: Sales Trend UIC and PIC

	UIC	PIC
Year	**Sales Trend 1996=100**	**Sales Trend 2002=100**
1996	100.00	
1997	97.12	
1998	107.29	
1999	96.35	
2000	100.92	
2001	105.35	
2002	104.67	100.00
2003	109.10	97.10
2004		90.26
Average annual trend	+1.30	-3.25

Our results provide strong evidence that the homogeneity of contestants is an important prerequisite for the efficiency of tournaments. The question, however, is how companies are able to secure the homogeneity of contestants in a world where – for various reasons – the productivity (potential) of employees is typically heterogeneous and where information on these potentials is asymmetrically distributed (with companies having no or only limited information on true productivity potentials of employees). This problem is hardly analyzed theoretically or empirically. In what follows, we investigate how UIC establishes homogeneity in its tournament and whether the mechanism applied represents an empirically plausible solution for the information asymmetry problem.

Mechanisms of Information Disclosure in the Organizational Practice (*H3*)

Concerning *H3*, UIC works with a handicap system that uses individualized targets in order to favour contestants with a lower *a priori* chance of being among the winners of the contest. UIC's general problem is where to set the individual targets: If targets are set too high, incentives are destroyed because employees know they will not be able to meet them. If, on the other hand, targets are set too low, incentives are also destroyed because employees know they will meet the targets anyway. Accordingly, only for a small range of an individual target, incentives are induced. The question is how to identify this range of targets, given that employees have better information about their true productivity potential.

Employees know their individual talents better, in the case of sales people they may also know their region and its productivity potential better or sometimes they may even know the potential of new products in their market better. Hence, the company has to find a way to reliably gather this information from the employees, knowing that the employees have an interest to make the true potential look lower in order to minimize their effort costs. Using past performance as an indicator for the productivity potential may look like an alternative, but it does not represent an efficient solution because it bears the typical ratchet effect problem (see e.g. GIBBONS 1997: 13): Employees who know that working harder today will only increase their target for tomorrow have an incentive to systematically withhold efforts to keep targets low. Hence, finding the right target is a major challenge in designing a system of handicaps for sales tournaments.

To solve this problem, UIC uses a built-in information disclosing mechanism which produces the information that is necessary for an efficient handicapping system as a by-product. It applies a clever combination of individual targets, individually fixed bonus payments for target accomplishment and variable bonus payments for target over-accomplishment with individually different marginal rates of return. A newcomer of whom is known the least and who has no work experience so far is confronted with a relatively low individual target which is comparatively easy to meet. Such an un-ambitious target is combined with a low fixed bonus for target accomplishment, and with a variable bonus component for surpassing the target with a high marginal rate of return for additional efforts to raise outputs above the target. This variable bonus component makes it attractive to go beyond just meeting the target in the actual time period. Over time, the target is adjusted upwardly according to the output realized in the previous period, but at the same time the fixed and the variable bonus component are also adjusted in order to avoid or substantially reduce the ratchet effect. The higher the individual target is set, the lower is the marginal return in the variable component and the higher is the fixed bonus component. As a result, it is not only attractive for newcomers to meet the target because this will earn them a fixed bonus payment, but it is – particularly at the beginning – also attractive to even surpass the target, because this earns them a high variable component. The incentive to exert more effort than necessary to just meet the target is present despite the fact that the company will use this information to raise the target in the following years, because with higher targets in the following years newcomers know this will earn them substantially higher fixed bonus payments for target accomplishment.[12] Therefore, employees have an incentive resulting from rewards in the current and in the following period to surpass the target as possible and thereby reveal information on their true productivity. This in turn

12 The information disclosing mechanism can only work if UIC manages credibly commit to stick to its policy of accompanying an increase in individual targets by an increase in the fixed bonus payment. The fact that real-life organizations may indeed be able to overcome problems of credible commitment in practice is demonstrated vividly in the well-known example of Lincoln Electric and its policy of sticking to the standards once set.

provides the information for UIC to set adequate individual targets taking individual talents, learning effects and regional specificities into consideration.[13] This conjecture is supported by a statistical analysis of individual sales growth over the years regressed on the variables used for the handicap system (table 6).

