Career Development and Specific Human Capital Collection*

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This paper is concerned with how firms provide workers with incentives to collect firm specific human capital when the skills collected cannot be contracted upon and where the worker is repaid for collecting skills by promotion. I consider two scenarios: (i) where the firm has private information on the worker's promotion prospects, and (ii) where there is symmetric uncertainty about the worker's promotion prospects. I show that the resolution to this incentive problem results in models of career development similar to those seen in Japan and the United States. I also discuss how differences in production methods and the role of an external labor market may help to explain observed differences in career development in Japan and the United States. J. Japan Int. Econ., September 1992, 6(3), pp. 207–227. Graduate School of Business, University of Chicago, Chicago, Illinois 60637. © 1992 Academic Press, Inc.

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Japanese management practices are well known for seniority provisions and egalitarian treatment of workers. It is often mistakenly assumed that these seniority provisions imply that workers need simply remain in a firm long enough to ascend its hierarchy. Many authors have shown this proposition to be untrue (Marsh and Mannari, 1976, Cole, 1979, Koike, 1988). Instead, an important implication of seniority provisions in Japanese organizations is that there is relatively late selection of "high-fliers" compared to the United States. Workers who join large Japanese firms are

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typically not differentiated from their cohort until 12 to 15 years after they join,\(^1\) after which there is considerable differentiation by ability (Cole, 1979, Hatvany and Pucik, 1981, Pucik, 1985, Aoki, 1988). In the United States, there is a tendency to choose stars at an earlier stage and quickly move them to positions of authority (Rosenbaum, 1984).

While it may be tempting to explain late selection of potential stars by a respect for seniority in Japanese culture, research suggests that the roots of these practices are based in incentive issues. In particular, those who are chosen as stars can be given intensive training and may become encouraged to greater effort. However, overlooked workers are likely to become discouraged. According to Takeuchi (1985), “Japanese business organizations paradoxically use the principle of equality to motivate employees . . . [because] . . . the promotion of only one or two persons will cause the remaining employees to lose their will to work” (pp. 18–19). In a similar vein, Hatvany and Pucik (1981) quote a personnel director of a major Japanese trading company who believes that “the secret of Japanese management is to make everybody feel that he is slated for the top position in the firm” (p. 13). Thurow (1985) and Thompson et al. (1985) make a similar point on the costs of early selection of stars.

The purpose of this paper is to examine the impact of early selection of stars on incentives to collect firm specific human capital. Unlike Becker (1964), I do not consider easily verified skills but rather such nebulous skills as building relationships with clients or shop floor staff, getting a general understanding of how the organization operates, or finding out how a new product is likely to fare in the marketplace. For this type of skills, direct payment for skills collected is likely to be difficult to implement.

Throughout the paper, I assume that workers cannot be directly compensated for skills collected. Instead, workers are paid for collecting skills by promotion to a better paid position. However, many factors other than skill collection determine a worker’s promotion prospects, such as the worker’s ability or match to the firm. Hence collecting skill may not be sufficient to guarantee promotion.

In Section 1, I consider the case where the firm has private information on an employee’s promotion prospects (which, for simplicity, I equate with his ability). The questions which then arise are (a) can firms reveal information on promotion prospects before training and (b) should they do so? In other words, should the firm use a fast track? The most obvious way to reveal information on the worker’s promotion prospects is simply to tell him. However, the firm has an incentive to tell the worker that he has healthy promotion prospects if he trains, even if this is untrue. Empirical

\(^1\) This promotion policy is known as the “escalator system.”
evidence on performance evaluation illustrates this incentive to exaggerate promotion prospects (see Hall and Lawlor, 1969; Fischer, 1979; Rosenbaum, 1984). Hence, more credible signals are required.

I consider two scenarios regarding wage payments. First I consider the case in which the firm has discretion over the wage it pays in any job. Second, I consider the case in which collective bargaining specifies the wage that must be paid in any job, so that the firm cannot tailor its wage offers to the worker's ability. I show that when the firm has discretion over its wage offers, it signals information on ability by offering the worker a discretionary wage raise before he collects skills. This constitutes a credible signal because the firm would never offer a (suitably determined) wage raise to a low ability worker if he trained as a result of getting that raise. When the firm is constrained to offer a single wage to workers in any job, it signals ability to a worker by promotion to a more difficult task, even though the worker may not be sufficiently qualified for that task. Hence, quick promotion may be the means by which the fast track is implemented. I characterize these forms of career development as similar to American practices.

Though the firm can signal information on ability to workers, it may not do so. Instead, it may reveal no information on promotion prospects. This has the benefit of retaining incentives for low ability workers. This strategy is similar to the Japanese model of career development. The firm's optimal policy depends on the returns to training workers of different ability and the cost of signaling information to the worker.

Following the basic results of the model, I consider why Japanese and American organizations differ in their personnel practices. I make two arguments. First, I argue that the methods of production used in Japan involve more delegation of tasks than an American organization, where decisions tend to be more centralized. As a result, it is more important for Japanese organizations to retain incentives for the less able. Second, there are worse opportunities for quitting in midcareer in Japan than in the United States (Cole, 1979; Koike, 1988). I argue that the Japanese model of career development is likely to be difficult to implement in an economy in which quitting is common as bids received by workers from other firms (or the response of the employer to bids) may reveal information which the firm would prefer not to reveal.

