Firm Competition and Incentive Pay: Rent Seeking at Work

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Abstract

Empirical evidence shows that competition among firms generates steep incentives inside firms. I argue that an incentive-based wage schedule increases productive investments, but also gives rise to inefficient rent-seeking investments. A fixed wage schedule eliminates these inefficient investments at the cost of reducing the incentives for making productive investments. I show that more competition reduces firms' profits, which reduces the inefficient investments thereby making an incentive-based wage schedule more attractive.

Keywords: Payment methods, Competition, Rent Seeking

JEL-code: J2, J3

1 Introduction

A recent empirical literature shows that competition among firms tends to increase the performance-pay sensitivity of compensation schemes (Burges and Metcalfe 2000, Cuñat and Guadalupe 2004, 2008 and 2009, Guadalupe 2007 and Karuna 2004). In this paper, I offer an explanation for this empirical regularity.

Earlier theoretical literature has suggested an ambiguous relationship between competition and the incentive schemes in firms. Holmström (1982) and Nalebuff and Stiglitz (1983) argue that more intense competition generates more information, which can be

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used to mitigate moral hazard problems. This makes incentive pay more attractive. Hart (1983) instead takes the stand that managerial slack is reduced by the competitive market pressure, which reduces the need for incentive pay.[1]

Schmidt (1997) argues that, on the one hand, higher level of competition will increase the marginal profit to cost-cutting activities and therefore the contract will provide steeper incentives to induce the manger to exert more effort. On the other hand, because it reduces average profits, competition increases the likelihood of bankruptcy. The threat of bankruptcy implicitly disciplines the employees, which implies that flat incentives are attractive.[2] Raith (2003) allows for entry and exit in a similar model, which implies that competition does not affect the average profits in the industry and therefore that it unambiguously generates more incentive-based wage schedules.

I model a firm's choice between an incentive-based or a fixed wage schedule as a trade off between the stimulating effect an incentive-based wage schedule has on productive investments compared to the costs of intra-firm rent-seeking investments it gives rise to. This type of investment may arise when wage contracts are incomplete (see e.g. Hart and Moore 1990) or when effort is difficult to observe (see e.g. Alchian and Demsetz 1972). To obtain a higher wage, an increase in the probability of getting promoted or a better office, etc., workers may spend time with peers and managers, supplying information and opinions.[3] These activities are a matter of intra-firm reallocation, i.e., they increase the worker's own wage but not the value of the firm, and resources are therefore wasted. By committing to a fixed rule of equal sharing, the breeding ground for such intra-firm rent seeking can be eliminated at the cost of workers having less incentive to work hard.

Fiercer competition reduces firms' profits. I show that because the workers' choice of intra-firm rent-seeking investments is based on the value of the expected profit, these investments are reduced in response to more intense competition. The cost of using an incentive based schedule is therefore reduced, which makes it more attractive than a fixed wage schedule.

[1] Scharfstein (1988), however, shows that this result is very sensitive to the assumptions made.

[2] Martin (1993) provides a related analysis where competition reduces the profits' responsiveness to managerial effort, which implies that flat incentives will be used.

[3] Rent seeking within the firm is similar to "influence activities", which were first modeled by Milgrom (1988) and Milgrom and Roberts (1988 and 1990).

The paper is closely related to Schmidt (1997) and Martin (1993) in that competition affects the wage schedule through the profit level. Indeed, in my model without intra-firm rent seeking, for similar reasons, competition leads to flat incentives. However, if introducing inefficient rent-seeking activities, then competition will, in line with the empirical evidence, instead lead to steeper incentives.

In contrast to most of the earlier literature on the provision of incentives within firms, this paper models competition among firms as a contest to win market shares. This kind of competition has been analyzed in many other contexts (see e.g. Schmalensee 1976, Besen and Farrell 1994, Konrad 2000 and Huck et al. 2002). The wage schedule I adopt is based on Nitzan (1991), and later made endogenous by Lee (1993). I introduce intra-firm rent seeking to this schedule and extend the literature by analyzing the effects of the intensity of competition among groups.

2 The model

Consider a game of N identical firms. Each firm is run like a partnership and consists of n identical risk neutral workers who make investments in order to increase their firm's probability of winning a contract ω. This can be interpreted to imply that the firms compete for market shares over time and, on average, the probability of winning the market shares is equal to the probability of winning the contract. Assume that the competition between the firms can be described by the following function

$$\pi_A = \frac{\sum_{i=1}^{n} x_{iA}}{\sum_{k=1}^{N} \sum_{i=1}^{n} x_{ik}},$$

where x_{iA} are investments made by worker i in firm A and $\sum_{k=1}^{N} \sum_{i=1}^{n} x_{ik}$ are the investments made by all n workers in the N firms.[4]

I consider the workers' incentives to exert effort when the wage is based partially on effort and partially on equal shares. To the extent the wage is based on effort, I examine a simple wage contract in which an employee's share of firm A's profits is given by both her productive effort, x_{iA}, and her efforts to influence her compensation in an unproductive way , z_{iA}, i.e., intra-firm rent seeking.

[4]Nitzan (1994) surveys the literature using this contest success function.