Table 6: Sales Growth regressed on individual handicap parameters (UIC)

Dependent Variable: **Sales Growth ($sales_t/sales_{t-1}$)**	FE-Coeff. Beta-Coeff.	(p-value)
Ambitiousness of target ($target_t/sales_{t-1}$)	1.0264*** 0.7586***	(0.000)
Amount of Fixed Bonus for target accomplishment	$-8.74*10^{-6}$*** -0.1063***	(0.069)
Variable Bonus (=Marginal Increase for Surpassing the Target)	$2.97*10^{-6}$*** 0.0961***	(0.101)
Constant	-0.0565***	(0.337)
Observations		402
Clusters (i)		80
F-Test (p-value) =		0.000
Adjusted R2 =		0.5759

As expected, we *firstly* find that a higher marginal rate of return as represented by the size of the variable bonus correlates significantly positive with individual sales growth, i.e. individuals go further beyond last year's sales if the marginal rate of return on surpassing the target is higher. *Secondly*, we find that a higher fixed bonus payment correlates negatively with individual sales growth, which is also as expected because a higher fixed bonus indicates a higher individual target level which is coming closer and closer to an individual's limit. *Thirdly*, we find that individual sales growth correlates positively and statistically significant with the ambitiousness of the individual target, where ambitiousness is measured as "sales target in t" divided by "realized sales in t-1". We see that even if targets are largely raised above past performance, individuals still do not withhold efforts but try to outperform their targets. All of these results support the view that UIC has indeed managed to install an efficient information disclosing mechanism hinting at the validity of *H3*.

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13 Hence, UIC uses a comparatively simple combination of target setting and bonus variations as an incentive system that incorporates an information disclosing mechanism providing the information necessary to create a successful handicapping system. Or as O'KEEFE/VISCUSI/ZECKHAUSER (1984: 51f.) put it, we indeed find evidence for "real-world actors …[being] immensely inventive in designing private contractual arrangements that produce satisfactory outcomes when the precise conditions for the principal theorems of welfare economics are not met."

The effect of the winner-contestant ratio (*H4*) and the cash value of the travel incentive (*H5*) on incentives provided in tournaments

Concerning our hypotheses on the incentive effects of the specific parameters of a tournament with homogeneous contestants vs. heterogeneous contestants (*H4*, *H5*), table 7 provides the fixed effects estimation results of effort as measured by individual sales growth regressed on prize spread and control variables for the UIC contest. Model 1 includes the WINNER-CONTESTANT-RATIO and control variables, in model 2 to 3 the rest of the explanatory variables are added. Since sales growth may depend on experience, we included SENIORITY and SENIORITY SQUARED as control variables. Since we know already that sales growth depends on individual targets we also include the individual target increase as a control variable. The WINNER-CONTESTANT-RATIO accounts for the effect of differences in the chance to win. Indeed, WINNER-CONTESTANT-RATIO and INDIVIDUAL TARGET INCREASE have a significant effect on sales growth.