The purpose of possibly instigating a "fast track" in Section 1 is to signal to the worker that he is talented. However, it is not necessary to assume that the firm has private information on the worker's promotion prospects to generate a relationship between career development and the incentive to collect firm specific skills. This is illustrated in Section 2, where I consider a model with symmetric uncertainty about the worker's promotion prospects when he trains. Here two workers compete for a
promotion. After a period of time, one worker is revealed to be more talented than the other. The firm must then decide how much on-the-job training to provide the talented worker and the less talented worker. Here a fast track implies intensively training the more able worker. I show that handicapping the more able worker (by providing more training to the less able worker) maximizes the two worker’s incentives to collect firm specific skills as this renders the promotion race close. By contrast, intensively training the leader makes the promotion race less sensitive to skills collected. It is also shown that when workers can quit more easily, the firm is more likely to train its more able intensively than when the labor market does not bid for the worker.

The paper is structured as follows. In Section 1, I begin by considering the case in which the firm has private information on the worker’s ability. I illustrate that the firm can either treat all workers equally before training or signal information on promotion prospects either by offering discretionary wage increases or by assigning the worker a difficult task. Following this, I consider why practices may differ in Japan and the United States. In Section 2, I extend the model to consider the case with symmetric uncertainty about ability. I conclude with a brief discussion.

1. Private Information

A single worker joins a firm for up to three periods, denoted periods 1 to 3. When the worker joins in period 1, his promotion prospects or ability are unknown to all parties. The population of ability $a \in A$ is given by a uniform distribution over a support $[0, 1]$.

**Assumption 1.** The firm obtains perfect information on the worker’s ability at the end of period 1. This information is privately held and cannot be verified to the worker.

During period 2, the worker can collect firm specific skills, $s$, at a utility cost of $c$. Skills are denoted by $s \in S = \{0, 1\}$, where $s = 1$ implies that skills have been collected and $s = 0$ implies that they have not. Skills affect output only in period 3.

**Assumption 2.** (i) The firm can observe whether the worker collects skills but cannot verify this information to an enforcing agency.

(ii) Output cannot be verified.

Assumption 2(i) implies that the worker cannot be directly paid for collecting skills, while part (ii) rules out output-contingent contracting. The worker can be assigned to one of two jobs at the beginning of each period.
He cannot be laid off. He can either carry out a difficult job, D, or an easy job, E, with output given respectively by $y_D(a, s)$ and $y_E(a, s)$. I make two important assumptions on the technology. First, I assume that job D is more suited to those with high ability. Second, I assume that the return to training is higher in job D than in job E, so that training increases the probability of promotion to job D.

### Assumption 3
(i) $y_D(a, s) \geq y_E(a, s) \geq 0$ for all $s \in S$, $a \in A$.
(ii) $y_D(a, 1) - y_D(a, 0) > y_E(a, 1) - y_E(a, 0) = \nabla > 0$, for all $a \in A$.

I assume that the return to training in job E, $\nabla$, is independent of ability to simplify the analysis. Empirically, it appears that the effect of choosing stars in organizations is that the stars become encouraged while those left behind become discouraged. Imposing this complementarity between ability and effort requires an additional assumption. In particular, I rule out cases in which the high ability workers become discouraged to collect skills, because they realize that they will "make it" anyway. Assumption 4 rules out this possibility.

### Assumption 4
$y_D(1, 0) < y_E(1, 0)$.

This assumption implies that unless the worker trains, he is never more productive in job D. The worker's utility from a wage profile $W'$, $t = 1, 2, 3$, is given by

$$V = \sum_{t=1}^{3} W' - cs. \tag{1}$$

The price of output is constant at unity. The firm is risk neutral and maximizes profits given by expected output minus wage costs. The worker has a reservation utility of $r$ each period. This is independent of perceived ability in the firm (though see Section 2 for an alternative). The worker can quit at the end of any period to receive his reservation utility in each future period.

### Contracting
The firm offers a contract which is possibly contingent on the worker's ability after period 1. In period 1 the worker is offered $w_1$, as information on ability is unknown at that point. In periods 2 and 3, the firm can offer $w_t^i(a)$ in job $i$ in period $t$ to a worker of ability $a$. The purpose of possibly

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2 See Kahn and Huberman (1988) for an analysis of up-or-out contracts as a means of inducing specific skill collection.

3 Many other studies have shown complementarity between ability and effort. For example, see Kanter (1977), Tannenbaum et al. (1974), and Cohen (1958).
offering contracts which vary by ability is to induce some workers to train and others not to. However, in equilibrium the firm offers at most two contracts, one to those who train in equilibrium and one to those who do not. To see this, assume that more than one contract was offered where the worker trains. In particular, assume that type $a$ gets one contract and type $b$ gets another. Then if the contracts involve different costs to the firm, the firm always offers the cheapest contract to both $a$ and $b$. Hence the contracts must have the same cost to the firm, in which case I can restrict attention to a single contract where the worker trains.

