Subordinates as Threats to Leaders

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Abstract

A leader of an organization may view a subordinate as threatening or weakening the leader's position. The threat may increase with the subordinate's ability and reduce the rents the leader wins. In particular, a leader who trains his subordinate reduces the cost to the owner of a firm in replacing the leader, and so reduces the leader's bargaining power. The leader therefore provides inefficiently low training for the subordinate.

1 Introduction

Many leaders choose or train their potential successors. For example, a CEO in a corporation may appoint a division manager. Or a presidential candidate in the United States can select his vice-presidential running mate. It appears that the leader often appoints subordinates of lower quality than the leader himself. One explanation, explored here, is that the possessor of some particular skill or knowledge may be able to win higher rents. Thus,

a leader may view a subordinate possessesing the same skill or knowledge as threatening or weakening the leader's position, thereby allowing some third party to replace the incumbent leader. The threat of replacement in turn reduces the leader's rents. The leader may therefore purposely avoid training or educating his subordinate, or deliberately pick a less competent one.

Rulers at different times and of different countries have recognized this problem.

In ancient Egypt, slaves became the favorites of the kings of the New Empire. Distrust their own subjects, they used slaves, who had little legitimacy to become kings themselves, to create a trustworthy surrounding, But history also shows that the threat was real. The slaves were not always faithful to their masters–some of them e.g., took part in the great conspiracy against Ramses III (see Erman (1894)),

The Ottoman sultans adopted a similar solution. Murad I (1326-1389), who had been put on the throne by Turkish notables, soon resented the power they had gained in return. To counteract their power, he began to build up the power of various non-Turkish groups in his service, particularly those composed of Christian slaves and converts to Islam. He thereby developed the famous devsirme system, by which Christian youths were drafted from the Balkan provinces for conversion to Islam and life service to the sultan.

The Sultans found an additional advantage in this system: they could demand complete personal obedience from the slaves. For though the slaves might gain power and wealth, their careers and their very lives were at the ruler's disposition.

Eventually, however, the sultans could no longer could control the devsirme by setting it against the Turkish notables, the devsirme gained control of the sultans, and used the government for its own benefit rather than for the benefit of a sultan or his empire. When the devsirme in turn gained power, they controlled the princes by keeping them uneducated and inexperienced;the old tradition by which young princes were educated in the field was replaced by a system in which all the princes were isolated in the private apartments of the harem.

2 Literature

This paper discusses what is popularly called "office politics." Some aspects of that are studied under the name of "influence activities" (see Milgrom (1988)). Rajan and Zingales (2000) examine optimal hierarchical organization when a leader must have access to information, but must also be limited in his appropriative activity. The ideas here relate to Carmichael's (1998) explanation for tenure: members of an academic department may fear that hiring high-quality faculty will reduce the future income of current members. Tenure, which makes the future income of the current members independent of the quality of new hires, removes the disincentive of hiring poor quality faculty.[1] In contrast, we shall see that our model assumes no uncertainty.

Levy (1999) considers able leaders who have more accurate information than unable decision makers. He shows that an able leader may choose an unable advisor to signal his own ability. Making a decision that contradicts the advice signals confidence in his own information and thereby in his own ability. Unable decision makers choose able advisors since they need better information. Relatedly, Swank (2000) considers a leader who can seek the advice of an agent. The agent may be better informed than the principal, but any disagreement between the leader and agent casts doubt on the principal's independent ability. A leader who cares about his reputation may therefore avoid getting advice from an agent.

Segendorff (2000) investigates under what circumstances a separating equilibrium exists in which competent leaders choose incompetent co-workers and incompetent leaders choose competent co-workers. The competent leader seeks implicit insurance: if things go wrong he can blame the incompetent co-worker and retain his reputation for high ability. For the low-ability leader the expected gain from such an insurance is outweighed by its costs in lowering expected policy outcomes.

[1] The truthtelling mechanism is the same as in Grooves (1973).

3 Assumptions

3.1 Output

The firm's profits in each of the two periods increase with the quality of the firm's manager (or leader) and with the quality of his subordinate. Quality is firm specific; training increases quality in one firm, but cannot substitute for training in another. Denote the quality of the leader by q_M and the quality of the subordinate by q_S. Denote the value of the firm's output by $f(q_M, q_S)$, with f continuous and concave in each of its arguments. The quality of a player is defined by his training in the previous period, $0 \leq e_i \leq \overline{e}$. In period 1 the subordinate is newly hired, with no firm-specific training and so low productivity. The quality of players hired in period 2 is by the same reasoning low in that period. The quality in period 2 of a person hired as a subordinate in period 1 is determined by his training in period 1. On position j in the firm, that quality is $q_j = q(e_i)$, where $q'(e_i) > 0$, $q''(e_i) < 0$ and $q(0) = 0$. The quality of the manager in period 1 (and in period 2 if reappointed) is $q_M = q(e_M)$, with e_M exogenously given.

