The Timing of Promotion to Top Management in the U.S. and Japan: A Duration Analysis

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ABSTRACT

This paper first develops a simple search model of the firm seeking to choose a new CEO by using the promotion tournament. We then use the model to derive two empirical hypotheses concerning the duration of the tournament and its relationships to firm size and observable signals of the contenders' ability such as educational credentials. These hypotheses are tested by using unique micro data on recently completed tournaments of 695 leading corporations in the U.S. and 819 leading corporations in Japan. Further, the comparative nature of the data set allows us to contrast the relevance of the search model between the two nations. The estimates from our preferred specifications of a Weibull duration model provide evidence for the hypotheses in both the U.S. and Japan. Specifically, (i) larger firms are more likely to prolong the promotion tournament; (ii) when CEO contenders have less outside experience, the firm is more likely to prolong the tournament; and (iii) when CEO contenders are not college graduates, the firm is more likely to prolong the tournament. Furthermore, contrary to the popular view, CEO contenders having strong college credentials (e.g., graduating from the University of Tokyo) do <u>not</u> significantly alter the firm's optimal stopping rule of the tournament in Japan, whereas, strong credentials do matter in the U.S.

THE TIMING OF PROMOTION TO TOP MANAGEMENT IN THE U.S. AND JAPAN: A Duration Analysis

I. Introduction

We develop a simple search model of the firm seeking to select its new CEO by using the promotion tournament. We then use the model to derive two empirical hypotheses concerning the duration of the tournament and its relationships to firm size and observable signals of the contenders' ability such as educational credentials. These hypotheses are tested by using unique micro data containing information on recently completed tournaments of 695 leading corporations in the U.S. and 819 leading corporations in Japan.

The paper makes three distinct contributions. For the first time, we analyze the CEO promotion tournament in the U.S. and Japan using a duration model.[1] Second, we generalize the Weibull hazard so that the regressors need not have the same proportional effect at all dates. A likelihood ratio statistic is then applied to determine whether the proportional hazard is appropriate. Third, on our reading of the literature, the paper represents one of the first attempts to model the tournament in the search theoretic framework.[2]

Our findings are of particular relevance concerning the Japanese economy. While diverse theories as to the determinants of the postwar success of the Japanese economy have been advanced, the matter remains controversial with competing views of alleged unique human

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[1]In the last few years we have witnessed a rather impressive emergence of econometric studies of top management compensation and turnover in Japan such as Anderson, Jayaraman, and Mandelker (1993), Ang and Constand (1993), Kaplan (1992), Kaplan and Minton (1993), Kato and Rockel (1992), and Morck and Nakamura (1992). However, the focus of these studies has been on the incentive structure of top management compensation and turnover, and the influence of main banks and other firms in the same corporate group. None of these studies has examined promotion tournaments in Japanese firms.

[2]A notable exception is O'Flaherty and Siow (1992).

resource management practices, superior industrial policy, and innovative production methods. Recently Koike (1991) stresses the positive role played by the promotion policy of Japanese firms in accounting for their competitiveness. He argues that Japanese firms tend to prolong the promotion tournament longer than U.S. firms, resulting in more competition among employees and more accumulation of firm-specific human capital.

We contribute to this important controversy by providing the first rigorous econometric and comparative evidence on the promotion policy of top management. As emphasized by Koike (1991), we find that Japanese firms do tend to prolong the promotion tournament relative to U.S. firms. Furthermore, our search model of the tournament suggests that the difference in the promotion policy between the two nations may be caused by the difference in: (i) time discount rates; (ii) incentive effects of the promotion tournament; and (iii) adjustment costs of replacing the incumbent CEOs.

The paper is organized as follows. In the next section, we develop a simple search model of the promotion tournament, which will be used to guide our empirical analysis. Sections III and IV derive two empirically testable hypotheses, while section V provides the basic empirical strategy and describes the data. In section VI we present our main empirical results, and we follow with concluding remarks.

II. A Simple Search Model of the Promotion Tournament

Consider the firm seeking to choose its new CEO by using the promotion tournament.[3] The firm acquires additional information on the ability of each contender by observing him in

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[3]For the promotion tournament in general, see Milgrom and Roberts (1992; chapter 11) for instance. For recent applications of the idea of the promotion tournament to Japanese promotion policy, see Itoh (1991) and Prendergast (1992).

his current job, and the tournament ends when the firm names the winner and replaces the incumbent CEO. A firm's decision on when to end the tournament can be modelled in a simple search theoretic framework[4]. Assume that the ability of each contender is revealed to the firm at rate δ. Thus, the probability that one contender's ability is revealed to the firm within a short interval of length h is δh.[5] The parameter δ is the arrival rate of information on the ability of CEO contenders. We summarize the ability of a contender by the profit, π, of the firm under his leadership as CEO. Successive revelations of the ability of contenders over the course of the tournament are drawn from a known distribution with finite mean μ and variance v, cumulative function $F(\pi)$, and density $f(\pi)$.

Assume that the firm maximizes the expected present value of profit flow, discounted to the present over an infinite horizon at rate r. The ending of the tournament will entail costs. First, as stressed in the tournament literature, since contenders are fully aware that the firm seeks to learn their ability by observing their performance on current jobs, the promotion tournament provides positive incentive effects on contenders. The termination of the tournament will forego these positive incentive effects.[6] Second, the conclusion of the tournament will lead to replacement of the incumbent CEO, which may entail some adjustment costs such as costly reorganization of internal organizations. Denote the cost of ending the tournament by c.

If the firm ends the tournament, the firm will earn the discounted present value of profit under the new leadership net of the cost of the tournament termination over an infinite

[4]For a thorough literature review on the search approach in labor economics, see Devine and Kiefer (1991) for instance.

[5]We are making a simplifying assumption that no more than one contender's ability is revealed in the interval h. The assumption is innocuous.

