Promotion, Turnover and Compensation in the Market for Executives

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Abstract

The goal of this paper is to analyze and decompose the role of competition in the market for managers and incentives using data on internal promotions, job turnover and the compensation of executives. Particularly, examine the effect of agency, human capital, preferences on the promotion and tenure of executives, with goal of explaining the differences in the promotion, tenure and compensation structure across managers. Our approach is to structurally estimate an dynamic equilibrium model disentangling demand and supply factors affecting compensation, promotions and turnover.

1 Introduction

Recent papers studied the reasons for the rise in CEO compensation in the US. Two main reasons related to the increase in firm size have been proposed in the literature: First, the market for executives became more competitive (e.g. Murphy and Zabojnik, 2004, Gabaix and Landier, forthcoming), and second, the changes in incentives related to moral hazard and firm size caused the rise in compensation (see Gayle and Miller, 2007). The goal of this paper is to analyze and decompose the role of competition in the market for managers and incentives using data on internal promotions, job turnover and the compensation of executives. Particularly, examine the effect of agency, human capital, preferences on the promotion and tenure of executives, with goal of explaining the differences in the promotion, tenure and compensation structure across managers. Our approach is to structurally estimate a dynamic equilibrium model and disentangle demand and supply factors affecting compensation, promotions and turnover.

We will focus on the supply of both males and female executives, seeking to explain how patterns of work experience affect promotion, job switching and retirement. The paper will explain more fully the determinants of managerial compensation, and investigate the selection and tenure of top level managers, using a large panel data set on managers and their employers to estimate models that account for the main components in managerial compensation, the backgrounds of the managers, firm characteristics, including accounting information, and its financial returns.

The compensation data is augmented with data on the titles of the executives, along with their professional and demographic background compiled from the Marquis "Who's Who" . In order to define promotions, we extend the seminal empirical investigation of Baker, Gibbs and Holmstrom (1994) on internal promotion within a single "case study" firm. Their work used individual data from this firm on the wages of managers, and turnover within the firm from one position to another, where entry into their data set occurred from nonmanagerial ranks and/or other firms, and exit from the data set included retirement or taking a position outside that firm. We investigate much more inclusive measures of managerial compensation, along with promotion and turnover within and between all firms in the sample briefly described above. We estimate a probability transition matrix from the sample to determine career patterns within and between firms. We find, within each firm a clear pattern of advancement that maps out the evolution of managerial careers independently of compensation issues and this pattern can be extended in a natural way to job transitions between firms.

The model we formalize is motivated by empirical regularities we find in the data. First the compensation of the executives are sensitive to fluctuations in the abnormal returns. In fact, the firm's excess return (over and above the market's return) is the most important determinant of managerial compensation, suggesting the importance of incentives and moral hazard. Secondly, as describes in Gayle and Miller (2007) CEO compensation is more sensitive to the excess return than the compensation of other executives. We find that in fact the higher the executive's rank in the firm, the more sensitive his compensation to the abnormal return. This can be rationalize by a career concerns model in which the returns to exerting effort is greater earlier in the career when the manager's career is longer and greater promotion prospects (see Holmstrom, 1998). We also find that firm turnover is positively correlated with promotions and higher compensation.*

Executives choose job, firm and effort level every period. They have preferences over jobs, particularly, effort is costly. These taste parameters vary across jobs and firms. In addition, every period managers privately observe a firm-job specific taste shock. The effort level is private information as well. While working they accumulate firm-specific and general human capital. We assume human capital accumulation on a job is greater when the manager exerts effort. The rate of human capital accumulation varies across jobs and firm as well, therefore, working in some firms and jobs may increase the manager's stock of human capital. Firms offer contracts which provide incentives for managers to exert effort. Because exerting effort increases the manager's stock of human capital, future promotion prospects provide incentives. Thus, variation in compensation across firms and jobs partially reflect the different opportunities to accumulate human capital and different promotion prospects. In addition, managers' age and rank imply differences in career concerns affecting the optimal compensation schemes. The markets for executives is competitive. Managers have different stocks of human capital and compensation adjusts to clear the market for each skill set.†

We find that promotion probability rises with tenure but the probability of firm turnover declines with tenure. This is consistent with accumulation of human capital which is firm specific. Overall, tenure is positively correlated with compensation. It increases with ranks, and the portion of the compensation which is tied to the excess return is increasing in tenure. However, tenure has a relatively small but negative effect on the compensation part which is not related to firm performance, suggesting that the gap between the executives' value in the firm and their outside market value grows with tenure. MBA degree increases promotion probability, firm turnover probability and compensation, consistent with general human capital (see Frydman 2005 for evidence on the increase importance of general skills in executive compensation).

