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*Department of Economics*

# Incentives in Business and Academia

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## INCENTIVES IN BUSINESS AND ACADEMIA

BERTIL HOLMLUND

# Incentives in Business and Academia\*

by

Bertil Holmlund<sup>♦</sup>

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## Abstract

This paper discusses some issues of compensation policy in business and academia from the perspectives of incentive theory, other theories, and empirical research. The main conclusion is that mechanical rules for performance-related pay are likely to be inferior to more subjective performance evaluation criteria. Formalized performance pay, where pay is directly linked to measures of output, can easily have dysfunctional effects, especially when some dimensions of performance are easier to observe than others. Subjective performance evaluation is not perfect, but it is probably the best method to obtain a holistic assessment of multidimensional performance indicators.

Keywords: compensation policy, performance-based pay, incentive theory.

JEL-codes: J30, J33.

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## INCENTIVES IN BUSINESS AND ACADEMIA

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## **Introduction**

Over the past couple of decades, Swedish pay setting systems have changed substantially. The general trend has been to allow for more local flexibility. The changes have probably been most dramatic in the public sector where a rigid pay system based on age, seniority, and occupation has been replaced by a system that, at least in principle, makes room for substantial flexibility tied to individual performance and the need to recruit, retain, and motivate employees. This development has also affected universities, where employees can be paid very different salaries for the same position and educational background.

The principal case for the introduction of a more individualized pay setting is presumably that it will elicit better performance from employees. But individualized pay setting can appear in many guises, and it raises difficult questions concerning the design of an optimal compensation system. This paper discusses some of these issues from the perspectives of incentive theory, other theories, and empirical research. My main conclusion is that mechanical rules for performance-related pay are likely to be inferior to more subjective performance evaluation criteria. Formalized performance pay, where pay is directly linked to measures of output, can easily have dysfunctional effects, especially when some dimensions of performance are easier to observe than others. Subjective performance evaluation is not perfect, but it is probably the best method to obtain a holistic assessment of multidimensional performance indicators.

I briefly review some prominent themes in incentive theory before discussing its relevance for academia. The literature on incentives in organizations is extensive, and my review is highly parsimonious.<sup>1</sup> Some notable features of academia, for example the institution of tenure, are not discussed.

## **Incentives and insurance**

Incentive theory has been a major research area in economics over the past couple of decades. The literature has typically been concerned with the design of compensation systems in organizations where informational problems are pervasive. The classical model is concerned with the tradeoff between incentives and insurance.

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<sup>1</sup> Overviews include Gibbons (1999), Gibbons and Waldman (1999), Lazear (1995), Lazear and Oyer (2007), and Prendergast (1999).

Consider a principal-agent model where the principal is a firm and the agent is a worker. Alternatively, the principal is a shareholder, and the agent is a CEO. Output depends on the worker's effort as well as random events outside his control. The worker dislikes work effort and is risk averse. The principal cannot observe effort, but output is observable by both parties. The worker is offered a contract where compensation is linked to output. Suppose that the compensation scheme is linear, where total compensation involves a fixed base salary and a bonus that depends on output. The worker chooses effort to maximize utility, taking the parameters of the compensation scheme as given. This optimization yields effort as an increasing function of the magnitude of the bonus.

The firm maximizes profits by choosing the base salary and the bonus, recognizing how the worker responds to these parameters, and recognizing the need to provide the worker with a utility level such that the worker is willing to participate in the firm. The outcome of this game is an optimal compensation scheme where the bonus depends on the agent's risk aversion and the volatility of output. The higher the degree of risk aversion and the higher the volatility, the lower the bonus becomes. Increased risk aversion increases the importance of the base salary.

These results illustrate the tradeoff between insurance and incentives in the optimal compensation scheme. Risk-averse agents want some insurance against unfavorable outcomes beyond their control, and the optimal contract provides insurance by including a base salary that is independent of outcomes. When uncertainty becomes extremely large, the bonus approaches zero.

The compensation system also has implications for how workers are matched to firms. A higher bonus is most attractive for more productive workers because they are the most capable in reaping the benefits of pay for performance schemes. Firms have obvious incentives to take this selection effect into account when designing the optimal contract.

Empirical work has documented reasonably strong support for the hypothesis that incentive pay matters for effort and worker selection. A well-known study is Lazear (2000), which uses data on a firm that installs auto windshields and switched from an hourly wage scheme to a piece rate per windshield installed. The piece rate system is found to have increased productivity in the firm by about 44 percent. Approximately one-half of this increase was a "pure" productivity effect for workers who worked in the firm under both pay schemes. The

rest of the increase was from worker selection as less productive workers left the firm and were replaced by more productive ones.