[6]A similar point is made by Itoh (1991) and Prendergast (1992).

horizon. That is,

$$U^e(\pi)=\frac{\pi-c}{r} \tag{1}$$

Alternatively, if the firm decides not to end the tournament, the firm will earn instead:

$$U^n=\frac{1}{1+rh}bh+\frac{\delta h}{1+rh}E_\pi[\max(U^e(\pi),U^n)]+(1-\delta h)\frac{1}{1+rh}U^n \tag{2}$$

where b is the profit under the incumbent CEO. The first term is the discounted present value of the profit under the incumbent CEO over the interval h. Over the next interval, two mutually exclusive events may occur; (i) the value of π is revealed with probability δh; and (ii) the value of π is not revealed with probability (1-δh). In the first event, the firm will earn the expected discounted present value of following the optimal policy if π is revealed, whereas, in the second event the firm will earn the discounted present value of continuing the tournament.

Since $U^e(\pi)$ is monotonically increasing in π and U^n does not depend on revealed value of π, one can solve for a minimum level of π (reservation profit π^*) at which the firm is indifferent between ending and continuing the tournament. That is,

$$U^e(\pi^*)=\frac{\pi^*-c}{r}=U^n \tag{3}$$

The firm's optimal policy is to end the tournament when $\pi \geq \pi^*$. From Eq. (3), one can obtain the following optimality condition which is in parallel to the optimality condition for unemployed search:

$$\pi^*=b+c+\frac{\delta}{r}\int_{\pi^*}^{\infty}(\pi-\pi^*)f(\pi)d\pi \tag{4}$$

Alternatively,

$$(\pi^{*}\quad b-c)r=(E_{\pi}[\pi\,|\,\pi\geq\pi^{*}]-\pi^{*})[1-F(\pi^{*})]\delta \tag{5}$$

The left-hand side represents the marginal cost of not ending the tournament when the revealed ability of the contender is equal to π^*, or the imputed interest income flow on the difference between profit under his leadership as CEO and profit under the leadership of the incumbent CEO net of c. The right-hand side is the marginal benefit of not ending the tournament. That is, it is the marginal expected gain in future profit from not ending the tournament, given that the tournament will be ended only when the revealed ability of the contender, π, exceeds π^*, multiplied by the probability that such value of π is revealed. Comparative static results in parallel to the search model of unemployment can be obtained from this optimality condition. Particularly, increases in b, c, δ, or μ will result in an increase in the reservation profit. On the other hand, an increase in r will lead to a decrease in the reservation profit.[7]

Let E denote the probability that the firm will end the tournament in a short interval of length h. Denote by η the conditional probability that once a contender's ability (π) is revealed, the firm will end the tournament by naming him the CEO. The firm will name him the winner insofar as π exceeds its reservation level, π^*. Thus,

$$\eta(\pi^{*})=\int_{\pi^{*}}^{\infty}f(\pi)d\pi=1-F(\pi^{*}) \tag{6}$$

Since E is the product of $\eta(\pi^*)$ and the probability that π is revealed to the firm within a short interval of length h,

$$E=\delta h\,\eta(\pi^{*}) \tag{7}$$

Dividing through by h yields the instantaneous rate of ending the tournament, namely the hazard:

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[7]Derivations of these results and other unreported results are available upon request.

$$\theta = \delta \eta(\pi^*) \tag{8}$$

Using Eq. (8) and Eq. (4), again one can obtain comparative statics results in close analogy to those in the search model of unemployment. Specifically, an increase in b or c will lead to a decrease in the hazard rate whereas an increase in r will result in an increase in the hazard rate.

III. Firm Size and Hazard

By using the above search model, one can develop an empirically testable hypothesis between firm size and the hazard rate. First, one can argue (**ceteris paribus**) that the cost of ending the tournament, c, is greater for larger firms. The reasoning is that positive incentive effects of the promotion tournament are less relevant for smaller firms since direct monitoring (as opposed to indirect incentive devices such as the promotion tournament and deferred payments) may be more feasible for these firms.[8] The termination of the tournament may not forego much of the incentive effects for those smaller firms. The replacement of the CEO can also be carried out more smoothly in smaller firms where the internal organization of the firm is less complex and less hierarchical.

Moreover, for Japanese firms, recent theoretical contributions in the literature of Japanese corporate governance suggest that the system of financial corporate grouping (that is, grouping of firms linked by their relationships to a main bank and by cross-holding of equity) allows large Japanese firms to be relatively free from pressure from individual shareholders who are mostly interested in short-term returns. It follows that large Japanese firms affiliated with financial

[8]Similar arguments are developed for the incentive effects of profit sharing by Cable and Wilson (1990) and Kruse (1993).

corporate groups are more likely to pursue longer-term goals, thereby having a lower discount rate, r.[9] Since larger c and lower r results in a lower hazard rate (as shown in the prior section), one can predict,

H_1 (Firm Size and Hazard): the hazard will fall as firm size rises.

IV. Signals and Hazard

While a strict interpretation of our model implies random search, it is clear that firms will most likely use some observable signals to decide which employees to include in the promotion tournament.[10] For example, educational qualifications and prior work experience may be used to identify suitable candidates. Indeed, the firm may assume correctly that those with stronger credentials and/or previous work experience will tend to be in the right-hand tail of $f(\pi)$. Since the firm knows who has stronger credentials and greater prior experience, it will be optimal for the firm to closely monitor the progress of these talented individuals. In other words, when one has a sample of tournament winners with varying educational credentials and prior work experience,

H_2 (Signals and hazard): stronger educational credentials and greater prior experience will result in higher hazards.[11]

[9]For Japanese corporate groups, see Aoki (1988; chapter 4) for instance.

[10]On the issue of systematic versus random search, see for instance Salop (1973) and Kahn and Low (1988).

[11]One can envision a more general model in which the firm's decision is made in two stages. First, as modelled in the paper, given observable signals, the firm decides the optimal promotion policy. Second, given the optimal promotion policy, the firm selects the optimal pool of CEO promotion contenders in terms of their observable signals such as educational credentials and experiences by balancing the cost and benefit of selecting the pool with strong signals. One can view our analysis in the paper as a study of the optimal promotion policy, given the pool of optimally chosen contenders.