There are not many firm-turnover in our sample, but we find that executives who change firms typically move to higher ranks and are more likely to leave firms with a large number of employees, suggesting that perhaps the likelihood of promotion in a large firm may be smaller, inducing executives to move up the ranks in other firms. Negative firm performance also increases the likelihood of executives to change firms.

Whereas the above regularities support the idea that career concerns, incentives and market competition are important to understand the turnover and compensation structure in the market for executives, we need to estimate the model in order to quantify the magnitude of preferences and human capital effects on supply of executives and the importance of incentives and value of executives skills in firms to the demand for manager. Estimation results ......(in progress)

2 Data

The main data for our empirical study was compiled from Standard & Poor's ExecuComp database. We extracted compensation and annual title data on up to the top eight paid executives of 2,818 firms in the S&P 500, Midcap, and Smallcap indices spanning the years 1992 to 2006. The ExecuComp database contains 30614 individual executives. We supplemented these data with firm level data obtained from the S&P COMPUSTAT North America database and monthly stock price data from the Center for Securities Research (CSP) database, and the background history of these executives found in Who's Who.

The sample was partitioned into three industrial sectors by GICS code. Sector 1, called primary, includes firms in energy (GICS:1010), materials (1510), industrials (2010,2020,2030), and utilities (5510). Sector 2, consumer goods, comprises firms from consumer discretionary (2510,2520,2530,2540,2550) and consumer staples (3010,3020,3030). Firms in health care (3510,3520), financial services (4010,4020,4030,4040), information technology and telecommunication services (410, 4520, 4030, 4040, 5010) comprise Sector 3, which we call services.

We then coded the code the annual title of executive accordingly into position in the firms. While some positions, such as the CEO are easy to rank, ranking other executive officer positions is sometime more problematic. See Table 1 for a detailed description of the different titles. Below is a description of how we obtained the ranks. Of the 30614 executives in our sample we are able to collect background information from the whoswho data base for 16300 belonging to 2100 firms. The original who's who data contain the biographies of about 350,000 past and present executives. We were then able to match executives from our compusat data base using the full name (i.e. first, middle and last name along name suffix), year of birth and gender. There seems to be no sample selection based on the rank of the executives: we have more executives in the whoswho sample in lower ranks. If there is any sample selection, it is biased toward larger companies.

The match data set allow us to have an unprecedented access to detailed firm characteristics and accounting data, executives compensation component, such pension, salary, bonus, options, etc. and executive characteristics, such age, gender, education and detailed sequencing of the executives career path. See Table 4 for a summary of final data set.

In an optimal contract where shareholders create incentives to induce diligent work, they compel the manager to bear risk on only that part of the return whose probability distribution is affected by his actions. Assuming the manager is risk averse, his certainty equivalent for a risk bearing security is less than the expected value of security, so shareholders would diversify amongst themselves every firm security whose returns are independent of the manager's activities, rather than use it to pay the manager. We define the abnormal returns of the firm as the residual component of returns that cannot be priced by aggregate factors the manager does not control. In an optimal contract, compensation to the manager might depend on this residual in order to provide him with appropriate incentives, but it should not depend on changes in stochastic factors that originate outside the firm, which in any event can be neutralized by adjustments within his wealth portfolio through the other stocks and bonds he holds.

More specifically, let v_t the value of the firm at that point in time. Then the abnormal return attributable to the manager's actions is the residual

$$x_t \equiv \frac{v_t - v_{t-1}}{v_{t-1}} - \pi_t \qquad (1)$$

where π_t is the difference between the return on the market portfolio in period t and the return on the firm's stock.