Given this, the firm can offer one contract where the worker trains, which I call the star contract, and one contract where the worker does not train, which I call the basic contract. Alternatively, it can offer only a single contract to all workers, which I call the pooling contract. Let $w_i^t$ be the wage paid in period $t$ for job $i$. The star contract in the subgame after period 1 is denoted by $\sigma^* = \{w_{D}^*, w_{D}^*, w_{E}^*, w_{D}^*\}$, the basic contract is characterized by $\sigma = \{w_{E}^*, w_{D}^*, w_{E}^*, w_{D}^*\}$, while the pooling equilibrium is characterized by $\sigma = \{w_{E}^*, w_{D}^*, w_{E}^*, w_{D}^*\}$. Note that I allow the firm to offer different wages in the same job (for example, $w_{E}^*$ need not equal $w_{D}^*$).

There are incentive compatibility constraints for both the worker and the firm. First, by Assumption 3(ii), the worker trains only if it improves his prospects of attaining job $D$. This is the worker’s incentive compatibility constraint (WIC). Second, the firm only offers job $D$ if the profits from doing so are higher than those from assigning the worker to job $E$. This is the firm’s incentive compatibility constraint (FIC). If the firm offers two contracts, it must credibly signal to the worker offered the star contract that he is talented. This is the firm’s signaling constraint (S). Finally, the firm must also ensure that the worker earns at least that possible elsewhere. This is the worker’s individual rationality constraint (WIR). Equilibrium in the model is found by maximizing profits subject to these constraints.

I begin by solving the case where the firm does not signal information on promotion prospects. This is the pooling or “Japanese” contract. I then consider the optimal contract when the firm separates workers by ability which I call the star system. Throughout the paper, I assume that all agents operate in pure strategies.

The pooling contract. Here the firm offers all workers the same terms before period 3 though information becomes available on the worker’s ability after the first period. Given Assumption 4, the worker is assigned to job $E$ in periods 1 and 2. By Assumption 3(i), if he trains and is above some critical ability $\alpha$, he is given job $D$ in period 3. A necessary and
sufficient condition to induce the worker to collect firm-specific human capital is

\[ [1 - \alpha] (w_D^3 - w_E^3) \geq c. \]  

(WIC)

But the firm promotes the worker only if it receives higher profits from doing so. Hence, following Waldman (1984), \( \alpha \) is defined by

\[ y_D(\alpha, 1) - y_E(\alpha, 1) = w_D^3 - w_E^3. \]  

(FIC)

The optimal pooling contract implies that (i) the worker is given job E in periods 1 and 2 and (ii) he is offered \( r \) in all periods and jobs except that \( w_D^3 \) is chosen to maximize profits subject to (WIC) and (FIC). In equilibrium, (WIC) binds as all workers above ability \( \bar{a} \) should be promoted, where \( y_D(\bar{a}, 1) = y_E(\bar{a}, 1) \). I assume that \( \bar{a} < 1 \) to avoid a trivial solution to the firm’s problem. Note that from (FIC), \( \alpha > \alpha^* \), so that (WIC) binds to minimize \( \alpha \). Let the optimal pooling contract imply that all workers above \( a_p \) are promoted in period 3, where \( a_p \) is the solution to maximizing profits subject to (WIC) and (FIC).

It is not necessary that a pooling contract exists where all workers train. To see this, note that if \( w_D^3 - w_E^3 = 0 \), there is no benefit from being promoted and therefore no point in acquiring skills. Increasing \( w_D^3 - w_E^3 \) makes promotion more desirable (from (WIC)), but also increasingly unlikely (from (FIC)), so that it is possible that training cannot be encouraged by any \( w_D^3 - w_E^3 \).

The pooling contract implies that the firm does not use its information on worker ability. This can lead to inefficiencies because the worker always trains while the first best may require that only some should train (i.e., if \( \nabla \alpha > c \)). In addition there may be inefficient allocation of workers to jobs. After training, efficiency requires that a worker should be allocated to job D if \( y_D(a, 1) \geq y_E(a, 1) \). Let \( \bar{a} \) be defined by \( y_D(\bar{a}, 1) = y_E(\bar{a}, 1) \). Then from (FIC), \( a_p > \bar{a} \), if \( a_p > 0 \), so some workers are inefficiently allocated to jobs. (Note that it is possible that no worker is promoted after training.)

The welfare of the pooling contract where training occurs is measured by the surplus created over the cost of training. Hence the welfare generated by the pooling contract is

\[ W_p = 2 \int_0^1 y_E(a, 0) da + \int_0^{a_p} y_E(a, 1) da + \int_{a_p}^1 y_D(a, 1) da - c. \]  

(2)

\(^5\) For example, let \( y_E(a, s) = (1 + s)/10, y_D(a, s) = as, \) and \( c = 0.4 \). Then from (WIC), \( (1 - \alpha)(w_D^3 - w_E^3) = 0.4 \). From (FIC), \( \alpha - 0.2 = w_D^3 - w_E^3 \). Combining these gives the quadratic \( (\alpha - 0.2) (1 - \alpha) = 0.4 \), which has no real roots.
The star system. I now consider the optimal contract in which not all workers are treated identically before training. Before doing so, let me restate the problem. The worker would like to know his ability before he trains. However, the firm cannot be trusted to reveal this information truthfully. Therefore the optimal contract must be designed to credibly reveal to the worker that he is talented.