Is there any empirical evidence of a tradeoff between insurance and incentives such that more high-powered incentives are more likely to appear in less volatile environments? The support favoring this hypothesis is, in fact, rather meager. In general, studies using data on executives, sharecroppers, and franchisees provide no clear results on the prevalence of pay for performance schemes in risky environments (Prendergast 2002). These observations, among others, have initiated a rich body of research on compensation systems in realistic and complex environments. An interesting and empirically relevant case is where a job involves several distinct activities.

## **Multitasking**

If a job involves several activities, agents presumably choose to allocate efforts according to how the remuneration scheme treats these activities. One activity may be subject to performance related pay because output is easy to measure. Output from another activity may be hard to measure and therefore not suited to performance pay. For example, quantity may typically be more easily measured than quality. In this situation, the agent can “game” the compensation system and allocate excessive effort on the activity where output is measurable. The possibility for such dysfunctional responses to bonus schemes requires more complicated compensation rules. If task A is more easily observed than task B, the principal will find it optimal to weaken incentives associated with task A in order to prevent overinvestment in this task.<sup>2</sup>

The empirical literature has documented evidence of the functioning of compensation systems in situations with multitasking. An example is the paper by Brickley and Zimmerman (2001), which examines how teaching and research are affected by changed incentives introduced in the early 1990s in a top-tier U.S. business school. The change aimed at improving teaching, and a number of steps were taken to enforce this new priority. Teaching quality was assessed by student surveys and various other means, including evaluation teams. The increased emphasis on teaching was communicated to faculty at all levels. However, no mechanical rules for how salaries would be linked to performance were applied. The study finds a

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<sup>2</sup> Holmström and Milgrom (1991) is a seminal paper on multitasking.



substantial and almost immediate increase in teaching ratings following the change in compensation policy. There is also evidence of a decrease in research output. All in all, the results are broadly consistent with agency theory in a multitask environment.

Fehr and Schmidt (2004) report experimental evidence on incentive problems in a principal-agent model with multitasking. There are two tasks, and only the first is contractible (i.e., perfectly observable and verifiable in court). Information on the second task is “soft” and cannot be verified in court. The principal can offer two types of contracts, which the authors refer to as a “piece rate contract” and a “bonus contract”, respectively. The piece rate contract pays a fixed base wage and a piece rate for each unit of effort spent on the first task. The bonus contract involves a fixed wage, but the principal also announces that she might offer a bonus if performance is satisfactory. This bonus is voluntary and based on a subjective performance evaluation, and it cannot be enforced. Fehr and Schmidt find that bonus contracts strongly outperform piece rate contracts. Under piece rates, agents allocate the most effort to the first task and disregard the second. Principals understand this, and thus, most prefer to offer a bonus contract.

## **Relative compensation**

In some contexts, it is easier to measure relative performance than absolute performance. Output may be noisy, and effort may be unobservable, but measuring how one agent’s output compares to another agent’s output may nevertheless be possible. The theory of tournaments, as developed by Lazear and Rosen (1981), among others, deals with this case. The theory views pay setting as the outcome of a contest between agents who compete for fixed “prizes”, i.e., salaries associated with winning the contest. Promotions in an internal labor market can be analyzed using tournament theory.

A key feature of the theory is that levels of compensation (the prizes) are set in advance and independent of an agent’s effort. For example, there could be one salary level for the president of the company and lower salaries for vice presidents. Output depends on effort and random events (luck). Prospective presidents compete for the top salary, and each agent can increase his probability of winning the prize by exerting more effort. The agent’s optimal level of effort will be an increasing function of the prospective gain from winning the tournament. The larger the spread between salaries awarded to the president and a vice president, the higher

effort is exerted. Another implication of this theory is that less effort is exerted in more risky environments. If output is largely determined by random factors that are independent of effort, there are weak incentives to put forth effort for a given salary spread because the marginal return to effort will be low.

The firm's problem is to choose a profit-maximizing salary structure, recognizing that effort levels are influenced by this structure. It turns out that the optimal salary spread will be larger in more risky environments, i.e., where luck is the dominating factor in the determination of output. Increased risk means weaker incentives for exerting effort, which the firm offsets by increasing spread. Another result is that the spread will be increasing in the number of contestants in the tournament.

Tournaments can thus be used to influence incentives in ways analogous to performance related pay. There may be little relationship between the winner's salary and his marginal product, but the overall structure may be efficient because it induces appropriate incentives throughout the organization.

A potential drawback of tournament schemes is that they may destroy cooperation between workers. Workers may find it advantageous to engage in "sabotage" in order to reduce the likelihood that a competitor wins the promotion contest. Lazear (1989) has studied this case and concludes that the outcome will be characterized by pay compression (relative to the situation where worker interactions are ignored). Less salary spread reduces uncooperative behavior, which is good for efficiency. This result is yet another example of how high-powered incentives may create dysfunctional responses.