V. Data and Empirical Strategy

The **Business Week CEO 1000 Special Issue** (October 23, 1987) provides information on the most recently completed CEO promotional tournament of 1,000 leading corporations in the U.S., which were selected on the basis of their market equity values (share price multiplied by number of shares outstanding) as of stock-market close, September 11, 1987. The information includes detailed personal characteristics of winners of the most recently completed tournaments (or the current CEOs) such as educational credentials, experience prior to joining the present firm, experience within the present firm prior to winning the promotion tournament, and experience after winning the tournament. Merging the data with the usual accounting data that we assembled from **Moody's** and **Standard and Poor's**, and eliminating observations with missing data and those firms that chose the current CEO not by the promotion tournament,[12] we created a data base containing information of 695 leading U.S. corporations on the most recently completed CEO promotional tournament and various company characteristics.

To create a comparable data set for Japan, we began calculating the market equity value of all Japanese companies listed on Japan's eight Stock Exchanges (there were nearly 2,000 companies listed in 1986), multiplying share price as of stock-market close, July 31, 1986, by number of shares outstanding as of August 1, 1986. Data on share prices were taken from the Weekly Toyo Keizai **1987 KABUKA SORAN Special Issue** (February 6, 1987), and data on number of shares outstanding were taken from the **Fall 1986 KAISHA SHIKI HO**, published by the Oriental Economist. Based on these calculations, we selected the 1,000 most valuable Japanese companies, and compiled biographical data on their current chief executives (shacho or

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[12]We consider "not by promotion tournament" those firms that chose the current CEO by having the firm founded by the CEO or by bringing in an outsider as CEO. In either case, the tournament duration is zero.

todori)[13], or winners of the most recently completed CEO tournaments, from the **1987 KAISHA SHOKUIN ROKU** (published by the Diamond) and the **1987 YAKUIN SHIKI HO** (published by the Oriental Economist). The resulting data were further merged with the corporate accounting data that we collected from the **Weekly Toyo Keizai KABUKA SORAN Special Issue** (February 6, 1987), the **Fall 1986 KAISHA SHIKI HO** (published by the Oriental Economist), and a computer tape **DATA MAX** prepared by the Oriental Economist. After eliminating observations with missing data and founders and external recruits, our final sample contains 819 observations.

Our data enable us to model the duration of tournaments defined as the time between the year in which the tournament winner (or the current CEO) joined the firm and the year in which he was selected as the CEO. Deducting backward from the fact that he did indeed eventually become the CEO, we assume that the tournament resulting in selecting him must have begun when he joined the firm.[14]

For this purpose, we specify the hazard function as Weibull, such that,

$$\theta(t)=\alpha\lambda^{\alpha}t^{\alpha-1} \tag{9}$$

where the hazard, $\theta(t)$, is time dependent unless $\alpha=1$, in which case we have the Exponential model (see Lancaster, 1990: 36). Moreover, we can allow for a heteroskedastic hazard by allowing α and/or λ to depend on time-invariant regressors. To date, almost all empirical

[13]Japanese banks call their chief executives "todori" whereas other Japanese companies call them "shacho".

[14]This assumption is clearly consistent with institutional accounts of the Japanese promotion policy that employees are formally and informally categorized by the year in which they joined the firm and are subject to the same promotion process (See, for instance, Itoh, 1991 and Prendergast, 1992). Note that the assumption is not valid for founders and external recruits that are excluded from the data.

applications that use the heteroskedastic Weibull hazard have allowed λ (but not α) to vary with the explanatory variables. The implication of this specification is that the proportionate effect of each of the regressors on the hazard is the same regardless of the value of t. In this paper, we test the latter specification by allowing both α and λ to depend upon regressors, and then we test whether α is homoskedastic. If so, then we determine whether the Exponential reduction, $\alpha=1$, appears valid.[15]

To test the first hypothesis concerning the relationship between firm size and hazard, we consider three alternative size variables: total sales (SALE), number of employees (EMPLOYEE), and market value of the firm (VALUE). As shown in Table I, the average firm in our US sample is significantly larger than the average firm in our Japanese sample. In fact, the average US firm employs about five times more employees than the average Japanese firm.

For the second hypothesis concerning signals and hazard, the data allow us to consider several variables. First, we create a dummy variable, NO COLLEGE, that equals unity if the winner of the tournament holds no college degree and zero otherwise. Not too surprisingly, as shown in Table I, nearly all winners in both nations are college graduates (95.2 percent of the winners in the Japanese sample and 96.7 percent in the U.S. sample). This suggests that what makes the difference among those CEO tournament contenders may not be whether they attended college, but rather which college they attended. To capture this aspect of educational credential

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[15]It is quite plausible that the incentive effects of the tournament, c will diminish as the tournament progresses, or $c=c(t)$: $c'< 0$. As the tournament progresses, the size of the contender pool may decrease because a contender whose ability is revealed to the firm and is not chosen to be the winner will exit from the tournament. The incentive effects of the tournament will apply only to those who are still in the tournament. Second, the productivity of the incumbent CEO may well decline as time goes by due to the depreciation of his human capital, or $b=b(t)$; $b'< 0$. Since it has been shown that the hazard is a decreasing function of c and b, it follows that increasing hazard (or positive duration dependence) is likely. In fact, that is what we find.

signal, we create a dummy variable, TOKYO (HARVARD for the U.S. sample), that equals to unity if the winner of the tournament holds a college degree from the University of Tokyo (Harvard University for the U.S. sample), and zero otherwise. As shown in Table I, 26.3 % of all winners in the Japanese sample received their highest degrees from the University of Tokyo, while 13.1% in the U.S. sample received their highest degrees from Harvard. Furthermore, the data enable us to create for the Japanese sample two additional dummy variables -- ECOBUS and ENGINEER -- where ECOBUS (ENGINEER) equals to unity if the winner of the tournament holds a degree in Economics and/or business (in engineering), zero otherwise. Likewise, the data allow us to create for the U.S. sample an additional dummy variable, MBA, that equals to unity if the winner holds a degree of MBA, zero otherwise. Finally, for prior experience, the data enable us to calculate the number of years spent after finishing an undergraduate degree (or completing high school for those without college degrees) and before joining the present company (PRIOR EXP).

Where possible, we employ a simple difference-in-means test to determine whether the average value of a given variable in Japan is equal to that in the U.S. As is almost self-evident from a casual reading of Table I, we reject the null hypothesis of equality in most cases. For example, the average age at promotion is statistically different (and, in fact, higher) in Japan than in the U.S. One notable exception to the rule, however, is prior experience. We do not reject the null hypothesis (at the 10% significance level) that the average prior experience of Japanese contenders is equal to the average prior experience of U.S. contenders. While it is tempting to conclude from this finding that Japanese and American firms equally value years of experience outside the firm, the duration results presented in the next section lead to a different point of view.