The firm can signal to the worker that he is talented either by giving a discretionary wage raise and/or by promotion to job D before training. However, in equilibrium the firm will never offer promotion to job D before training because (a) output is higher in job E before training and (b) from an ex ante perspective signaling through wages is costless for the following reason. Suppose that the firm gives a discretionary wage raise of \( x \) to a fraction \( p \) of the workforce to induce training. Then it can reduce the wage paid in period 1 below \( r \) by \( px \) to satisfy (WIR). Hence, signaling through wages is costless so promotion in period 2 is never used.

Results

Since workers on the basic contract do not train, they are paid \( r \), their reservation wage in period 2 and 3. Therefore if the worker is offered the basic contract, the firm earns profits after period 1 of \( 2(y_E(a, 0) - r) \) on a worker of ability \( a \).

Next consider the star contract. The worker would like to know his promotion prospects before he collects skills. If the firm could be trusted to honestly reveal information on the worker it could simply identify those who will be promoted after training. If this is the case then the worker would train if offered a contract where

\[ w^3_D = w^3_E \geq c, \quad \text{(WIC')} \]

as the uncertainty associated with the Japanese system is eliminated (compare (WIC) and (WIC')). The optimal contract then offers \( w^1 = r \), \( w^2_E = r \), \( w^2_D = r + c \), satisfying (WIR) and (WIC'). Any worker who knows that he will be promoted in period 3 trains and earns \( w^3_D = r + c \) in the final period.

The problem with this is that the firm has an incentive to tell the worker that he is talented and will be promoted if he trains in cases in which the firm has no intention of promoting the worker. Hence the firm must credibly signal to the worker that he will be promoted after training. The worker trains if he believes that he will be assigned to job D after training and job D carries a wage premium of at least \( c \). The firm's profits after period 2

\[ \text{For related work on wages as signals, see Beaudry (1990).} \]
from offering $\sigma^*$ to a worker who subsequently trains but is assigned to job E in period 3 are

$$y_E(a, 0) + y_E(a, 1) - w^2_E - w^3_E,$$

(3)

while the profits after period 2 from offering $\sigma$ to a worker who does not subsequently train are $2 \{y_E(a, 0) - r\}$. Therefore if

$$w^2_E + w^3_E \geq 2r + y_E(a, 1) - y_E(a, 0) = 2r + \nabla,$$

(5)

the firm signals to the worker that it does not intent to appropriate the returns to training. This satisfies (FIC), the firm's ex post incentive not to appropriate the returns to training. In equilibrium, $w^2_E$ is not offered. However, since the worker's incentive compatibility constraint implies that

$$w^3_D - w^3_E \geq k$$

for some $k \geq c$, this implies that

$$w^2_E + w^3_D \geq 2r + \nabla + c.$$

(4)

Hence the firm must offer a wage in the star contract where the worker's individual rationality constraint after period one does not bind. In equilibrium (S) binds as this maximizes the number offered $\sigma^*$. If the firm offers more than $V$ as a signal, then it divulges no more useful information on ability than is transmitted by offering $\nabla$. It also makes signaling less efficient as the number of workers offered $\sigma^*$ falls as the wages offered in the star contract increase. If the firm offers less than $\nabla$ over the two periods then no information on ability is revealed. Hence unless (FIC) holds, no information is revealed so that the raise fulfills no signaling role.

If the contract offered satisfies (4), the worker's incentive compatibility constraint is given by (WIC') and the wage premium in job D is chosen to be $c$. The cost of inducing training is then $\nabla + c$ so that the firm offers the star contract if

$$y_D(a, 1) \geq y_E(a, 0) + \nabla + c.$$  
(5)

Since $\nabla = y_E(a, 1) - y_E(a, 0)$ this is simplified to

$$y_D(a, 1) - y_E(a, 1) \geq c.$$  
(6)

Let $a = a_S$ solve (6) with equality.
The worker earns expected wages of \(2r + [1 - a_s]\nabla\) after period 1 since in addition to his reservation wage he earns \(\nabla\) with probability \(1 - a_s\) from (4). Then the firm offers a period 1 wage of \(w^1 = r - [1 - a_s]\nabla\) to satisfy (WIR) with equality.

Thus the firm offers the worker a contract where he earns rents of \(\nabla\) after period 1 if offered the raise contract. One contract among the set of optimal contracts is

\[
\begin{align*}
    w^1 &= r - [1 - a_s]\nabla \\
    w^2_E &= r + \nabla, \\
    w^3_E &= r, \\
    w^3_D &= r + c.
\end{align*}
\]

One final point is worth noting on the optimal contract. To satisfy the worker's individual rationality constraint \(w^*_D \geq r + c\). Since (S) binds, this implies that \(w^*_D \geq r + \nabla\). Then this model implies that if the pooling contract has too many workers training, \(\nabla < c\), the wage paid to the worker must rise in equilibrium when he is promoted from job E to job D.

Let \(\hat{a}\) be defined by \(y^E(\hat{a}, 1) - y^E(\hat{a}, 0) = 1\). This defines a critical level of ability above which all workers should train and below which workers should not train on efficiency grounds. However, the firm offers \(\sigma^*\) only to workers above ability \(a_s > a\). The star contract is inefficient as those between \(\hat{a}\) and \(a_s\) do not train though they should.