Empirical tests of tournament theory have used data from a variety of areas, including professional golf, car racing, and business. There is a reasonable amount of support for some key predictions of the theory. For example, Ehrenberg and Bognanno (1990) report that golfers' performance improves when the levels of prizes increase. Eriksson (1999) examines rich Danish panel data on executives from a number of firms and confirms that the salary spread increases with the volatility of demand. He also finds that the salary spread increases with the number of participants in the contest, which is also consistent with the theory.

## **Team production and team compensation**

Many productive activities involve worker interactions such that one worker's effort influences the output of his peers. This implies that the individual contribution to output is difficult to identify and that performance pay based on individual output does not work well. An alternative is to base compensation on the entire team's output. These team compensation schemes are, however, associated with free-rider problems that are exacerbated by the size of the team. Suppose that there are  $N$  people in the organization and that each member's contribution to output is of the order  $1/N$ . The larger  $N$  becomes, the smaller the impact of each worker's effort on aggregate output, and the smaller the individual returns from increased effort.

Various devices have been discussed to overcome the free-rider problem, such as peer pressure and social norms (see e.g. Kandel and Lazear 1992). A system with mutual monitoring among agents is conceivable. With sufficiently low monitoring costs, such schemes can solve the free-rider problem. Similarly, establishing social norms and mechanisms for punishing deviations from the norm may be feasible. However, these mechanisms presumably work best in relatively small organizations where the  $1/N$  problem is less pertinent.

Empirical work on team compensation has typically examined the impact of profit-sharing on productivity. A number of studies based on data for large firms indicate that profit-sharing indeed increases productivity (see references in Prendergast 1999). These results are puzzling in light of the  $1/N$  problem and might reflect peer pressure and mutual monitoring. However, empirical research in this area faces difficult identification problems, and it is not clear whether existing work has been able to capture the causal effects of profit-sharing on productivity.

## **Extrinsic versus intrinsic motivation**

Recent research in behavioral economics, drawing from work in psychology, has emphasized the possibility that explicit performance pay may be counterproductive by reducing *intrinsic* motivation. This "motivation-crowding theory" asserts that monetary incentives may affect intrinsic motivation either by inducing changes in preferences or by changing the perceived

nature of performed tasks (Frey and Jegen 2001). Under some conditions, monetary incentives may “crowd out” intrinsic motivation. Under other conditions, “crowding in” may occur. The literature argues that the introduction of monetary incentives is likely to crowd out intrinsic motivation if agents perceive that the new scheme is associated with lower self-determination and self-esteem. Crowding in is expected if agents perceive monetary incentives as supportive and involving more freedom and increased self-determination. The possibility that explicit monetary incentives can be counterproductive by weakening intrinsic motivation has only recently been subject to formal theoretical modeling; see, for example, Benabou and Tirole (2003).

There is by now substantial evidence confirming the empirical relevance of motivation crowding theory. Deci et al (1999) provide an overview of laboratory evidence from psychology. Frey and Jegen (2001) offer a survey of laboratory and field evidence from economics. Deci et al conclude that tangible rewards tend to have adverse effects on intrinsic motivation.<sup>3</sup> Frey and Regen emphasize that crowding in and crowding out may occur, and subsequently, they attempt to specify conditions under which one mechanism is more plausible than the other.

Andersen and Pallesen (2008) offer new evidence on the motivation crowding hypothesis by examining the impact of reforms of the pay-setting system in the Danish public sector (including universities). The traditional system was based on strict seniority rules within each class of jobs. The new system, introduced around the turn of the century, made room for flexibility by allowing for pay on top of the basic salary, such as pay for handling special functions and rewards for special qualifications or performance. Each institution negotiated the details of the new system, and a variety of compensation schemes emerged. The authors classified the new system using a scale ranging from “no publication incentive” to “very strong publication incentive”.

Andersen and Pallesen focus on the relative changes in published journal articles from 2000 to 2005. These two years roughly correspond to before and after the reform. The unit of observation is the department (not the individual researcher). Is there any evidence that departments with stronger monetary incentives performed better? The answer is a qualified

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<sup>3</sup> “Careful consideration of reward effects reported in 128 experiments leads to the conclusion that tangible rewards tend to have a substantially negative effect on intrinsic motivation, with the limiting conditions we have specified. Even when tangible rewards are offered as indicators of good performance, they typically decrease intrinsic motivation for interesting activities.” (Deci et al, 1999.)

yes. The raw correlation is positive – stronger incentives are associated with a larger increase in performance. However, the results become more complex when variables capturing “supportive” compensation schemes are introduced. The idea is to test the hypothesis that monetary incentives that are perceived as supportive should enhance performance, whereas incentive schemes that are perceived as control devices should have an adverse effect. In general, the results appear to confirm these ideas although one may quibble over the details of the study.