I assume that productive investments are not perfectly observable and that the workers observe a joint signal of productive investments and the intra-firm rent-seeking investments, i.e., of $x_{iA}^a z_{iA}^{1-a}$. The parameter a is the weight put on productive investments and $1-a$ is the weight put on intra-firm rent seeking investments. The proportion of the profits that accrues to each worker, or equivalently, a worker's share of output in firm A is given by

$$f_{iA} = (\frac{x_{iA}^a z_{iA}^{1-a}}{\sum_{i=1}^n x_{iA}^a z_{iA}^{1-a}})(1 - s_A) + \frac{s_A}{n}. \tag{1}$$

where s_A is the share of the wage schedule which is based on equal shares.[5] Note that sum of the workers' shares equals 1.

I consider a two-stage game where in the first stage, each firm selects the type of wage schedule that maximize its profit. In the second stage, each worker employs a Nash strategy and chooses how much to invest taking the behavior of all other workers as given.

3 Incentive pay and competition among firms

3.1 Stage two

At stage two, a worker i in firm A solves

$$\max_{x_{iA},\, z_{iA}} \pi_A \omega f_A - x_{iA} - z_{iA}. \tag{2}$$

The first-order condition with respect to x_{iA} is given by

$$(\frac{\sum_{k=1,k\neq A}^N \sum_{i=1}^n x_{ik}}{(\sum_{k=1}^N \sum_{i=1}^n x_{ik})^2}\frac{1}{n} + a\frac{\sum_{i=1}^n x_{iA}}{\sum_{k=1}^N \sum_{i=1}^n x_{ik}}\frac{n-1}{n^2 x_{iA}}(1 - s_A))\omega = 1, \tag{3}$$

and the first order condition with respect to z_{iA} is

$$\frac{n-1}{n^2 z_{iA}}(1 - s_A)(1 - a)\frac{\sum_{i=1}^n x_{iA}}{\sum_{k=1}^N \sum_{i=1}^n x_{ik}}\omega = 1. \tag{4}$$

[5] Nitzan (1991) introduced a similar sharing rule where $a = 1$.

The other $N-1$ firms have analogous problems. We will look for values of x, z and s that may solve these equations. It is easy to verify that the optimal investments are

$$x_A^* = \frac{(N-1) + a(n-1)(N - \sum_{k=1}^{N} s_k)}{Nn^2} \pi_A^* \omega \tag{5}$$

and

$$z_A^* = \frac{n-1}{n^2}(1-a)(1-s_A)\pi_A^* \omega, \tag{6}$$

where firm A's probability of winning the contract, π_A^*, is

$$\pi_A^* = \frac{1 + a\,(n-1)\,(\sum_{k=1,k\neq A}^{N} s_k - (N-1)s_A)}{N}. \tag{7}$$

3.2 Stage one

Given the solutions at stage two, a worker in firm A solves

$$\max_{s_{iA}} \pi_A^* \omega f_A - x_A^* - z_A^*. \tag{8}$$

where $f_A = \frac{1}{n}$ since workers are identical. The equilibrium wage schedule is given by

$$s^* = \frac{1}{n-1}(\frac{1}{(N-1)a} - \frac{2}{N}). \tag{9}$$

By equations (5), (6), (7) and (9) we obtain the equilibrium investments from the perspective of stage one[6]

$$x^* = \frac{(N-1) + a(n-1)N(1 - \frac{1}{n-1}(\frac{1}{(N-1)a} - \frac{2}{N}))}{N^2 n^2} \omega, \tag{10}$$

and

$$z^* = \frac{1}{N}(1 - \frac{1}{n-1}(\frac{1}{(N-1)a} - \frac{2}{N}))\,(1-a)\,\frac{n-1}{n^2}\omega. \tag{11}$$

Comparative statics on the wage schedule in equation (9) reveals that:

Proposition 1 *For $0 \leq s \leq 1$, the more intense competition within the sector and the larger the firm size the more is the wage schedule based on relative effort.*

[6]This equilibrium exists for a large set of parameter values.

When the competition within the sector increases, the expected value of the contract is reduced, and so are the intra-firm rent seeking investments. Hence, a wage schedule based on effort is less costly and therefore more attractive.

The wage schedules that best reflect reality are those where s belongs to the closed unit interval $[0, 1]$. However, the model does not exclude other possibilities. $s < 0$ implies that firms collect equal shares from workers and distribute them according to relative effort. The model generates the result that if a is sufficiently large such that $s < 0$, then more intense competition among firms in fact leads to *more* equal sharing. The reason is that competition reduces the marginal impact the wage schedule based on effort has on the probability of winning. This is due to that productive investments are reduced, but the gain from this cost reduction is smaller than the loss in terms of probability of winning. This result is similar to Martin (1993) and Schmidt (1997) who show that competition changes the profits' responsiveness to managerial effort, which generates flatter incentives. However, when introducing a sufficient amount of intra-firm rent seeking then the result is reversed and in line with the empirical evidence.

Finally, a larger firm size increases free riding per worker as well as reduces intra-firm rent seeking per worker. An effort-based wage schedule is therefore more attractive in large firms. The model supports recent empirical evidence on this topic (Agell 2004 and Agell and Bennmarker 2007).

4 Summary and concluding remarks

I show that product market competition affects intra-firm rent seeking activities on top of productive effort, which has previously been suggested in the literature. The results are in line with new empirical findings and extend the earlier theoretical literature on this topic (Holmström 1982, Nalebuff and Stiglitz 1983, Hart 1983, Martin 1993, Nickell 1996, Mayer and Vickers 1997 and Schmidt 1997). The model finally sheds new light on the literature of rent seeking among groups.

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