Surprisingly, in relation to standard empirical results, SENIORITY does not have a significant effect on individual sales growth. However, if we take into account that the standard seniority effect is already reflected in the variable INDIVIDUAL TARGET INCREASE, this anomaly becomes easily explainable. In model 2, we add our explanatory variable CASH VALUE OF TRAVEL INCENTIVE. The coefficient is not significant, the results for the other variables remain stable. Hence, we conclude that the cash value of the travel incentive does not have an effect on individual sales growth – at least within the range of cash values used in the UIC contest. In model 3, we include further important incentive components that have been explained in the former section. These are the amount of BONUS POINTS collected if the target is met, the MARGINAL RETURNS (SALES POINTS) FOR OVER-ACCOMPLISHMENT and the NUMBER OF ADDITIONAL PERFORMANCE GOALS for which points can be collected (like selling newly introduced products or reducing cancellations). As expected, we find very strong effects for all of these incentive components, but the effect of the CASH VALUE OF THE INCENTIVE TRAVEL remains insignificant, and the rest of the variables remains stable. The same holds true if we use the level of sales as an alternative output indicator (see table A1 in the appendix). Hence, our empirical results support *H5*: A higher cash value of the travel incentive may not necessarily be associated with an increase in effort. As long as a sufficiently luxurious trip is announced, the cash value of the incentive tour may indeed not make a difference since it is never disclosed and almost impossible to detect. However, it seems reasonable to assume that if the cash value of the travel incentive falls below a certain luxury threshold, its size will matter. This is one of the major differences between cash prizes in tournaments and travel incentives: While organizations may not be able to monotonically increase effort by increasing the size of the prize, it may profit from the fact that incentives will not automatically be reduced when the value of the prize is reduced – giving the company a much higher discretion in adjusting the value of the prize according to its economic situation.

Table 7: Fixed Effect Regressions: Individual Sales Growth in UIC Contests

Dependent Variable: Individual Sales Growth						
Independent Variables	FE-Coeff. Beta-Coeff.	(p-value)	FE-Coeff. Beta-Coeff.	(p-value)	FE-Coeff. Beta-Coeff.	(p-value)
	Model 1		Model 2		Model 3	
INDIVIDUAL TARGET INCREASE	1.0671*** 0.8074***	(0.000)	1.0655** 0.8061**	(0.000)	1.0684*** 0.8083***	(0.000)
WINNER-CONTESTANT-RATIO	-1.3034** -0.1105**	(0.002)	-1.6244** -0.1377**	(0.003)	-1.2923 -0.1095	(0.099)
CASH VALUE OF TRAVEL INCENTIVE	No		$-2.44\ 10^{-7}$ -0.0487	(0.322)	$1.05\ 10^{-8}$ 0.0021	(0.979)
BONUS AMOUNT FOR 100%TARGET ACCOMPLISHMENT	No		No		$-2.0*10^{-5}$* -0.2203*	(0.014)
INCENTIVE INTENSITY ABOVE 100% TARGET	No		No		$4.44*10^{-6}$* 0.1392*	(0.038)
NUMBER OF MULTIPLE TASKS	No		No		-0.0385** -0.2166**	(0.023)
SENIORITY	0.0076	(0.310)	0.0096 0.3405	(0.205)	0.0278** 0.9918**	(0.017)
SENIORITY^2	-0.0001	(0.557)	-0.0001 -0.1608	(0.554)	-0.0002 -0.1859	(0.512)
CONSTANT	0.2005	(0.139)	0.3146*	(0.104)	0.1796	(0.457)
Observations		352		352		352
Clusters (i)		59		59		59
F-Test (p-value) =		0.000		0.000		0.000
Adjusted R2 =		0.5850		0.5636		0.2248

*: 5%-significance level, **: 1%-significance level, ***: 0,1%-significance level

On the other hand, we also clearly find that those variables which are fully disclosed to the contestants and which can be assumed to affect effort levels according to tournament theory do indeed have a strong effect on the output variable sales growth. WINNER-CONTESTANT-RATIO is one such variable. The numerical chance to win the tournament given by the WINNER-CONTESTANT-RATIO varies between 25,4% and 31,9% in the UIC contest. Within this range we find a significant and substantial negative effect of an increase in the ratio on effort: A 2% increase in the numerical chance to win (which is approximately equal to one standard deviation), for example, decreases sales growth by 2.6 percentage points in model 3. This is equal to a 10.440 € drop in individual sales, which is more than the per capita cash value spent on the incentive tour, so the magnitude is economically relevant. While the theoretical analysis for symmetric tournaments would have predicted a positive correlation between the WINNER-CONTESTANT-