2.1 Definition of Compensation

The cost to shareholders of employing a manager, called direct compensation, is the sum of salary and bonus, the value of restricted stocks and options granted, as well as the value of retirement and long term compensation schemes. The discounted sum of these direct compensation measures the reduction in the firm's value from outlays to management. Total compensation to a manager is defined as direct compensation plus changes in wealth from holding firm options, and changes in wealth from holding firm stock. In order to compute the remaining two components in total compensation, one must take a stand on how managers would dispose of this wealth if it were not held in their firm's financial securities. We assume that the manager would hold a well diversified portfolio instead, an implication our model. When forming their portfolio of real and financial assets, managers recognize that part of the return from their firm denominated securities should be attributed to aggregate factors, so they reduce their holdings of other stocks to neutralize those factors. Hence the change in wealth from holding their firms' stock is the value of the stock at the beginning of the period multiplied by the abnormal return.

Our model implies that changes in wealth from holding firm options, and changes in wealth from holding firm stock both have mean zero. Hence direct and total compensation have the same expected value. Therefore whether risk neutral shareholders minimize expected total compensation or expected direct compensation is moot. However changes in wealth from holding firm stock and options reflect the costs a manager incurs from not being able to fully diversify his wealth portfolio because of restrictions on stock and option sales. Consequently managers care about total compensation, not direct compensation, because the former determines how their wealth changes from period to period when they optimally smooth their consumption over the lifecycle and make optimal portfolio choices. This explains why we followed Antle and Smith (1985, 1986), Hall and Liebman (1998) and Margiotta and Miller (2000) and Gayle and Miller (2008) by using total compensation rather than direct compensation in our study.

2.2 Organizational Structure

There are K ranks or levels in the firm denoted $m \in \{1, \ldots, M\}$, each rank has s_k positions, and within each rank, A K dimensional transition matrix P stochastically determines promotions within the firm. If no one was ever demoted and all promotion were to an adjacent rank then P would be a band matrix taking the form

$$P \equiv \begin{matrix} p_{11} & p_{12} & \cdots & \cdots & 0 & 0 \\ 0 & p_{22} & p_{23} & \cdots & \cdots & 0 \\ 0 & 0 & \ddots & \ddots & \cdots & \cdots \\ 0 & 0 & 0 & \ddots & \ddots & \cdots \\ 0 & 0 & 0 & 0 & p_{K-1,K-1} & p_{K-1,K} \\ 0 & 0 & 0 & 0 & 0 & p_{KK} \end{matrix}$$

We assume this is the case, and also suppose the number of positions shrink as the the rank increases, or $s_k > s_{k+1}$, an empirical issue we can test for.

Looking at all titles and job transitions we look for patterns and transitions for all firms in the sample, identifying an ordered hierarchy of jobs. Pioneer work by Baker Gibbs and Holmstrom [QJE 1994 a,b] document a hierarchy in one firm constructed using title to title transitions. We explore if similar patterns may hold for the top executives in many the firms. Identifying hierarchy from data on title transitions allows analysis of pay changes, disentangling pay raises from the concept of promotion. In our data we observe total compensation including the portion of the compensation which is tied to firm performance. This allows us to create an additional measure of how much of the executive's pay is tied to the firms' performance in the different "ranks" of the hierarchy. This measure allows to capture the notion that as executives are going up in the firm's hierarchy, they have larger effect on the firms' performance, and therefore more of the compensation should be tied to the performance.

The titles we observe are ordered into ranks. The hierarchy contains seven levels and is constructed as follows: First, in any pairwise comparison of two titles x, y, where title x is in rank k_1 and title y, is in rank k_2 and without loss of generality, rank one is above rank 2: $k_1 \succeq k_2$, the percentage (and absolute numbers) of transitions from k_2 to k_1 weakly exceeds the transitions from rank k_1 to k_2. Thus the overall transitions between the two ranks also satisfy this property. Second, is weak transitivity which implies no "cycles:" If title z in rank k_3, and $k_2 \succeq k_3$, $k_1 \succeq k_2$ then $k_1 \succeq k_3$. This is satisfied for any pairwise of titles within each rank as well as for the ranks. We use weaker criterion than the criterion in BGH on which a level x is above a level y if almost all transitions are from x to y. This is because our hierarchy is build for all firms in the market and it the patterns are more involved than patterns within one firms. In particular, our definition allows for more "demotions" because we rank titles across all firms in the sample and naturally there will be more transitions downwards (demotions) across firms. Table 1 displays the ranks and titles.