The welfare from the signaling contract is

\[
W_S = 2 \int_0^{a_s} y^E(a, 0)da + \int_0^{a_s} y^E(a, 0)da + \int_{a_s}^1 (y^D(a, 1) - c)da. \tag{7}
\]

A Comparison of the Two Contracts

The choice between the star and pooling contracts depends on the returns to training. A comparison of \(W_S\) and \(W_P\) gives the advantage of the pooling contract over the signaling contract as

\[
W_P - W_S = a_s (\nabla - c) - \int_{a_s}^{a_p} (y^D(a, 1) - y^E(a, 1))da. \tag{8}
\]

The first term measures the surplus to training in job E, \((\nabla - c)\). All workers train with the pooling contract but only a fraction \(1 - a_s\) train with the star contract. Hence under the pooling contract, all workers are induced to collect skills (with a return of \(\nabla\)) but the cost \(c\) must be
reimbursed to meet the participation constraint. The lower the cost to
training, the greater the benefits from the pooling contract.

The second term measures inefficient allocation of workers to jobs; with
a star contract, workers above ability $a_s$ are promoted in period 3 while
only workers above ability $a_p \geq a_s$ are promoted with the Japanese con-
tract. This arises through the incentives for the firm to cheat after training,
as stressed in Waldman (1984) and Kahn and Huberman (1988). These
costs are more severe with the pooling contract than with the signaling
contract, because the wage offered to a worker under a pooling contract
must be higher to account for greater uncertainty over promotion pros-
pects.

**Fixed Wage Scales**

In the previous section, the firm signaled its information on $a$ by offering
the talented worker a different wage than that of a less able worker. How-
ever, many organizations use pay scales for particular jobs where there is little opportunity for discretion in the wage offered. This is particu-
larly true for jobs covered by collective bargaining agreements in which
the job wage for a worker (of a given seniority) is usually specified by the
contract. In this section of the paper, I consider how the firm can signal
information to the worker on his promotion prospects when the firm is
constrained to offer all workers in a job the same wage.

The key difference in the analysis above arises in period 2. Because the
firm cannot differentiate by offering a talented worker in job $E$ a wage
different than that of the less able worker, the wage cannot be used as a
signal. Instead, signaling is carried out by assigning the worker to job $D$
in period 2, even though the worker's productivity is higher in job $E$.

A job $D$ assignment signals information in the following way. Assume
that the worker is assigned to job $D$ in period 2. If the firm subsequently
demotes him to job $E$ after training it earns profits after period 2 of

$$y_D(a, 0) - w_D^* + y_E(a, 1) - w_E^*.$$  \hspace{1cm} (9)

If, instead, the firm offers the worker a job $E$ assignment and he does not
train, the firm earns profits of $2[y_E(a, 0) - r]$ as the firm always offers $r$ to
a worker who does not train. Then if

$$y_D(a, 0) - w_D^* + y_E(a, 1) - w_E^* < 2[y_E(a, 0) - r]$$

or

$$y_D(a, 0) - y_E(a, 0) < w_D^* - r - \nabla + w_E^* - r, \hspace{1cm} (S^*)$$
the firm earns higher profits from offering the worker a job E assignment than from promoting him and subsequently demoting him, even if he does not train after a job E assignment. As \( y_D \geq y_E \), this implies that for some \( a^{**} \) (which depends on \( w_D^{**} \)), all workers below \( a^{**} \) are offered the basic contract (a job E assignment) and all workers above \( a^{**} \) are offered the star contract, which now involves early promotion to job D. Hence promotion in period 2 carries information on ability.

The worker is retained in job D after training if

\[
y_E(a, 1) - w_E^3 < y_D(a, 1) - w_D^3.
\]

Let \( a^* \) solve this with equality. Then the worker realizes that if \( a > a^{**} \), he is offered early promotion, but that he retains his job after training only if \( a > a^* \). Hence his incentive compatibility constraint is given by

\[
\max \left( 1, \frac{1 - a^*}{1 - a^{**}} \right) \left[ w_D^3 - w_E^3 \right] \geq c.
\]

The firm's objective is then to maximize expected profits subject to its signaling constraint, the worker's incentive compatibility constraint, and the worker's individual rationality constraint.

Formally this model is no different from that in the previous section. The firm can signal information on the worker's ability, though here it occurs through promotion in period 2 rather than through a wage increase. The only difference is that the firm must now incur inefficient assignment of talented workers in period 2 if two contracts are offered. If the cost of early promotion is small, the firm may use a fast track where young stars are overpromoted as a signal that they should train.

Why Do the Two Countries Use Different Personnel Practices?

In this section of the paper, I consider why observed practices in Japan differ from those in the United States. I make two arguments, one related to differences in production methods and the other to differences in the labor market.

Technological differences. The return to intensively training stars is likely to depend upon the extent to which authority is centralized in an organization. In institutions where most important decisions are made by senior management, there may be little efficiency loss associated with the less able becoming discouraged. On the other hand, in organizations where many important decisions are delegated to middle managers and shop-floor workers, the costs of discouraging the less able may be important.
There is a substantial evidence that Japanese organizations delegate decision making to a greater extent than American organizations. See Cole (1989) and Koike (1988), for example. This occurs through two principal channels: first, just-in-time production, where goods are produced after customer demands are received, and second, quality control circles, where production decisions are discussed and decided upon at the shop-floor level. Through both practices, many decisions regarding what to produce and how to produce it are made at a lower level of Japanese hierarchy than in the United States. Under these circumstances, it should not be surprising that Japanese organizations would care more about discouraging less able workers than American organizations.