## **Concluding remarks**

Professors in academia are expected to carry out a variety of tasks, such as research, teaching, service to the university (administration), and service to the public (consulting, popular science). Of these four main tasks, output from research should be relatively easy to measure, but is it really? Think of a dean of a social science faculty as a principal. The agents are located in departments with different publication traditions, making straightforward application of remuneration formulas difficult. Controversies over the weights attached to different journals, how articles should be weighted relative to monographs, how co-authorship should be assessed, and how citations should be counted are almost inevitable. However, these problems do not seem insurmountable. At least within a discipline (department), some consensus on the appropriate rules of the game is likely to emerge. Indeed, bonus payments for publication in top journals are practiced in some economics departments.<sup>4</sup>

The difficult problem is how to deal with multitasking. Teaching performance is arguably measurable via student evaluation, which has become standard procedure. In these surveys, students are asked to rate the teachers on a variety of dimensions. Although these surveys offer useful information, they do not provide information about the most relevant outcome variable, namely, how much students have *learned* from a course.

A number of studies have attempted to test whether there is a positive correlation between learning and teacher ratings. The results are largely inconclusive; at best, they suggest a weak positive correlation between learning and ratings. An example is the paper by Gramlich and Greenlee (1993), which examines a large sample of economics students, focusing on the

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<sup>4</sup> The optimal compensation system should, of course, reflect the goal of the university. A recent paper by Hamermesh and Pfann (2008), using U.S. data on economists, shows that the quantity of research (more publications), holding measure of quality constant, has no impact on researchers' reputation (as judged by peers).

teachers' ratings and the students' learning in introductory courses in microeconomics. The data set is rich in terms of background variables, including previous grades and test scores. The study finds only a slight positive correlation between the rating of teachers and final exam grades, and the correlation is only sometimes statistically significant. These results corroborate earlier findings, and it seems safe to conclude that student ratings of teachers are highly imperfect measures of actual learning. Using such ratings as the basis for teacher compensation or teacher recruitment therefore seems ill-advised.

Measuring output from service to the university appears at least as difficult as measuring teaching skills. Administrative skills are almost, by nature, multidimensional, and basing explicit monetary incentives on measured output from administrative activities seems difficult. However, output associated with consulting and popular science activities is easier to measure.

Teamwork in economics has seen a substantial increase since the 1970s, a trend revealed by a sharply rising fraction of co-authored papers (Sutter and Kocher 2004). The reasons for this development are not well understood. It perhaps reflects increased specialization within the profession, which in turn requires more cooperation among people with diverse skills (e.g., a theorist and an empirical researcher). There is some evidence that co-authorship in economics increases overall quality of research (measured by journal quality) but reduces quality-adjusted output per researcher (Hollis 2001). An interesting issue is how co-authorship should be treated in compensation policy. Should an individual researcher's output be discounted by the number of co-authors? I suspect that some discounting is warranted, but full discounting might produce too weak incentives for cooperation. However, the paper by Sauer (1988) suggests that approximately full discounting is practiced in U.S. economics department.<sup>5</sup>

The standard incentive theory portrays individuals as agents who dislike work and work only for money. This view is probably mostly wrong when applied to scholars engaged in research. Presumably, research is associated with intrinsic (psychic) rewards. There are also more tangible non-pecuniary benefits associated with successful research. Examples include status from publication in top journals and citation records and awards (which do not necessarily involve money). Academics do not work only for money, which is surely recognized by deans. The more important the intrinsic rewards, the less need there is for monetary compensation to recruit and retain employees. The possibility that individuals appreciate work

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<sup>5</sup> That is, the returns to a coauthored paper with  $n$  authors is  $1/n$  times that of single-authored paper.

can easily be incorporated into conventional incentive theory as long as one allows for disutility of effort *on the margin*.

All things considered, mechanical pay-for-performance rules have serious drawbacks when jobs involve multiple activities. Research output can arguably be measured with some accuracy, but other activities are much harder to measure. This does not imply, of course, that pay and performance should be unrelated, but only that pay should be based on a more holistic perspective that weighs all relevant indicators of performance together. Subjective performance evaluation is probably the best way to deal with multitasking in academia.<sup>6</sup>

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<sup>6</sup> Baker et al (1994) is a seminal paper on subjective performance evaluation. The paper demonstrates that objective and subjective measures may be complements under some conditions.

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