2.2.1 Transition Patterns

Tables 2a,b describe the patterns of job to job transitions within firms per year. Percents in table 2a are calculated as a fraction of the base rank. For example, the first row represents transitions from rank 1 to the other ranks. 88% of the 3995 executives in this ranks remain in the job, 6 percent move to rank two, etc. The columns represent transitions into rank 1, 4% of executives in rank 2 move into rank one. Note that the transition rates from rank 1 to two excessed the transition rates from rank two to rank 1. This is because the number of executives in rank 1 is very small compared to the number in rank two. From table 2b we can see that the number of transitions into rank 1 from rank 2 is 735 while only 221 executives move from rank 1 to rank 2. The diagonal is the percent/number of executives who remain in their positions. The upper-right triangle is therefore the promotions (yearly transitions into higher ranks) and the lower triangle represents demotions. The last two rows in table 2b represent the number/percent of entries into the level (the percent is calculated as a fraction of the number of executives in the level in which the entry occurs). The two right columns are the number/percent of executives exiting the rank. For example, the highest rank, rank 1 has 33% of entry and 12% exits yearly (calculated as a fraction of executives in rank 1), ranks 2 has more entries than exits, the differences decline in the rank. Rank 4 has the same percent of entry and exit. The lower ranks, ranks 5-7 have more exits than entries as expected from entry level jobs.

Tables 3a,b describe turnover across firms. The row entries at table 3a describe the percent of transitions from a rank as a fraction of all transitions involving firm turnover from the rank. For example, 52% of executives who moved from rank 1 move into the same rank in a different firm. The rest of the movers move into lower levels in other firms. The patterns are different from the internal transitions patterns. A large percent of executives who change firms in ranks 2 and 3 move to rank one. There a substantial fractions of all firm-to-firm transitions are into higher ranks. Table 3b describes the number and rates of firm turnover, by rank, as a proportion of all the executives in that rank. It reveals, that overall, transitions that involve changing firms are small relative to internal transitions. Overall, the yearly turnover rate is 1.5%. The table also shows that the rate declines with ranks. Very few executives change firms and move into levels 6 and 7.

2.3 Empirical characterization of Promotion, Turnover and Compensation

Table 5 describes the characteristics of executives by rank. The average age between Rank 1 and 3 is declining (from 59.6 to 52), and it is more or less constant in ranks 3 to 7. higher in declining from rank 1 and 3 of a logistic regression. There is higher percent (out of total executives in the rank) of executives with MBA degrees in the top 4 ranks, and the percent of executive with a Master degree and Ph.D. is greater in the bottom there ranks. There is a larger percent of executives with professional certification in the bottom 4 ranks. Total compensation and the salary components are highest in rank 2 and then in rank 1 (this is not surprising as Rank 1 is a life-cycle transition, but CEO's are in Rank 2. As they age they move to Rank 1), they decline monotonically in ranks, providing an additional confirmation to the promotions which were defined independently of compensation. Salaries are a small component of the total compensation.

Tables 6 and 7 describe managers' characteristics by sector and firm size: the sector with the highest percent of executives with no degree is Consumer, it also has the lowest percent of executives with advance degrees and the highest percent of female executives. Service sector has the lowest average tenure and the highest promotion rate and highest total compensation. We have two measures for firm size: assets value and number of employees. Total compensation is roughly twice as large in large firms (using both measures), promotion and turnover rates are greater, tenure is lower , and there are more executives holding MBA degrees.

2.3.1 Promotion and Turnover

The results from the logistic regression in Table 8 describes the probability of moving into a higher rank as a function of firm and individual characteristics. The coefficient on ranks (relative to the lowest rank, 7) show that the lower the rank the higher the probability of moving up, this is not surprising as these ranks are constructed according to transition patterns. The probability of promotion is negatively correlated with the probability of moving up and current and past firm performance measured by excess returns. The probability of promotion varies by sector, it is the highest in the service sector, and it is positively correlated with number of employees.

There is a large positive correlation between firm turnover and promotion, executives who change firms are likely to move to a higher position. Tenure in the firm and number of previous (firm) moves is positively related to the promotion probability. The only statistically significant education variable is certification which includes executives who do not have a bachelor degree; these executives are less likely to move up the ranks. Age is negatively correlated with promotions. Notice that the executive's compensation effect on promotion is not statistically significant. We further investigate the probability of promotions using conditional logit. Accounting for executives fixed-effects or firm fixed-effects does not change much the above correlations.