RATIO and sales growth for WINNER-CONTESTANT-RATIOS below 0.5, this may – according to *H4* – not be the case for asymmetric tournaments. Apparently, the UIC tournament is – in spite of the many efforts to reduce the heterogeneity of contestants with the help of a truly intelligent handicapping system – still not completely symmetric in its structure, such that the effort-maximizing optimal WINNER-CONTESTANT-RATIO according to our theoretical considerations may well be below a ratio of 0.25 meaning that in this range an increase in the winners chance would still decrease efforts as indicated by our empirical results.

Table 8: Fixed Effect Regression: Individual Sales on WINNER-CONTESTANT-RATIO (PIC 2002-2004)

Dependent Variable: Individual Sales		
Independent Variables	FE-Coeff. Beta-Coeff.	(p-Value)
WINNER-CONTESTANT-RATIO	-75'560.06**	(0.001)
YEAR DUMMIES	Yes	
CONSTANT	96’734.35***	(0.000)
Observations		225
Clusters (i)		70
F-Test (p-value) =		0.000
Adjusted R2 =		0.0583

*: 5%-significance level, **: 1%-significance level, ***: 0,1%-significance level

An even stronger effect we find in the PIC contest (see table 8). If we simply regress sales on WINNER-CONTESTANT-RATIO and use YEAR DUMMIES to control for changes in overall economic conditions we find a very strong negative effect of the WINNER-CONTESTANT-RATIO on sales.[14] Increasing the numerical chance to win by one standard deviation (which is equal to 24 percentage points in this case) leads to a drop in individual sales of almost 60% of a standard deviation or 15.527 €, which is worth three times the cash value spent on an individual’s incentive tour. By comparing the strength of the standardized effects in the UIC and PIC contest it seems that an increase in the numerical chance to win at a very high level (50% and more) has an even stronger incentive-destroying effect than an increase at lower levels (around 25%). However, such a comparison may not be valid here, as the PIC contest is characterized by a significantly larger degree of heterogeneity than the UIC contest. The optimal WINNER-CONTESTANT-RATIO

14 Due to the structural changes in the contest from 2001 to 2002, we only use the years 2002-2004 for this analysis. Since there were large changes in the chances to win but not in the prize spread this period gives us a nice quasi-experimental setting to study the effect of the winner’s chance on output.

in both contests may hence be different. The results for the PIC contest, however, hint at the optimal WINNER-CONTESTANT-RATIO having been widely surpassed.

5. CONCLUSIONS

Although the theoretical literature on organizational reward systems points to the importance of heterogeneity in tournaments, very few is known on how the resulting problems are resolved in real world business organizations. One of the main problems which has not been tackled so far is that – unlike is assumed in most theoretical models – in real business organizations there are more than two contestants and they are usually not homogeneous by nature. We have analyzed these effects theoretically as well as empirically for the case of incentive travel contests. Even though we based our theoretical model on the LAZEAR/ROSEN-framework, our implications for the two-contestant-case go beyond the implications derived by LAZEAR and ROSEN: Taking into account that the typical wage scheme applied in incentive travel contests *combines* variable payments based on absolute performance with those based on relative performance, we are able to show that incentives will never be completely distorted even in the two-contestant-case with extreme heterogeneity. The observed combination of payments based on absolute performance with those based on relative performance in the organizational practice may well be the result of an attempt to combine the advantages of both types of remuneration and to level out the adverse effects of each of the two incentives mechanisms, which has not been discussed in the literature so far. Furthermore, concerning the specificities of incentive travel contests as opposed to contests for cash payments or merchandise, we further derive – for the two-contestant-case as well as for the case of more than two contestants – that the cash value of the incentive travel may indeed be varied without having an effect on the effort levels displayed by contestants – at least within a reasonable range of cash values where the organization succeeds in convincing its employees that the travel incentive is sufficiently exclusive. That this range may in fact be considerable is highlighted by the empirical data: Even though the cash value of the travel incentive (which is never disclosed to the contestants) varies from 7,833€ per participant in 1996 to 18,880€ in 2000 and back to 10,933€ in 2003 in one of the studied contests, there is no significant effect to be observed on the effort levels displayed by contestants. This in turn may make travel incentives – and other non-monetary incentives – so attractive in that it provides organizations with the necessary discretion to vary the cash value of travel incentives according to changes in the economic conditions.