*Labor market differences.* In the model constructed above, it was assumed that the firm does not face pressure from the labor market to retain its best workers. For example, if a firm chooses to use the "Japanese model" of career development, then it does not face the prospect of some of its worker's quitting nor of information being revealed on ability from another source.

However, bids made by other firms for a worker may serve to transmit some information which the firm would prefer not to reveal. For example, if a cohort of workers is working in the hope of future promotion, those workers in most demand by other firms are likely to infer better information on their career prospects than those who are continually turned down for jobs. Furthermore, the current employer is likely to fight harder to keep talented employees than less talented employees, so that the firm's response to a bid may reveal information on career prospects, even if the offer itself does not.\(^7\)

The caricature of the Japanese labor market is of lifetime employment, in which workers join firms from college and remain there until retirement. This is often contrasted with American labor markets in which workers

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\(^7\) This argument appears to imply that other employers have better information on the worker's ability than the worker himself. However, the impact of the labor market does not rely on this assumption. First, it is not necessary to interpret \(a\) as the worker's ability. Consider instead a case where the worker knows his ability with certainty but does not know his employer's opinion of his ability. The employer's opinion of the worker's ability is given by \(a\), as in the model above. Then the signal described above would be to signal what his employer thinks of him, not necessarily his true ability. With this interpretation, the labor market may be useful as it could transmit information on what superiors are likely to think of the worker. Alternatively, the source of uncertainty may not be ability but rather the state of the product market. For example, the \(a\) variable used above could index the state of demand where high values of \(a\) imply prosperous times ahead and, hence, good promotion prospects. Low values of \(a\) imply poor promotion prospects. In this case, the firm could signal that the state of demand is good, not that the worker is talented. Bids from other employers would then most likely reveal information on promotion prospects for the market as a whole, which is useful to the worker when deciding whether to collect skills. 
are perceived as transients, moving from one employer to the next. In reality, both labor markets are more similar than the caricature (see Koike, 1988). However, it remains the case that the returns to quitting in mid-career are low in Japan compared to the United States, particularly for workers quitting jobs in large firms. As a result, Japanese employers are unlikely to face the same labor market pressures as those facing many American organizations and so they are more free to choose models of career development which do not pinpoint stars at an early age.

2. Symmetric Uncertainty

So far, I have argued that instigating a fast track can have implications for the collection of human capital when (i) firms have private information over promotion prospects and (ii) workers fear that firms will appropriate the returns to training. There are reasons to believe, however, that in many organizations these are not relevant considerations. First, information on a worker's promotion prospects may be relatively common knowledge by the list of clients he holds or by measures of his productivity. Second, Carmichael (1983) has suggested that a solution to the firm's appropriation problem is to offer workers a tournament for promotion in which the prizes are determined before the workers collect skills. By fixing the wage bill the firm cannot appropriate the returns to training.

Another limiting factor of the model in Section 1 is that the firm operates a fast track either by offering wage increases or by speeding the promotion of the most able. In the literature on career development, much of the literature has focused on how American firms intensively train the most able (providing the less able with less training), compared to more equal training opportunities for Japanese workers.

In this section I consider a model with (i) two workers competing in a tournament, (ii) symmetric uncertainty about the workers' promotion prospects, on (iii) on-the-job training provided by the firm. Here a fast track is offered if the firm intensively trains high ability workers. I then consider the workers' incentives to collect firm specific capital as a function of the on-the-job training provided by the firm.

The model can be summarized as follows. Two observationally equivalent workers join a firm. After a period of time, a signal is observed on the workers' abilities, leaving one worker (the leader) with higher perceived ability than the other (the follower). The firm then provides on-the-job training to the leader and the follower. Following this, the two workers collect firm-specific skills to improve their promotion prospects.

I make two points here. First, when the uncertainty about the workers' ability are characterized by normal distributions, the workers' incentives
to collect human capital are maximized when the leader is handicapped by being provided with less on-the-job training. Intensively training the leader harms worker incentives. Second, when the leader can renegotiate his contract after information is revealed on his ability, he is more likely to be given intensive training than when he cannot renegotiate his contract.

**The Model**

Two observationally equivalent workers join a firm at the beginning of period 1. There is symmetric uncertainty about the (uncorrelated) abilities of the two workers, where all agents believe that worker $i$ had ability, $a_i$, that is normally distributed with mean $a_0$ and variance $\sigma^2_0$. During period 1, an observation on each worker's ability is observed by all agents. The signal on ability for agent $i$, $\alpha^i_0$, is given by $\alpha^i_0 = a_i + \varepsilon^i$, where $\varepsilon^i$ is a normally distributed error with mean 0 and variance $\sigma^2_0$. The error terms for both workers are uncorrelated. Let the worker who draws the higher $\alpha^i_0$ be called the leader and let the other worker be referred to as the follower.

In period 2, the firm provides on-the-job training to the two workers. Training is obtained by carrying out tasks, where the number of tasks has been normalized to zero. Therefore without loss of generality let the leader carry out $t$ tasks and the follower carry out $-t$ tasks. After on-the-job training, the two workers exert effort collecting firm specific human capital in period 2. In particular, worker $i$ can collect skills $s_i \geq 0$ at a cost $C(s_i)$.