VI. Empirical Results

Our duration analysis begins with nonparametric estimation of the hazard functions for the U.S. and Japan. We first estimated the survival curves (without regressors) by using LIMDEP (1989). The nonparametric point estimates of the hazards at various durations are summarized in Figure I. We immediately see that the hazards in both Japan and the U.S. generally increase with duration, thereby indicating that the Weibull distribution (with a monotonic hazard function) might be appropriate. As expected, the nonparametric z-test proposed by Mudambi and Taylor (1991, eq. 3) has realized values of 22.24 and 21.31 for Japan and the U.S., respectively, and we therefore reject constant transition probabilities at conventional levels of significance. Indeed, our search model suggests that while firms will prolong tournaments up to a point to enhance work effort and to reap quasi-rents from prior investments in the incumbent CEO, eventually they must announce a new winner. The implication is for eventual positive duration dependence. We also note that the hazard rates are generally higher in the U.S. than in Japan at any given duration, which concurs with our prior expectation.

Because there is no censoring of our data, we are able to formulate our (parametric) Weibull model in linear form (see Lancaster, 1990: 35),

$$\ln(T) = -\ln(\lambda) + \frac{U}{\alpha} \qquad \textbf{(10)}$$

where T is the completed duration and exp(U) follows the exponential distribution. As is typically the case, we specify $\lambda = \exp(-\beta'X)$ so that consistent estimates of β can be obtained by using ordinary least squares (OLS). Efficient estimates, however, are obtained only by using maximum likelihood (ML) since the disturbances are non-normal.

The Weibull **hazard** is said to be heteroskedastic if λ varies with X; see Lancaster (1990).

However, it is clear that the above linear model will have heteroskedastic **disturbances** if α is a function of a set of regressors, Z. Moreover, there appears no a priori reason to exclude the possibility that the disturbances are indeed heteroskedastic. We therefore initially specify that $\alpha = 1/(\sigma \exp(\gamma'Z)^{1/2})$ and then test whether $\gamma=0$. As discussed in the prior section, homoskedastic disturbances ($\alpha=\sigma^{-1}$) imply that the proportionate effect of each regressor on the hazard is independent of duration. Furthermore, the constant-hazard Exponential model results from the restriction that $\alpha=\sigma=1$.

Our preferred empirical model for the U.S. is found in Table II, while our results for Japan are found in Table III.[16] For both countries, we present unrestricted maximum likelihood estimates of ß and γ, as well as those where γ is restricted to be a vector of zeros. Our goodness-of-fit measure, r^2, is constructed by first calculating the expected duration for each observation in the sample [(see Lancaster (1990, p. 37)], and then correlating the expected duration with the observed duration. This measure of fit is completely analogous to R^2 in the classical linear regression model.

For the unrestricted models, we employed a general-to-specific modelling strategy to determine which variables were important in the regression and skedastic functions for Japan and the U.S., respectively. Likelihood ratio tests were used to determine which variables could be dropped without affecting the validity of the empirical model. Since likelihood ratio tests also strongly reject the restricted specification for both the U.S. and Japan, it appears that the proportional Weibull model is inappropriate for these data. Rather, we find that VALUE and PRIOR EXP are important variables for the U.S. skedastic function (i.e., the function that

[16]Due to extreme values, the variables VALUE, $(\text{VALUE})^2$, PRIOR EXP, $(\text{PRIOR EXP})^2$, SALE and $(\text{SALE})^2$ have been rescaled in order to condition the data for maximum likelihood estimation. Our conclusions are unchanged by the variable transformations.

describes movement in α), while SALE, EMPLOYEE, PRIOR EXP and ENGINEER are dominant variables in the Japanese skedastic function.[17] The variables VALUE, SALE and EMPLOYEE each measure the size of the firm, and it is easy to believe that the distribution of (log) durations around the conditional mean are different for smaller firms than for larger firms. Furthermore, we find that the distribution of durations depends upon years of experience outside the firm. For both the U.S. and Japan, we find that larger firms have smaller dispersion of (log) durations, and that (**ceteris paribus**) prior experience of the new CEO leads to greater uncertainty as to the end of the promotion tournament. Finally, in Japan we find that it is easier to predict the end of the promotion tournament for engineers than for others.

To ensure that our reduced unrestricted models (in Tables II and III) are congruent with the data, we constructed residual plots and performed a diagnostic check on the integrated hazard as described by Lancaster (1990, pp. 308-313). We found an exceptionally good fit for the U.S., and a good fit for Japan once we interacted the variable EMPLOYEE with a dummy to indicate whether the tournament winner had prior experience.[18] Additionally, an influential data analysis [see Taylor (1993)] revealed that those observations that have a larger impact on the estimated coefficients and standard errors appear to be legitimate. Conditional upon the information set,

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[17]The details of these tests and other unreported regression results are available from the authors upon request.

[18]The dummy variable to indicate whether the tournament winner had prior experience captures discrete differences between those who adhere strictly to the "lifetime employment ideal (working for the same firm for the entire working life) and the others. That the dummy variable is relevant to Japan yet not to the U.S. appears to be consistent with the importance that Japanese firms are alleged to place on the system of lifetime employment, whereby the firm provides its employees with lifetime employment security and in turn employees offer lifetime commitment and loyalty to the firm for the entire working life.

our final model specifications thus seem to be quite adequate.[19]

The estimated regression functions for the U.S. and Japan are qualitatively similar. We find, for example, that larger firms tend to have longer tournaments, and this coincides with our first hypothesis that the hazard will fall as the firm size rises. Because the coefficients on $(VALUE)^2$ in the U.S. regression and $(SALE)^2$ in the Japanese regression are negative, we see that the impact of marginally increasing the size of the firm is less for large firms than for small firms. Such an empirical result is intuitive. On the other hand, we find that the size variable EMPLOYEE influences the Japanese regression function only for those contenders with no prior experience. In this respect, Japanese firms with more employees typically require that contenders with no prior experience spend additional time preparing for the CEO position.