For a tournament with more than two contestants we show that as long as there is at least one sub-group of homogeneous contestants and as long as one of these sub-groups is put “at the threshold” (i.e. there is competition among its members for one or more of the winning positions), tournament incentives will not be completely distorted. For the “threshold group” incentives are fully intact. Empirically, we are indeed able to show that while average effort levels are lower in tournaments with heterogeneous as compared to tournaments with homogeneous contestants, among the members of the threshold-group efforts levels are very high. Furthermore, we are able to show that in an asymmetric tournament with more than two contestants there are no clear implications on the effort maximizing ratio of winning positions to contestants. Unlike it is the case in symmetric tournaments, in asymmetric tournaments even for values below the critical value of 0.5 as identified by GIBBS (2001: 14) an increase in the ratio of winning positions to contestants may reduce incentives – which is exactly what we observe in the data.

In light of the problems associated with contestant heterogeneity, it would come as no surprise if organizations would strive for a systematic reduction of heterogeneity among contestants by splitting leagues or active handicapping. We are the first to actually present empirical evidence on these mechanisms being actually used in the organizational practice. Furthermore, we are able to show *how* organizations manage to design efficient handicapping systems by installing an intelligent information disclosing mechanism allowing them to systematically detect the ability potential of an employee. In one of the contests designed in our case study firm, the UIC contest, we indeed observe such an intelligent information disclosing mechanism where individual targets, individual fixed bonus payments for target accomplishment and individual variable bonus payments for target over-accomplishment are effectively combined. As a result, contestant heterogeneity is significantly reduced in the UIC contest such that almost every contestant has a fair chance of obtaining one of the winning positions, and consequently the growth of sales over the years hints at incentives being vastly intact. This becomes especially obvious when compared to the PIC contest 2001 where both, handicapping and league-building have not been successfully implemented. Unlike it is the case in the UIC contest, in the PIC contest contestant heterogeneity is considerable such that it is basically always the same group of contestants that wins the travel incentive. As a result, growth rates of sales over the years are even negative for participants in the PIC contest – even though sales in both contests actually refer to the same product.

While the empirical evidence on incentive travel contests is highly consistent with the implications derived from our theoretical tournament model, our implications for the organizational practice are equally clear-cut: When designing tournament incentives, organizations should be aware of problems of contestant heterogeneity and should strive to reduce this heterogeneity by splitting leagues and/or handicapping. Both can only be successfully implemented if they are backed up by an intelligent information disclosing mechanism. *That* and *how* such a system may work is impressively demonstrated in the UIC contest designed by our case study firm. If contestant heterogeneity cannot be reduced any further (at least not at a reasonable price), organizations should instead concentrate on a careful design of the ratio of winning positions to contestants. As the effort-maximizing ratio of winning positions to contestants is a function of the ability distribution of contestants, the ratio may have to be constantly revised in response to organizational re-structuring and even in response to changes in the composition of the work-force – rendering the design of efficient tournament structures in the organizational practice a truly non-trivial problem.

Bibliography

Abrevaya, J.
2002 "Ladder tournaments and underdogs: lessons from professional bowling." Journal of Economic Behavior and Organization, 47: 87-101.

Becker, B. E., and M. A. Huselid
1992 "The Incentive Effects of Tournament Compensation Systems." Administrative Science Quarterly, 37: 336-350.