4 Hiring and firing

In period 1 the manager determines the training of his subordinate. At the beginning of period 2 the owner decides whether to reappoint or to fire the current manager. If the owner fires the manager, then the owner also chooses whether to fire the current subordinate, reappoint him as a subordinate, or promote him to serve as the new manager.

4.1 Compensation

Compensations in period 2 are the outcomes of Rubinstein-Stahl bargaining games, played just after the owner decides on reappointing the manager and the subordinate. The alternatotive market wage for a subordinate is w_S; the alternative market wage for a manager is w_M. A manager with the firm-specific training e_M earns a wage exceeding the market wage paid a manager with no training. The premium can be either a lump-sum payment, or else a share of the firm's profits. Profit sharing will appear in period 2 because the

owner sees it as giving the leader appropriate incentives when negotiating over the subordinate's compensation in period 2. No bargaining occurs in period 1 and therefore no premium need be specified for period 1.

A leader's or subordinate's compensation in period 2 increases with his contribution to profits. Four cases arise.

(i) If the owner reappoints the manager, then the contribution of the manager to the firm's output is

$$S_1(e_M, e_S) \equiv f(q(e_M), q(e_S)) - \max\{f(q(e_S), 0), f(0, q(e_S))\} \quad (1)$$

The maximum expression in (1) reflects the owner's right to hire a new manager by external or internal recruiting. It is natural to assume that a manager's quality is more important than a subordinate's quality. In the following we therefore assume that $f(x, 0) > f(0, x)$. That is, an owner who fires the manager will promote the subordinate. We implicitly assume that S_1 is non-negative. This is not a restriction. When bargaining over his own wage (see below) the manager would never want a negative S_1, and he can always choose $e_S = 0$ and thereby make S_1 non-negative.

(ii) If the owner reappoints both the manager and the subordinate, then the contribution of the subordinate to the firm's output is

$$S_2(e_M, e_S) \equiv f(q(e_M), q(e_S)) - f(q(e_M), 0). \quad (2)$$

(iii) If the owner fires the manager and promotes the subordinate, then the subordinate's contribution is

$$S_3(e_S) \equiv f(q(e_S), 0) - f(0, 0) \quad (3)$$

(iv) If the owner fires the manager and reappoints the subordinate to serve as subordinate, then the subordinate's contribution is

$$S_4(e_S) \equiv f(0, q(e_S)) - f(0, 0). \quad (4)$$

The manager and owner bargain over the manager's compensation. The manager and the subordinate bargain over the subordinate's wage. The manager's premium in period 2 is expressed as a share α of the firm's output. Such sharing gives him the right incentives when bargaining with the subordinate. (The outcome will be the same as in a bargaining game between the owner and the subordinate).

We examine the outcome of the bargaining as resulting from a Rubinstein-Stahl bargaining game over a pie of size S. The per-period discount rate is r. The player who makes the first offer gets

$$\frac{1+r}{2+r}S; \tag{5}$$

the other player gets

$$\frac{1}{2+r}S. \tag{6}$$

We also assume that a fair coin tossed before the bargaining starts determines who makes the first offer, so that the expected outcome for each player is $S/2$.

In bargaining between the owner and the manager each expects to get $S_1(e_M, e_S)/2$. That is, we find the expected value of α by solving

$$E[\alpha] f(q(e_M), q(e_S)) = S_1(e_M, e_S)/2,$$

which gives

$$E[\alpha] = \frac{S_1(e_M, e_S)}{2f(q(e_M), q(e_S))}. \tag{7}$$

It turns out that for all $\alpha > 0$ the manager behaves as if he was the residual claimant when bargaining with the subordinate. The outcome is thus as if the owner had bargained himself with the subordinate and the subordinate therefore expects to get $S_2(e_M, e_S)/2$.

If the owner fires the current manager, the subordinate's compensation is determined by bargaining between himself and the owner. If the owner fires both the manager and the subordinate, then their successors are hired at the market wages and no bargaining occurs.

5 Results

5.1 Backward induction

We use backward induction to find the subgame perfect equilibria. That is, we eliminate equilibria that rely on non-credible threats. We reduce the game by replacing the Rubinstein-Stahl bargaining games with their expected

outcomes. This simplification makes the owner's decision on hiring and firing the last move in the game. We start the analysis by focusing on that decision.