Less than 3% from all year-executives observations involve firm turnover. Because firm turnover is strongly correlated with transition into a higher rank, we further explore the characteristics of executives who change firms. The performance of the firm is negatively correlated with the probability that executives will leave the firm; turnover rates vary by sectors. The probability of executives leaving is increasing in the number of employees in the firm. The probability of moves in not monotonic in the executives' current rank: Low level ranks and also executives in rank 2 (CEOs) are more likely to move than executives in middle ranks. The current compensation of an executive is now statistically significant, executives with higher compensation in the current job are more likely to move, age and MBA degrees are also positively correlated with probability firm turnover. Tenure in the firm is negatively correlated with probability of changing firms, and managers who moved more in the past are more likely to move again.

Column 5 in Table 8 further explores the characteristics of those who move up the ranks among the movers: The sectors in which overall promotion probability is low have high probability of executives switching firms. Number of employees is also positively correlated with promotion among movers. Number of previous firm changes is now negatively correlated with promotion probability. Women who move are less likely to move up the ranks and so are movers with no bachelor degree or movers with a Ph.D.

Firm turnover and promotions are interesting because they help understand the compensation and how it is determined.

2.3.2 Compensation

We next turn to explore how compensation varies with firms' and executives' characteristics. OLS and Median regression results of compensation are described in Table 9. The most important determinant is the excess return and its interactions with ranks. Excess return has the largest effect as expected, consistent with the importance of moral hazard. It is the firm's return over and above the market's return. We define it formally in the model's section. If executives are risk averse and firms are risk neutral, the theory predicts that the optimal contract should include only uncertain variables that are affected by the manager's actions, therefore, aggregate risk should not be included. The interaction of excess returns with ranks is monotonic in ranks and is consistent with a theory of career concerns. That is, executives with longer career horizon and promotion opportunities have greater value to exerting effort. The higher the rank, the greater the impact of excess return on compensation. This is consistent with the hypothesis we test later: the benefit from exerting effort is greater as it will have effect on future choices of jobs and future compensation. Thus, it is less expensive to incentivize managers at lower levels. This hypothesis is also consistent with the positive coefficient on the interaction of age and excess return. Older executives have less years to realize benefits from current effort on the job, thus the incentives they require are greater. Note that this is controlling for levels, age and other human capital and individual characteristics. Human capital variables such as tenure and an MBA and Ph.D. are positively correlated with excess returns suggesting a possible connection between human capital and incentives.

Ranks are also significant as well as sectors (both separately and interacted with excess returns). MBA degree and number of previous moves positively affect compensation, but the magnitude is small when compared to the effects of excess returns related variables (and their interactions). Whereas tenure with the firm is positively correlated with promotion and the interaction with excess returns has a positive coefficient as well, it is negatively correlated with compensation. The effect is small (roughly 4000 $ for each year of tenure), and when factoring the effect together with the interacted effect of excess return, tenure increases overall compensation. However, it is consistent with the fact that firm-specific skills (beyond the interaction with excess return), are not compensated, and that if workers have a lot of firm-specific human capital, which contributes to compensation through increase likelihood of a good firm performance, they are less likely to leave. Again we find that moving to a new firm is positively correlated with higher compensation.

This findings motivate our formal model we present next. Our goal is to disentangle the effect of human capital, incentives, and distaste from effort in the different ranks. Thus we formulate a model of market for executives, and estimate the importance of career concerns and competition over executives.

3 Model

Our model focuses on the promotion, turnover, and executive compensation when the manager is subject to moral hazard. The promotions and career prospects vary across firms and jobs. In particular, managers accumulate human capital while working. The value of the human capital varies across jobs and firms. We assume that all the skills and human capital are general. Firms are infinitely lived and executives are finitely lived. They can work for at most T periods. We assume that the labor market is competitive. At the beginning of each period there are contracts that specify a one-period compensation plan, which depends on the job title, firm characteristics and worker's observable characteristics. The information in the model is incomplete. Executives have private information on taste shocks which affect their utility from working in a particular job and firm. Observing their taste shocks at the beginning of each period, executives choose a contract, and then a work routine that is not observed by the directors, and also picks real consumption expenditure for the period.