After collecting skills, there is another observation on the worker's ability generated by $\alpha^i_1 = a^i + \eta^i$, where $\eta^i$ is normally distributed with mean 0 and variance $\sigma^2_0$. Once again, the error terms are uncorrelated across workers and with the errors in period one. I assume that promotion is offered to the worker with the highest sum of skills, perceived ability, and on-the-job training after $\alpha^i_1$ is observed. In particular, the leader wins promotion if

$$Ea^l + t + s^l \geq Ea^f - t + s^f,$$

(10)

where $Ea^i$ is the expected ability of worker $i$ after the two observations on his ability.

The workers have a utility function

$$V = U(w) - C(s),$$

(11)

where $w$ is the wage paid at the promotion date. I assume $U' > 0, U'' < 0, C' > 0, C'' > 0, C'(0) = 0, C'(\infty) = \infty.$

Note that I have ruled out explicit handicapping schemes as they are in reality difficult to implement.
The firm offers incentives through a tournament, where the winner of the tournament earns \( W \) and the loser earns \( L \). Since the purpose of this section is to illustrate how stars are treated, I assume that \( W \) and \( L \) can be a function of all information before the workers collect skills. Thus \( W \) and \( L \) can be a function of \( \{x_0\} \). Note that the wage bill is fixed before workers collect skills.

One of the purposes of this section is to illustrate the impact of workers renegotiating their contracts after information on ability becomes available. Hence, reservation utilities are allowed to depend on ability in this section. In particular, a worker of expected ability \( a \) has reservation utility \( R(a) \). Hence the market rewards the more able.

**Updating**

After observing \( \{x_0\} \), each worker’s ability is updated to another Normal distribution with mean \( a_1 = (\sigma_0^2 a_0 + \sigma_0^2 x_0)/(\sigma_0^2 + \sigma_0^2) \) and variance of \( \sigma_1^2 = \sigma_0^2/(\sigma_0^2 + \sigma_0^2) \). The worker bases his choice of \( s \) on knowledge of this distribution. After \( \{x_1\} \) is observed, the prior is updated again to another Normal distribution with mean \( a_2 = (\sigma_1^2 a_1 + \sigma_1^2 x_1)/(\sigma_1^2 + \sigma_1^2) \) and variance \( \sigma_2^2 = \sigma_1^2/(\sigma_1^2 + \sigma_1^2) \).

Consider the leader’s incentive. He wins the tournament if

\[
(1 - \phi) a_1^f + \phi a_1^l + s^f + 2t \geq (1 - \phi) a_1^f + \phi a_1^l + s^f, \tag{12}
\]

where \( \phi = \sigma_0^2/(\sigma_0^2 + \sigma_0^2) \). Since \( E(a_1^f | a_1^f) = a_1^f \), the probability of the leader winning promotion is

\[
G(a_1^f + a_1^l + 2t + (s^1 - s^f)), \tag{13}
\]

where \( G \) is the (normal) distribution of \( \phi(\eta^f - \eta^l) \). The leader then chooses \( s^1 \) to

\[
\max_s G(\cdot) U(W) + [1 - G(\cdot)] U(L) - C(s), \tag{14}
\]

implying a first-order condition for an interior solution

\[
g(\cdot) [U(W) - U(L)] = C'(s^*), \tag{15}
\]

where \( g \) is the density of \( G \). The second-order condition \( g(\cdot)[U(W) - U(L)] < C'' \) is assumed to hold. Symmetry of \( G \) implies that the follower chooses the same level of skill collection so that the probability of promotion for the leader is \( G(a_1^f - a_1^l + 2t) \).

The firm’s objective is to maximize its profits subject to the workers’
incentive and individual rationality constraints. So far I have not described the returns to on-the-job training to the firm. One reason for intensively training stars is that the return to training stars is higher than the return to training the less able due to complementarity between ability and training. I ignore this effect here to isolate the effect that on-the-job training has on worker incentives by assuming that the firm's return to training a worker is \( t \), the number of tasks carried out.\(^9\) Hence the return to training nets out to zero so the only role that training plays is in providing incentives.

I have not specified whether workers can renegotiate their contracts after information on ability becomes known. I consider both cases separately.

**Case A: No Renegotiation by Workers**

Here the worker cannot demand a higher wage after information becomes available on his ability. If this is the case the firm will guarantee the worker \( R(a) \) in expected terms (as he is risk averse) so that the firm's objective is to maximize \( s - C(s) \) subject to the workers' incentive constraints and subject to expected utility being at least \( R(a) \).

**Proposition 1.** In the game with no renegotiation by workers, the optimal contract handicaps the star (by providing the follower with more training) until the probability of winning the tournament after \( \{\alpha_0\} \) is observed is \( \frac{1}{2} \).

**Proof.** See Appendix

The intuition for this result is simply that incentives are maximized when the promotion race is close.\(^{10}\) Consequently, the firm handicaps the leader. If the leader is provided more intensive training, then his chance of winning promotion is high, thus reducing the incentive for either worker to exert effort collecting skills.\(^{11}\)

**Case B: Renegotiation Possible by Workers**

In many cases stars may renegotiate their contracts after information on ability becomes available. Hence a worker of ability \( a \) must earn \( R(a) \). With the contract designed above, both workers have a 50% chance of

\(^9\) Note that (10) does not imply this as (10) only refers to the worker's productivity after promotion.