Suppose the owner reappoints the manager and the subordinate. Using (7) the owner's expected payoff is

$$(1 - E[\alpha]) f(q(e_M), q_S(e_S)) - \frac{1}{2} S_2(e_M, e_S) - w_M - w_S,$$

which simplifies to

$$\frac{f(q(e_M), 0) + f(q(e_S), 0)}{2} - w_M - w_S. \tag{8}$$

If the owner fires the manager and promotes the subordinate the owner gets

$$f(q(e_S), 0) - \frac{1}{2} S_3(e_S) - w_M - w_S. \tag{9}$$

If the owner fires the manager and reappoints the subordinate, the owner gets

$$f(q(0, e_S), 0) - \frac{1}{2} S_4(e_S) - w_M - w_S. \tag{10}$$

If the owner replaces both the manager and subordinate, the owner gets

$$f(0, 0) - w_M - w_S. \tag{11}$$

By assumption, output f increases more with its first argument than with its second argument, so that $f(x, 0) > f(0, x)$. This makes (9) greater than (10) and greater than (11). A necessary condition for (8) to exceed (9) is

$$\frac{f(q(e_M), 0) + f(q(e_S), 0)}{2} \geq \frac{f(q(e_S), 0) - f(0, 0)}{2},$$

which simplifies to

$$f(q(e_M), 0) \geq f(0, 0), \tag{12}$$

which holds for all levels of training. Hence, if the manager's quality is positive, the owner has a strict incentive to reappoint both the manager and the subordinate. This has nothing to do with the quality of the manager compared to his subordinate. To see the intuition, suppose e_S increases. Then the firm's profits when reappointing the manager increases, but this

increase corresponds exactly to the increase in wages. This is reflected in (8) where $f\left(q\left(e_M\right), q\left(e_S\right)\right)$ is exluded. The reason the owner gains from training of the subordinate is that the subordinate's bargaining power declines with the manager's quality, and the manager's bargaining power declines with his subordinates quality. This illustrates the strategy of divide and rule.

Notice that underlying (12) is the assumption that if $S_1\left(e_M, e_S\right)$ is negative then by the continuity of the Rubinstein-Stahl outcome the manager has to pay the owner. This would bring his expected payoff below the reservation wage w_M and he would resign. We do not, however, model this option, because the manager can avoid this problem by not training the subordinate.

In equilibrium the manager does not view his reappointment as threatened by his subordinate. Any decision to train the subordinate too little is based on other considerations. Training is firm specific, implying that the manager and the subordinate, if fired, would earn the the market wages w_M and w_S. The market wages are lower than the expected compensation earned if reappointed. No player has an incentive to leave the firm, and the owner has no incentive to fire anyone.

The manager, who knows he will be reappointed in period 2, chooses training for his subordinate in period 1 to

$$\max_{e_S \in [0,\overline{e}]} w_M + E\left[\alpha\right] f\left(q(e_M), q(e_S)\right) \Leftrightarrow \max_{e_S \in [0,\overline{e}]} w_M + \frac{1}{2} S_1\left(e_M, e_S\right) \tag{13}$$

Because f is continuous in (q_M, q_S), a solution e_S exists. Let f_j be the partial derivative of $f(q_M(e_M), q_S(e_S))$ with respect to its jth argument. The first-order condition for an interior solution is

$$f_2\left(q\left(e_M\right), q\left(e_S\right)\right) = f_1\left(q\left(e_S\right), 0\right) q'\left(e_S\right) \tag{14}$$

Observe that if (14) evaluated at $e_S = 0$ is negative, then the manager may prefer no training for his subordinate: such training would reduce the manager's future income. It is reasonable to believe that since (i) f_1 is evaluated at a lower value than f_2 and (ii) the manager's quality matters more than the subordinate's quality, then $f_1\left(q\left(e_S\right), 0\right)$ exceeds $f_2\left(q\left(e_M\right), q\left(e_S\right)\right)$ at $e_S = 0$. Whether such a local maximum is also a global maximum depends on the properties of f. In any case, the unique subgame perfect equilibrium has the owner reappoint both the manager and the subordinate.