Since the converse of duration time is the hazard rate, we gain a deeper appreciation of the importance of firm size by graphing the hazard function. To do so, we determine the observations in our U.S. and Japanese samples that fall at the beginning of the second and fourth quartiles when the firms are ranked according to size, as measured by VALUE in the U.S. and SALE in Japan. With VALUE and SALE respectively set to these quartile values, we then assume that all categorical variables are zero and that the new CEO has no prior experience. Finally, for Japan, we assume values for EMPLOYEE that correspond to the firms identified at the beginning of the second and fourth quartiles when the ranking is according to EMPLOYEE.

In Figure II, we graph the hazards for small and large firms. As expected, we see that large U.S. firms have lower hazards than small U.S. firms. This corresponds with our notion that positive incentive effects are less relevant for smaller firms and that replacing the incumbent

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[19]We also attempted to model durations by using a Weibull density with unobserved gamma heterogeneity, but the results were very unsatisfactory and in most cases the iteration routine failed to converge.

CEOs entails less adjustment cost for smaller firms. In Japan, we see that the hazards are initially lower for large firms than for small firms, but the relative positions reverse at a duration of about 27 years. While seemingly counter-intuitive, this result can be explained. Larger Japanese firms are more inclined to pursue long term goals (which implies a lower hazard), but there is less uncertainty among larger firms (which implies a hazard with greater curvature). The observed hazards are as expected if large Japanese firms are more bound to tradition and thus less discretionary than small Japanese firms. Furthermore, we see that U.S. firms have substantially steeper hazards than Japanese firms after a duration of about 15 years (note that the scale of the Japanese axis is half that of the U.S.). As discussed above, this is perhaps due to the hypothesized lower time discount rates and higher costs of terminating the promotion tournament in Japan.

Our regression functions also reveal that prior experience tends to shorten the typical tournament in both the U.S. and Japan, though our skedastic functions indicate that it is more difficult to predict tournament durations for those with greater prior experience. These regression results concur with our second hypothesis that prior work experience will result in higher hazards due to stronger (positive) signals, while the results from the skedastic function are also intuitively plausible since the variation in the quality of the previous work environment can be quite large.

In Figure III, we plot the hazards for mid-size firms by using the median values for SALE, EMPLOYEE and VALUE. We compare those tournament winners with no prior experience (PRIOR EXP = 0) versus those with a prior work history. Of those with a work background, the average previous experience is 11 years in the U.S. and 15 years in Japan. As expected, we see that the tournament winners with prior experience initially have substantially higher hazards than those without work experience. As the tournament duration progresses, however, we see that the relative positions of these hazards will switch, reflecting the fact that there is less promotion uncertainty for those with no experience. Interestingly, we see that this switch does not occur for the U.S. until about 43 years, and sometime after 50 years for Japan. Therefore we conclude that prior work experience is usually interpreted as a strong positive signal in favor of the tournament winner. The gap in the hazard between those with and without prior experience is greater for the U.S. than for Japan, supporting a popular notion that previous work experience is more valuable in the U.S. than in Japan.

Except for the industrial dummies, all of the other variables included in our model measure the academic credentials of the new CEO. As predicted by the second hypothesis, the lack of a college degree leads to a decrease in the hazard in both countries, whereas, a degree from Harvard or having an MBA diploma in the U.S. increases the hazard function. Surprisingly, having a degree from the University of Tokyo will not significantly change the average tournament duration in Japan. This result is unexpected since Japanese culture is usually thought to place extreme emphasis on credentials.[20] Nor will having a degree in economics or business influence the hazard function. Interestingly, however, having a technical background does appear to prolong the promotion decision, and from the skedastic function we see that there is less uncertainty about the (longer) tournament durations for engineers. Such a result is not entirely surprising since the different job skills are needed in managerial as opposed to technical careers.

VII. Concluding Remarks

The paper began with developing a simple search model of the firm seeking to select its

[20]We note that in the proportional Weibull model (which was rejected in favor of the unrestricted Weibull model), the coefficient on TOKYO is negative and significant. This supports our **a priori** view.

new CEO by using the promotion tournament. The model was then used to guide our empirical analysis. We derived and tested two empirical hypotheses concerning the duration of the tournament and its relationships to firm size and observable signals of the contenders' ability such as educational credentials. In summary, our preferred specifications of the Weibull duration model for the Japanese and U.S. samples provided much evidence for both hypotheses. Specifically, (i) larger firms are more likely to prolong the promotion tournament, (ii) when CEO contenders have less outside experience, the firm is more likely to prolong the tournament; and (iii) when CEO contenders are not college graduates, the firm is more likely to prolong the tournament. Furthermore, contrary to popular view, we find that strong college credentials (such as graduating from the University of Tokyo) do not significantly alter the firm's optimal stopping rule of the tournament in Japan, whereas, they do in the U.S.

Our results contribute to an important controversy over the determinants of the postwar success of the Japanese economy by providing the first rigorous econometric evidence on the difference in the promotion policy between Japanese and U.S. firms. Specifically, our duration analysis supports Koike's recent hypothesis that Japanese firms tend to prolong the promotion tournament longer than U.S. firms, resulting in more competition among employees and more accumulation of firm-specific human capital and thus more overall competitiveness of Japanese firms. Furthermore, our search model of the promotion tournament suggests that the difference in the promotion policy between the two nations may be caused by the difference in: (i) time discount rates; (ii) incentive effects of promotion tournaments; and (iii) adjustment costs of replacing the incumbent CEOs.[21]

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[21]One can use a standard human capital theory to explain the difference between the Japanese and U.S. promotion policy. For instance, Kato (1993) cites Kagono, Nonaka, Okumura, Sakakibara, Komatsu, and Sakashita (1984) reporting that Japanese chief executives

APPENDIX

This appendix contains the definition of variables.

The Japanese Sample

YEARS IN FIRM BEFORE PROMOTION = years spent in firm before winning the tournament (or becoming chief executive).

PRESENT AGE = age of the tournament winner at the end of 1985 (fiscal).

AGE AT PROMOTION = age at the time of winning the tournament.