Bognanno, M. L.
2001 "Corporate Tournaments." Journal of Labor Economics, 19: 290-315.

Bull, C., Schotter, A., and K. Weigelt
1987 "Tournaments and Piece Rates: An Experimental Study." The Journal of Political Economy, 95: 1-33.

Caballero, M. J.
1988 "A Comparative Study of Incentives in a Front desk sales force Contest." Journal of Personal Selling & Sales Management, 8: 55-58.

Center for Concept Development
2000 "A Study of the Incentive Merchandise and Travel Marketplace." Princeton, NY.

Conyon, M. J., and G. V. Sadler
2001 "Executive pay, tournaments and corporate performance in UK firms." International Journal of Management Reviews, 3: 141-168.

Ehrenberg, R. G., and M. L. Bognanno
1990 "Do Tournaments Have Incentive Effects?" The Journal of Political Economy, 98: 1307-1324.

Eriksson, T.
1999 "Executive Compensation and Tournament Theory: Empirical Tests on Danish Data." Journal of Labor Economics, 17: 262-281.

Frick, B., Prinz, J., and K. Winkelmann
2003 "Pay inequalities and team performance. Empirical evidence from the North American major leagues." International Journal of Manpower, 24: 472-488.

Gibbs, M.
2001 "Promotions and Incentives." Chicago: mimeo.

Gibbons, R.
1997 "Incentives and careers in organizations." Kreps, D., and K. Wallis (eds.): Advances in economics and econometrics: theory and applications. Cambridge University Press: 1-37.

Hampton, A.
1987 “The UK Incentive Travel Market: A User's View.” European Journal of Marketing, 21: 10-20.

Harbring, C.
2004 “Experimental studies on Incentives in Organizations” dissertation.de

Harbring, C., and B. Irlenbusch
2003 “An experimental study on tournament design.” Labour Economics, 10: 443-464.
2005 “How Many Winners Are Good to Have? On Tournaments with Sabotage.” Institute for the Study of Labor, IZA DP No. 1777.

Harbring, C., Irlenbusch, B., and M. Kräkel
2004 “Ökonomische Analyse der Professorenbesoldungsreform in Deutschland.” In Franz, W., Ramser, H. J. und M. Stadler (Hrsg.): Bildung. Wirtschaftswissenschaftliches Seminar Ottobeuren, Band 33.

Hastings, B., Kiely, J., and T. Watkins
1988 “Front desk sales force Motivation Using Travel Incentives: Some Empirical Evidence.” Journal of Personal Selling & Sales Management, 8: 43-50.

Jost, P.-J., and M. Kräkel
2006 “Simultaneous- versus Sequential-Move Tournaments with Heterogeneous Agents.” Schmalenbach Business Review, 58: 306 - 331.

Kirstges, T.
2000 “Incentive-Reisen in Deutschland. Eine empirische Untersuchung. Teil 1.” Tourismus Jahrbuch, 4: 16-18.

Kräkel, M., and D. Sliwka
2004 “Risk Taking in Asymmetric Tournaments.” German Economic Review, 5: 103-116.

Lallemand, T., Plasman, R., and F. Rycx
2005 “Women and Competition in Elimination Tournaments: Evidence from Professional Tennis Data.” Institute for the Study of Labor, IZA DP No. 1843.

Lambert R. A., Larcker D. F., and K. Weigelt
1993 “The Structure of Organizational Incentives.” Administrative Science Quarterly, 38: 438-461.

Lazear, E. P., and S. Rosen
1981 “Rank-Order Tournaments as Optimum Labor Contracts.” Journal of Political Economy, 89: 841-864.

Leegomonchai, P., and T. Vukina
2005 “Dynamic Incentives and Agent Discrimination in Broiler Production Tournaments.” Journal of Economics & Management Strategy, 14: 849-877.