Does the equilibrium training e_S increase or decrease with e_M? Differentiating (14) with respect to e_M and e_S and simplifying gives

$$\frac{de_S^*}{de_M} = -\frac{f_{21}}{f_{22} - f_{11}}. \tag{15}$$

Note that at an interior solution the second-order condition in the denominator is negative, so that the sign of (15) equals the sign of the cross derivative f_{21}. If the marginal productivity of the manager increases with the quality of the subordinate then e_S is a strategic complement to e_M and the equilibrium amount of training increases with the manager's training. By training his subordinate the manager increases his own productivity and the higher his own quality is the more can he gain from training the subordinate. A high-quality manager thus trains his subordinate more than would a low-quality manager. If the manager's productivity decreases with the quality of the subordinate, then the high-quality manager loses more than would a low-quality manager from training the subordinate.

Recall that training is costless for the owner, whose payoff in equilibrium is given by (8). The owner's payoff thus increases with the training of his subordinate. In the eyes of the owner, the manager trains the subordinate too little.

5.2 Training in steady state

Here we extend our analysis to additional periods by making use of an Overlapping Generations model. Let e_M^t and e_S^t denote the amount of training given to managers and subordinates belonging to generation t. The subodinate in generation t then becomes the manager in generation $t+1$. That is, $e_M^{t+1} = e_S^t$. In a steady state each generation of managers has the same training as the previous generation: $e_M^{t+1} = e_M^t$. Hence, in steady state $e_M^t = e_S^t$. The first-order condition (14) implicitly defines a correspondence $g : [0, \overline{e}] \twoheadrightarrow [0, \overline{e}]$ mapping the manager's level of training into sets of training levels for the subordinates, $e_S^t \in g\left(e_M^t\right)$. Any fixed point e to g is a steady state and it turns out that $e = 0$ is a fixed point. Too see this, suppose that $e_M^t = 0$. Then any $e_S^t > 0$ makes $S_1\left(e_M^t, e_S^t\right)$ negative, which would make the manager's expected payoff less than w_M. The best choice for a manager with zero training is to give his subordinate zero training. This makes $S_1\left(e_M^t, e_S^t\right) = 0$ and the manager's expected payoff then equals w_M.

Hence, $e = 0$ is a steady state. Whether this steady state is unique and stable depend on the specifications of f and q.

5.3 An example

We illustrate the effects with particular functional forms. Let $q(e) = e$, let $\underline{e} \leq e \leq \overline{e}$, and and let $f(q_M(e_M), q_S(e_S)) = ke_M + e_S$. We then have

$$f_1 = \frac{\partial f}{\partial e_M} = k$$

and

$$f_2 = \frac{\partial f}{\partial e_S} = 1$$

Then (14), which describes the manager's choice of training for his subordinate, becomes

$$f_2\left(e_M, e_S^*\right) - f_1\left(e_M^*, 0\right) = 0. \tag{16}$$

For our functional form this becomes

$$1 - k = 0$$

For $k > 1$, we have $1 - k < 0$, making the manager prefer zero training for his subordinate. This is also the unique steady state.

In contrast, consider the Cobb-Douglas production function $f(q_M(e_M), q_S(e_S)) = e_M^{\alpha} e_S^{\beta}$. Then

$$f_2\left(e_M, e_S^*\right) - f_1\left(e_M^*, 0\right) \tag{17}$$

simplifies to

$$\beta e_M^{\alpha} e_S^{1-\beta} - 0 > 0,$$

which is always positive: the manager would have the same incentives as the owner to train the subordinate.

In the Overlapping Generations setting $e = 0$ is the unique steady state in the first example. In the second example two steady states exist: $e = 1$ which is stable, and $e = 0$ which is unstable.

5.4 Conclusion

We have seen that a manager may want to apppoint a low-quality subordinate, even though a good subordinate increases the firm's output, even though a manager earns more the higher the firm's output, and even though in equilibrium the manager is not replaced by the subordinate. A capable subordinate does, however, reduce a manager's bargaining power, posing a potential threat to the manager's reappointment.

The inefficiently low training of subordinates that results is not easily solved. We saw above that the inefficiency appears even with profit sharing between the owner and the manager and between the manager and the subordinate. Nor would job security (that is, paying the manager a guaranteed wage even if he is replaced) ameliorate the problem of insufficient training. For such tenure merely increases the surplus to be divided between the owner and the incumbent leader by the wages of a new leader were he hired. The incumbent leader's marginal benefit from training his subordinate is unchanged, and therefore the leader would provide insufficient training.

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6 Notation

e_i Training of player i

q_1 quality of leader

q_2 quality of subordinate

r Intertemporal discount rate

S_1 Surplus divided between owner and leader

S_2 Surplus divided between the owner and the subordinate when the leader is reappointed

S_3 Surplus divided between the promoted subordinate and the owner when the leader is fired.

S_4 Surplus divided between the subordinate and the owner when the leader is fired