PRIOR EXP = years spent after receiving an undergraduate degree (or high school diploma for those without college degrees) and before joining the present firm i. If one receives an undergraduate degree after joining the present firm i, then it will be set to zero.

NO COLLEGE = 1 if the tournament winner holds no college degree, 0 otherwise.

TOKYO = 1 if the tournament winner received his highest degree from the University of Tokyo, 0 otherwise.

ECOBUS = 1 if the tournament winner holds a degree in Economics and/or Business, 0 otherwise.

ENGINEER = 1 if the tournament winner holds a degree in engineering, 0 otherwise.

VALUE = market value of the firm at the end of 1985 (fiscal).

SALE = total sales revenue in 1985 (fiscal).

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tend to place more emphasis on their role of gathering and distributing information between divisions and departments, and their role of forming consensus between divisions and departments than U.S. chief executives. This suggests that to be a chief executive in Japanese corporations may require more firm-specific information and human capital than in U.S. corporations. Since firm-specific information and human capital are acquired through on-the-job training, an individual will have to have more years of experience in the firm when becoming chief executive in Japan than in the U.S. The present paper offers an alternative explanation from the incentive perspective.

EMPLOYEE = number of employees at end of 1985 (fiscal).

IND = 1 if the tournament winner has no prior experience (or PRIOR EXP = 0), 0 otherwise.

GASE = 1 if the firm's industry designation is "electricity and gas (denki gasu)", 0 otherwise.

The U.S. Sample

YEARS IN FIRM BEFORE PROMOTION = years spent in firm before winning the tournament (or becoming chief executive).

PRESENT AGE = age of the tournament winner at the end of 1986 (fiscal).

AGE AT PROMOTION = age at the time of winning the tournament.

PRIOR EXP = years spent after receiving an undergraduate degree (or high school diploma for those without college degrees) and before joining the present firm. If one receives an undergraduate degree after joining the present firm, then it will be set to zero.

NO COLLEGE = 1 if the tournament winner holds no college degree, 0 otherwise.

HARVARD = 1 if the tournament winner received his highest degree from Harvard, 0 otherwise.

MBA = 1 if the tournament winner holds an MBA, 0 otherwise.

VALUE = market value of the firm at the end of 1986 (fiscal).

SALE = total sales revenue in 1986 (fiscal).

EMPLOYEE = number of employees at end of 1986 (fiscal).

CONS = 1 if the firm's industry designation is "construction (SIC Division C)," 0 otherwise.

GASE = 1 if the firm's industry designation is "electricity and gas (SIC 49)," 0 otherwise.

SERVE = 1 if the firm's industry designation is "service (SIC 47 and Division I)," 0 otherwise.

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Table I: Summary Statistics

Variable		Japan	U.S.
Duration of Tournaments:			
YEARS IN FIRM BEFORE PROMOTION	Mean	23.739	18.354 years
	S.D.	13.357	10.147
Age:			
PRESENT AGE	Mean	62.039	55.639 years old
	S.D.	7.0173	6.7991
AGE AT PROMOTION	Mean	55.919	48.924 years old
	S.D.	8.8480	6.9050
External Experiences:			
PRIOR EXP	Mean	9.3321	8.4374 years
	S.D.	12.344	9.1552
Educational Credentials:			
NO COLLEGE	Mean	4.7619 %	3.3309 %
TOKYO	Mean	26.252 %	
ECOBUS	Mean	35.897 %	
ENGINEER	Mean	21.856 %	
HARVARD	Mean		13.094 %
MBA	Mean		22.302 %
Size of Firm:			
VALUE	Mean	0.28526 trillion yen	3.1569 billion dollars
	S.D.	0.59185	6.3892
SALE	Mean	0.84738 trillion yen	3.4518 billion dollars
	S.D.	2.8243	7.2675
EMPLOYEE	Mean	4.6361 thousand	23.640 thousand
	S.D.	7.3124	55.517
Sample Size		819	695[b]

Notes:

a. See Appendix for definition of variables.
b. Since Moody's (1987) provided us with data on the number of employees only as of the end of (fiscal) 1986, there are but 563 cases used to obtain the summary statistics for EMPLOYEEs in the U.S.

Table II. Duration Models for the United States

Variable	UNRESTRICTED WEIBULL Coefficient	UNRESTRICTED WEIBULL T-statistic	PROPORTIONAL WEIBULL Coefficient	PROPORTIONAL WEIBULL T-statistic
	Skedastic Function: $\sigma^2 \exp(\gamma'Z)$			
VALUE	-0.00414	-4.55365	...	...
PRIOR EXP	0.10259	14.89670	...	...
σ	0.23868	22.38459	0.41417	32.35274
	Regression Function: $\beta'X$			
CONSTANT	3.33085	187.33873	3.31256	103.00534
VALUE	0.00129	10.73929	0.00137	2.87416
PRIOR EXP	-0.04028	-7.65219	-0.05289	-10.04618
HARVARD	-0.07112	-1.79161	-0.08834	-1.68130
NO COLLEGE	0.32832	4.54046	0.52165	5.60980
MBA	-0.06846	-2.24372	-0.08991	-2.11070
CONS	0.27733	1.64712	0.26746	1.42456
GASE	0.07242	1.87612	0.03297	0.59617
SERVE	-0.26211	-4.04514	-0.26492	-3.54193
$(\text{VALUE})^2$	-0.00131	-4.73871	-0.00144	-2.12974
$(\text{PRIOR EXP})^2$	-0.09354	-1.98115	0.00514	0.28147
r^2	0.63		0.61	
Log Likelihood	-367.58		-508.40	