\(^{10}\) If the worker is risk neutral, then incentives can be costlessly increased by increasing the spread of prizes without changing the workers' utility. When workers are risk averse, increasing the spread of prizes increases the firm's wage bill, so that the firm cares about incentive provision through \( G \).

\(^{11}\) This result relies on the density of \( G \) peaking at 0 so that a close contest maximizes incentives.
winning the tournament and earn expected utility of $R(a_0)$. If $a_1 < a_0$, then the leader cannot renegotiate his contract to anything more favorable than that designed above so that Proposition 1 continues to hold. However, if $a_1 > a_0$, this is not the case.

**Proposition 2.** Assume that the workers can renegotiate their wages. If $a_1 > a_0$, the leader is more intensively trained than in Proposition 1.

*Proof.* See Appendix.

Hence when stars can go to the labor market to renegotiate their contracts, they will get more intensive training than in the case where they cannot renegotiate. Hence in an economy such as the United States, where midcareer quitting is more common than in Japan, we would expect to see more renegotiation of contracts and hence more intensive on-the-job training of stars.

**Discussion**

There is a mistaken view that Japanese companies pay workers purely on the basis of seniority. As Vogel (1980) reminds us, “the Japanese company makes it clear that its substantial benefits to employees are not guaranteed” (p. 149). Instead, Japanese firms defer decisions on “high fliers” until 12 to 15 years after the worker joins. This contrasts with quick evaluation and selection of stars in American organizations. According to Thurow (1985), “the difference between Western and Japanese practices is whether employees are distinguished at the beginning or the end” (p. 29). This paper has illustrated how the choice of career development affects a worker’s incentive to collect skills, noting (i) the incentives of the less able, (ii) the signaling role of wages and promotion, and (iii) the effect of on-the-job training on incentives to collect firm specific human capital.

The results in Section 1 address a wider sociological literature known as labeling theory, which holds that if you treat someone as a star, he may then act as a star. As Baron (1984) summarizes recent advances in the sociology of organization, “stratification not only reflects but determines attributes of workers” (p. 59). This paper gives a simple economic interpretation of this phenomenon. Finally, note that the signaling results provide another justification for efficiency wage theory (where effort is positively correlated with wages) as here the worker exerts effort collecting skills if paid the required wage raise to signal that he is talented.

**Appendix**

*Proof of Proposition 1*

I show this by illustrating how any $s$ is induced most cheaply to the firm by choosing $G = \frac{1}{2}$. Let $\Delta = W - L$. First note that
\[ \frac{\partial \hat{s}^*}{\partial \Delta} = g(a'_1 - a'_1 + 2t) \left( \frac{U'(W) - U'(L)}{C''} \right) > 0 \] (16)

and

\[ \frac{\partial \hat{s}^*}{\partial t} = 2g'(a'_1 - a'_1 + 2t) \left( \frac{U(W) - U(L)}{C''} \right) > (>) 0 \quad \text{if } G < (>) \frac{1}{2} \] (17)

Consider the effect of increasing \( \Delta \) on the utility of the leader. As both workers increase skill collection, this is given by

\[ aU'_l = (2h' - C') \frac{\partial \hat{s}^*}{\partial \Delta} + GU'(W) - [1 - G]U'(L), \quad a \Delta \] (18)

where \( \lambda' \) is the marginal utility of an extra unit of output to the \( i \)-th agent. Similarly, for the follower,

\[ aU'_f = (2h' - C') \frac{\partial \hat{s}^*}{\partial \Delta} + [1 - G]U'(W) + GU'(L). \] (19)

Each worker is as likely to be the leader as the follower so I can consider the effect on expected welfare of the worker conditional on \( \{a_i, \} \), \( V \), by averaging these marginals, i.e.,

\[ \frac{\partial V}{\partial \Delta} = (2\lambda' - C') g(\cdot) \left( \frac{U'(W) + U'(L)}{C''} \right) + U'(W) - U'(L), \] (20)

where \( \lambda \) is the average marginal utility of income. This expression equals zero in equilibrium. By similar reasoning,

\[ \frac{\partial V}{\partial t} = 2(2\lambda' - C') g'(\cdot) \left( \frac{U(W) + U(L)}{C''} \right) = 0. \] (21)

But from (20), \( 2\lambda > C' \) as \( U'(L) > U'(W) \). This implies from (21) that \( g' = 0 \) or \( G = \frac{1}{2} \), so that each worker has an equal chance of victory after observing \( \{a_i, \} \).

**Proof of Proposition 2**

Suppose that \( G \leq \frac{1}{2} \). Then the expected utility of the follower is at least as great as that of the leader, which is at least \( R(a'_1) \). Then the follower strictly earns rents over his market wage. The firm can then reduce the
rents of the follower by increasing $G$. If $G < \frac{1}{2}$, this improves incentives from (17) and so the firm always increases $G$. If $G = \frac{1}{2}$, then second-order losses are induced from increasing $G$ but first-order gains incur in wage costs. Hence the firm always chooses $G > \frac{1}{2}$. ■

References