The objective of the manager is to sequentially maximize her expected lifetime utility, but she competes with other managers for her position. To convince the board that she will pursue the goal of the firm, which we assume is value maximization, the manager chooses a contract that aligns her interests with those of the firm. This alignment is embedded in the incentive compatibility constraints. We solve for walrasian equilibrium, with rational expectations. The compensation value of the contract in equilibrium is set so that given each workers observable characteristics and the realizations of the idiosyncratic taste shock (with respect to the job), and given the market contracts, markets clear. Given the available market contracts, no worker can increase utility by switching jobs, and no firm can increase profits by replacing workers. Assignments of workers to jobs is efficient.

3.1 Lifetime Utility

The risk-averse managers maximize expected life-time utility. ρ is the constant absolute risk aversion parameter. Denote the time period by $t \in \{0, 1, ..., T\}$. There are M firms in the market. Firms are indexed by $m \in [0, ..., M\}$, with $m = 0$ representing retirement. We assume retirement is an absorbing state. There are K different types of positions, index by $k \in \{1, ..., K\}$. Define $I_{mkt} \in \{0, 1\}$ to be an indicator of the mangers' choice of a job k in firm m. Note that $I_{0kt} = 1$ means the executive choices to retire. $l_{mkt} \equiv (l_{1mkt}, l_{2mkt})$ denote the two activities for firm $m \neq 0$, in job k. Activity two requires higher effort level. Define $l_{jmkt} \in \{0, 1\}$ as the indicator for choice of effort in a particular position in a particular firm. $j \in \{1, 2\}$, firm and retirement retirement $m = 0, l_{1mkt} = l_{2mkt} = 1$ for all k and t. β is the constant subjective discount factor. Managers have permanent taste parameters α_{jmk} which the utility parameters associated with job, firm and effort level choice: $I_{mkt} = 1$ and $l_{jmkt} = 1$. There is an individual taste shock that is indexed by time, firm and position ε_{mkt}. If a manager retires, $m = 0$, then $\alpha_{jmk} = \alpha_0$ for all j and k; and $\varepsilon_{0kt} = \varepsilon_{0t}$ for all k.For any choice of job $m \neq 0$ we assume that the disutility associated with the job increases in the high-effort level: $\alpha_{2mk} > \alpha_{1mk}$. The life-time utility is

$$-\sum\nolimits_{t,m,k} \beta^t I_{mkt} \left[\sum\nolimits_{j=1}^{2} \alpha_{jmk} l_{jmkt} \exp\left(-\rho c_t\right) \exp\left(-\varepsilon_{mkt}\right) \right]$$

3.2 Budget constraint

We assume there exists a complete set of markets for all publicly disclosed events, with price measure Λ_t defined on F_t and derivative λ_t. This implies that consumption by the manager is limited by a lifetime budget constraint which reflects both the opportunities she faces as an insider trader, and the expectations she has about her compensation. The lifetime wealth constraint is endogenously determined by the manager's work activities and her insider trading activity. By assuming markets exist for consumption contingent on any public event, we effectively attribute all deviations from the law of one price to the particular market imperfections under consideration. Let e_0 denote the endowment at date 0, and let $\varkappa_t$ denote the current price of shares, denumerable in terms of forgone consumption units in period t. We also measure w_{mkt+1}, the manager's compensation in period t, in units of current consumption. To indicate the dependence of the consumption possibility set on the set of contingent plans determining labor supply and effort, we define $E_0 [\bullet | l]$ as the expectations operator conditional on work and effort level choices throughout the manager's working life. The budget constraint can then be expressed as

$$E_t(\lambda_{t+1} e_{nt+1}) + \lambda_t c_{nt} \leq \lambda_t e_{nt} + E_t(\lambda_{t+1} w_{mkt+1} | l_{jkmt}, I_{mkt}) \tag{2}$$

3.3 Output

Managers are risk averse, therefore, the optimal contract is contingent only on the returns that the manager actions affects their probability distribution. Since managers are risk averse (an assumption we test empirically), his certainty equivalent for a risk bearing security is less than the expected value of security, so shareholders would diversify amongst themselves every firm security whose returns are independent of the manager's activities, rather than use it to pay the manager. We define the abnormal returns of the firm as the residual component of returns that cannot be priced by aggregate factors the manager does not control. In an optimal contract compensation to the manager might depend on this residual in order to provide him with appropriate incentives, but it should not depend on changes in stochastic factors that originate outside the firm, which in any event can be neutralized by adjustments within his wealth portfolio through the other stocks and bonds he holds.