Table III. Duration Models for Japan

Variable	UNRESTRICTED WEIBULL Coefficient	UNRESTRICTED WEIBULL T-statistic	PROPORTIONAL WEIBULL Coefficient	PROPORTIONAL WEIBULL T-statistic
	Skedastic Function: $\sigma^2 \exp(\gamma' Z)$			
SALE	-0.01655	-7.83994	...	...
EMPLOYEE	-0.03078	-3.98052		
PRIOR EXP	0.06265	13.72791	...	...
ENGINEER	-0.38454	-2.74701		
σ	0.29973	22.75554	0.42315	35.31056
	Regression Function: $\beta' X$			
CONSTANT	3.48138	180.28103	3.50920	107.78796
SALE	0.00220	8.15649	0.00420	2.46086
IND*EMPLOYEE[a]	0.00229	3.14376	0.00173	0.67080
PRIOR EXP	-0.01876	-4.73448	-0.03531	-9.39024
U. OF TOKYO	-0.00872	-0.49405	-0.06695	-1.91204
NO COLLEGE	0.14698	2.59038	0.15020	2.02385
ECOBUS	0.03367	1.49714	-0.02286	-0.64149
ENGINEER	0.08170	3.26539	0.04989	1.22802
GASE	0.13007	1.99369	0.13616	1.18552
$(\text{SALE})^2$	-0.00062	-5.59881	-0.00154	-1.80242
$(\text{PRIOR EXP})^2$	-0.11492	-8.19260	-0.04178	-4.30295
r^2	0.61		0.60	
Log Likelihood	-436.42		-610.97	

[a]IND is an indicator that equals 1 when the CEO has no prior experience to joining the firm, and equals 0 otherwise.

FIGURE I: NONPARAMETRIC HAZARDS

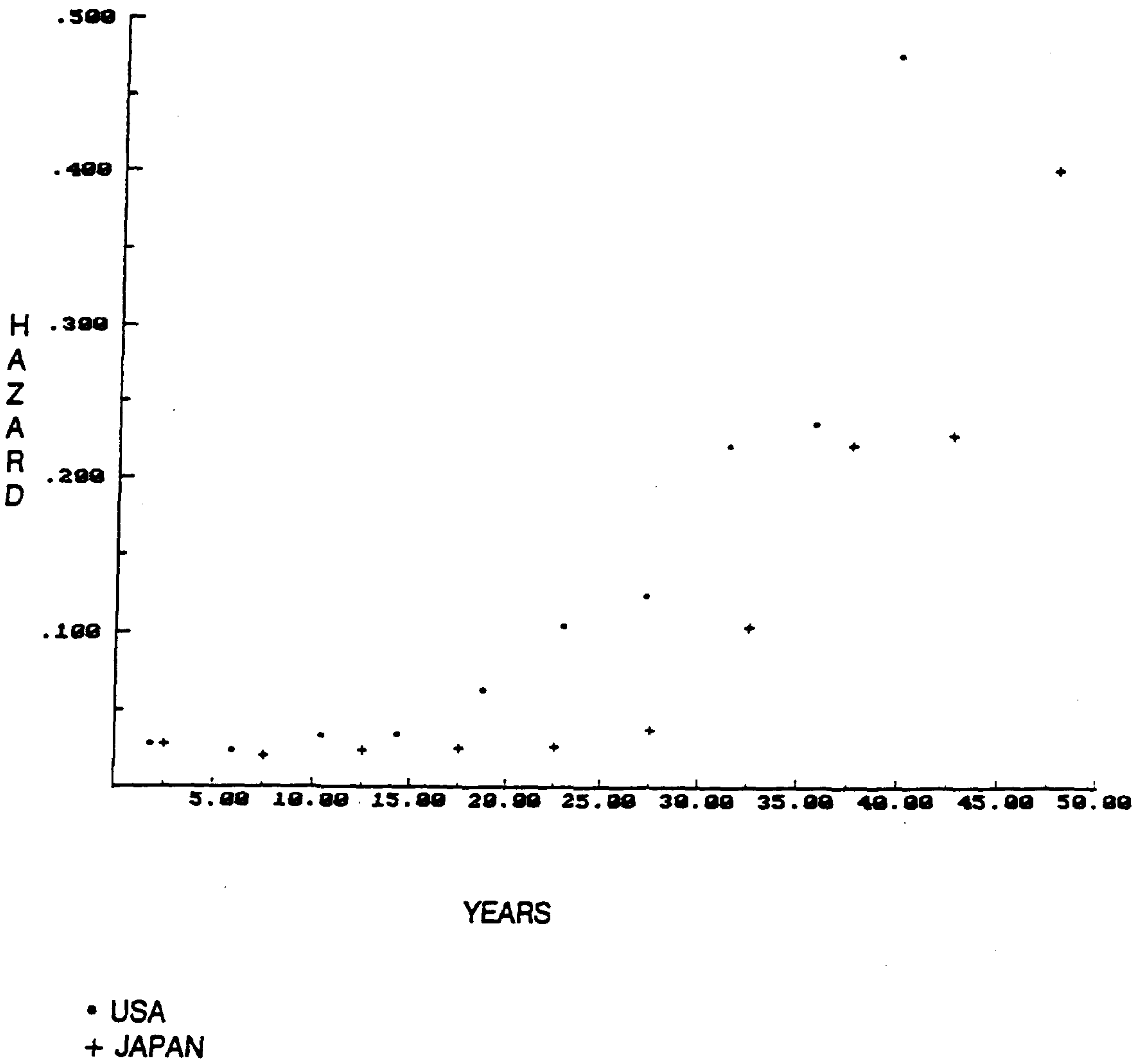
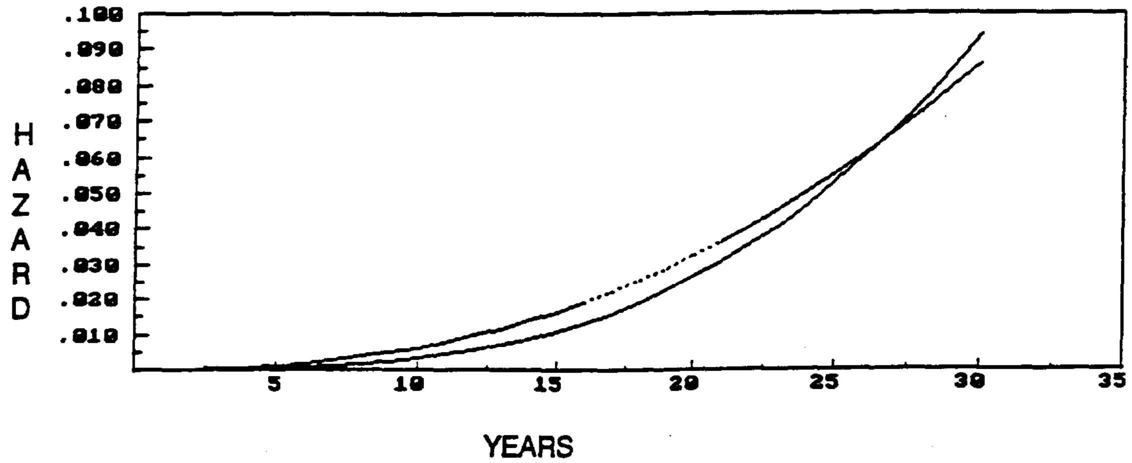


FIGURE II: HAZARDS BY FIRM SIZE

JAPAN

LARGE JAPANESE FIRMS _____ SMALL JAPANESE FIRMS ____...