Lynch, J. G.
2005 “The effort effects of prizes in the second half of tournaments.” Journal of Economic Behavior & Organization, 57: 115-129.

Main, B. G. M., O'Reilly, C. A., and J. Wade
1993 “Top Executive Pay: Tournament or Teamwork?” Journal of Labor Economics, 11: 606-628.

McLaughlin, K. J.
1988 "Aspects of Tournament Models: A Survey." Research in Labor Economics, 9: 225-256.

Murphy, W. H., and R. S. Sohi
1995 "Salespersons' perceptions about sales contests. Towards a greater understanding." European Journal of Marketing, 29: 42-66.

Murphy, W. H., and P. A. Dacin
1998 "Sales Contests: A Research Agenda." Journal of Personal Selling & Sales Management, 18: 1-16.

O'Keeffe, M., Viscusi, W. K., and R. Jr. Zeckhauser
1984 "Economic Contests: Comparative Reward Schemes." Journal of Labor Economics, 2: 27-56.

O'Reilly, C. A., Main, B. G. M., and G. F. Chrystal
1988 "CEO Compensation as Tournament and Social Comparison: A Tale of Two Theories." Administrative Science Quarterly, 33: 257-274.

Rosen, S.
1986 "Prizes and Incentives in Elimination Tournaments." The American Economic Review, 76: 701-715.

Schotter A., and K. Weigelt
1992 "Asymmetric Tournaments, Equal Opportunity Laws, and Affirmative Action: Some Experimental Results." Quarterly Journal of Economics, 107: 511-539.

Shinew, K. J., and S. J. Bachman
1995 "Incentive travel: an attractive option." Tourism Management, 16: 285-293.

Sunde, U.
2003 "Executive pay, tournaments and corporate performance in UK firms." International Journal of Management Reviews, 3: 141-168.

Taylor, B. A., and J. G. Trogdon
2002 "Losing to Win: Tournament Incentives in the National Basketball Association." Journal of Labor Economics, 20: 23–41.

Appendix:

Table A1: Fixed Effects Regressions of Sales on OIC Tournament Characteristics

Dependent Variable: Individual Sales						
Independent Variables	FE-Coeff. Beta-Coeff.	(p-value)	FE-Coeff. Beta-Coeff.	(p-value)	FE-Coeff. Beta-Coeff.	(p-value)
	Model 1		Model 2		Model 3	
INDIVIDUAL TARGET SALES	0.8049*** 0.7516***	(0.000)	0.7954*** 0.7427***	(0.000)	0.7914*** 0.7389***	(0.000)
SALES PREVIOUS YEAR	-0.1411** -0.1369**	(0.005)	-0.1394** -0.1353**	(0.006)	-0.1352* -0.1312*	(0.006)
WINNER'S CHANCE	-213'461.50* -0.0665*	(0.023)	-367'672.40** -0.1145**	(0.003)	- 522'041.50*** -0.1626***	(0.001)
PRIZE SPREAD	No		-0.1199* -0.0880*	(0.020)	-0.1661** -0.1219**	(0.003)
NUMBER OF MULTIPLE TASKS	No		No		-5'497.88 -0.1137	(0.100)
SENIORITY	7'154.81*** 0.9369***	(0.001)	8'250.26*** 1.0804***	(0.000)	11'073.64*** 1.4501***	(0.000)
SENIORITY^2	-153.21** 0.6688**	(0.013)	-156.80 ** -0.6845**	(0.010)	-154.07** -0.6726**	(0.010)
YEAR DUMMIES	No		No		No	
CONSTANT	88'244.16**	(0.004)	143'661.7***	(0.001)	185'685.70***	(0.000)
Observations		352		352		352
Clusters (i)		59		59		59
F-Test (p-value) =		0.000		0.000		0.000
Adjusted R2 =		0.5629		0.4809		0.2636

*: 5%-significance level, **: 1%-significance level, ***: 0,1%-significance level