More specifically, let w_{mkt} denote the overall compensation received by the manager at the end of period t as compensation for work done during the period, and ϑ_{mt} the value of the firm at that point in time. Then the gross abnormal return attributable to all the executives' actions is the residual

$$x_{mt} \equiv \frac{\vartheta_{mt} + d_{mt} + \sum_{k=1}^{K} w_{mkt}}{\vartheta_{mt-1}} - \pi_t$$

where π_t is the return on the market portfolio in period t and d_{mt} is the. This study assumes that x_t is a random variable that depends on the managers' effort activity choice in the previous period but, conditional on (l_{1mkt}, l_{2mkt}), is independently and identically distributed across both firms and periods.

3.4 Human Capital Accumulation

For simplicity we assume that all human capital is general in nature but the rate in which it accumulates depends on the type of firm, the manager effort level. More specifically, we assume that human capital is only accumulated if the manager works diligently. Let

$$h_t^{(k)} = (h_{11t}, h_{12t}, ..., h_{1Mt}, ..., h_{K1t}, ..., h_{KMt})$$

denote a $1 \times KM$ vector which measures the human of manager that hold the kth position in the entering period t, where each element

$$h_{kmt} = \sum_{s=1}^{q} l_{2mkt-s}.$$

where q is a finite integer. Note that since l_{2mkt-s} is private information then h_t is also the private information of the manager. Finally let

$$h_{mt} = (h_t^{(1)}, ..., h_t^{(K)})$$

denote the overall human capital of all the executives in the firm.

3.5 Managerial Skill and Firms Characteristics

We also assume that each executives is exogenously endowed with some vector of skill and each firms is characterizes by a vector z_{ft}, which measure of firms size, capital structure and industrial mix. Note that the executive endowed skill vector is fixed over time but the firm characteristics varies over time according to a known transition density. Let $z_{lt}^{(k)}$ be the skill of the executive in the k^{th} rank in the firm in period t and $z_{lt} = (z_{lt}^{(1)}, ..., z_{ft}^{(K)})$ denote the overall skill level of all the executives on the firm. Then transition distribution of firm characteristics is

$$F_{zf}(z_f|z_{lt}; h_t; z_{ft}) = \Pr(z_{ft+1} = z_f|z_{lt}; h_t; z_{ft})$$

Note that this means that for example the growth of the firm from one period to another depends on the human capital of the set of managers in the firm. Since the human capital of the managers in the firm depends on their past effort levels, the growth of the firm depends on past effort of managers as well; because managers move can across firms, this growth rate also depends on effort levels in other firms in the market.

3.6 Technology

Define $f(x|l_{m1t}, ...l_{mKt}; z_{lt}; h_t; z_{ft})$, the probability density function for x_t, conditional on the effort levels and human capital of all the mangers in the firm. , let

$$f(x|l_{m1t}, ...l_{mKt}; z_{lt}; h_t; z_{ft}) = \begin{cases} f_{m2}(x|z_{lt}; h_t; z_{ft}) & \text{if } \sum_{k=1}^{K} l_{2mkt} = K \\ f_{m1k}(x|z_{lt}^{(-k)}; h_t^{(-k)}; z_{ft}) & \text{if } \sum_{k=1}^{K} l_{2mkt} = K-1 \ \&\ l_{1mkt} = 1 \\ f_{m1}(x|z_{ft}) & \text{if } \sum_{k=1}^{K} l_{2mkt} < K-1 \end{cases}$$

where

$$h_t^{(-k)} = (h_t^{(1)}, ...h_t^{(k-1)}, h_t^{(k+1)}, ..., h_t^{(K)})$$

$$z_t^{(-k)} = (z_{ft}^{(1)}, ...z_{ft}^{(k-1)}, z_{ft}^{(k+1)}, ..., z_{ft}^{(K)})$$

This specification assumes that if one manager shirks then his human capital does not have effect on the output of the firm; if more that one executive shirks then human capital of all managers has no effect on the output of the firm.