USA

LARGE USA FIRMS _____ SMALL USA FIRMS ____...

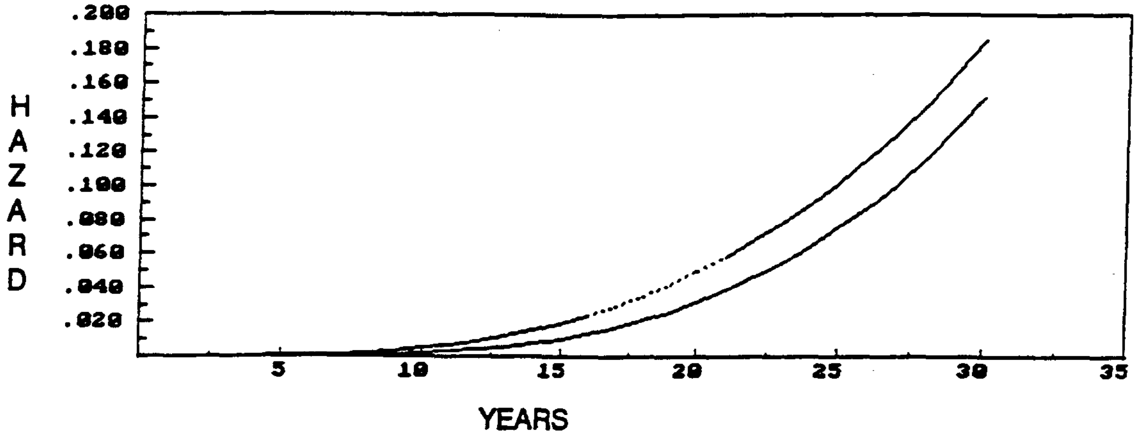
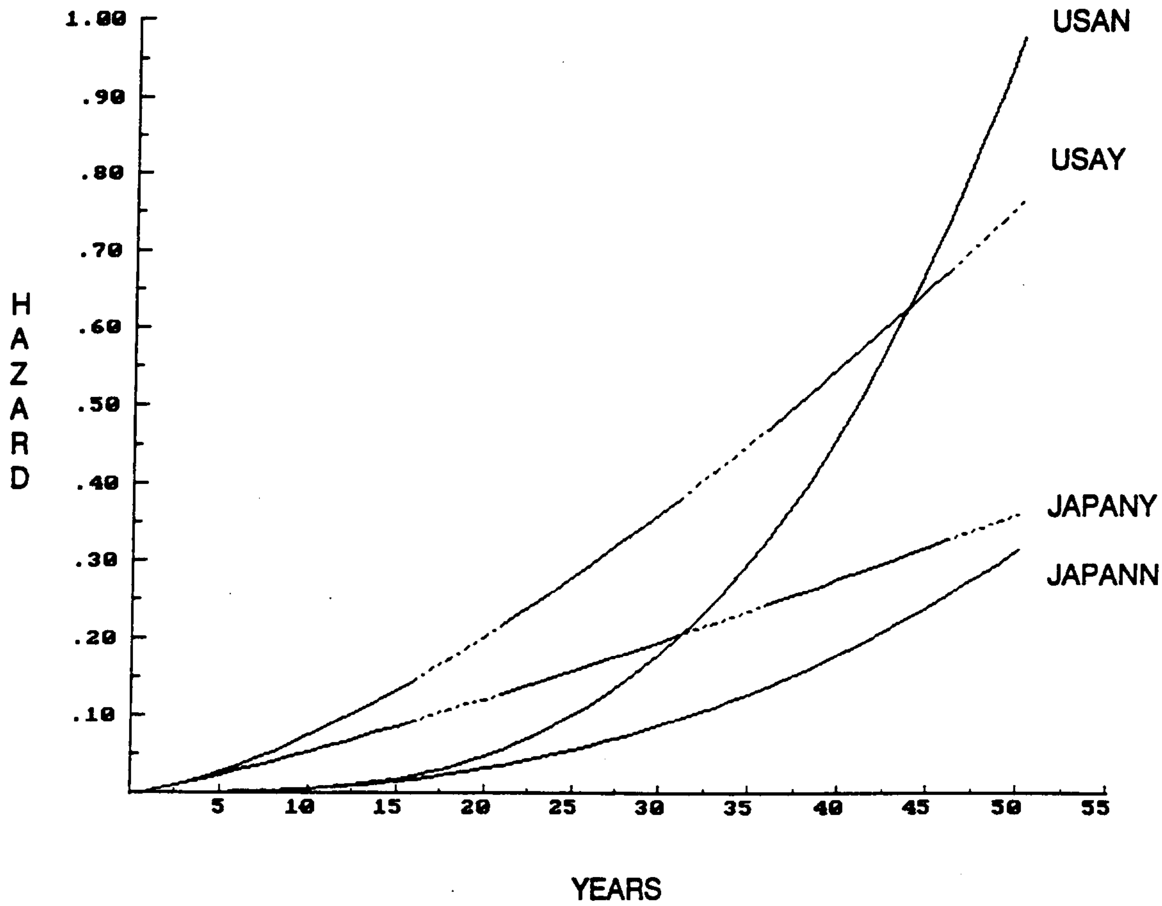


FIGURE III: HAZARDS BY PRIOR EXPERIENCE



JAPANY: JAPANESE WITH PRIOR EXPERIENCE
JAPANN: JAPANESE WITHOUT PRIOR EXPERIENCE
USAY: AMERICAN WITH PRIOR EXPERIENCE
USAN: AMERICAN WITHOUT PRIOR EXPERIENCE