Let $F_{m1}(.|.)$, $F_{m2}(.|.)$,and $F_{m1k}(.|.)$ denote the probability distribution functions, respectively, associated with $f_{m1}(.|.)$, $f_{m2}(.|.)$,and $f_{m1k}(.|.)$. In order to obtain the effect of moral hazard in this model we assume stochastic dominance, i.e.

$$F_2(x|z_{lt}; h_t; z_{ft}) \leq F_{1k}(x|z_{lt}^{(-k)}; h_t^{(-k)}; z_{ft}) \leq F_{m1}(x|z_{ft})$$

We can the define two likelihood ratio of each rank. Note that the shareholders now have three possible set of contracts to choose from. The first option is to have all managers work diligently; in that case, their returns are drawn from $F_{m2}(x|z_{lt}; h_t; z_{ft})$. The second case is the case of partial diligence; in that case the return is drawn from $F_{m1}(x|z_{lt}^{(-k)}; h_t^{(-k)}; z_{ft})$. The final option is that all managers shirk, and the return is drawn from $F_{m1}(x)$. We can then define two likelihood ratio of each rank,

(3) $$g_{m2k}(x|z_{lt}^{(k)}; h_t^{(k)}; z_{ft}) = f_{m1k}(x|z_{lt}^{(-k)}; h_t^{(-k)}; z_{ft})/f_{m2}(x|z_{lt}; h_t; z_{ft})$$

and

(4) $$g_{m2}^{(-k)}(x|z_{lt}^{(-k)}; h_t^{(-k)}; z_{ft}) = f_{m1}(x|z_{ft})/f_{m1k}(x|z_{lt}^{(-k)}; h_t^{(-k)}; z_{ft})$$

Note that if the second case hold then the compensation of the executive in rank k would not vary with x. This is empirically testable and since the compensation of executives of all rank sin our study varies with returns we are going to assume that the shareholders specified that they want the return to be drawn from $F_{m2}(x|z_{lt};h_t;z_{ft})$. Note that we make the restriction that $g_{m2k}(x|z_{lt}^{(k)};h_t^{(k)};z_{ft})$ only depends on $z_{lt}^{(k)}$ and $h_t^{(k)}$, this reduces the dimension of the conditioning set.

3.7 Information and Timing

At the beginning of every period, executives privately observe realizations of preference shocks and choose consumption. Firms then make a one-period contract offers to executives, and executives choose one of the contracts. Each executive then chooses an effort level which he privately observed. The realization of the outcome x is revealed at the end of the period, and is a common knowledge and the executives is paid w_{mkt+1}. Therefore, the complete labor market history is common knowledge.

3.8 Solving the Model

The model is solved in stages. Managers are price takers, therefore, the manager's problem of consumption and contract choices are equivalent to a single agent dynamic choice problems. We therefore first derive the indirect utility function for executives who retire, and then solve for optimal consumption when the manager works for at least one period and then retires. Using the valuation function that solves this problem, we then derive the optimal choice of job and firm for the worker, for any given set of contracts available in the market. We then solve for the employers' problem of offering an optimal contract for managers and choosing a combination of managers to the various position in the hierarchy; the optimal contracts circumscribe the short term contracts.

Definition 1. *Equilibrium: A Walrasian Market Equilibrium consists of a set of contracts offered for each combination of firm, job, effort level and manager characteristics. Taking beliefs about the managers' type and prices as given, the contracts maximize firms' profits, executives' choice of a contract and effort level maximize their utility. Firms' beliefs about executives' type satisfy rational expectations, and the market clears (there are no job vacancies).*

3.8.1 The Manager's Problem

In order to derive the solution to the optimal consumption decision we start out with the conditional valuation function for working one period at time t and then retiring and dying at $n+1$, where the nonpecuniary parts of utility from working are ε_{mkt} (is the expected conditional valuation of this unobserved nonpecuniary benefit, and α_k treated as a parameter, where α_0 is also estimated as a parameter.

and for notational ease let's denote by $z_{mt} = (z_{mlt}, h_{mt}, z_{mft})$, assume that z_{mt} has finite support $\mathbb{Z}$..

Lemma 2 (IndUt). *Substituting the optimal consumption and savings path $\left(c_t^0, e_{t+1}^0\right)$ which we derived from maximizing the utility subject to the budget constraint in equation 2 into the utility function to obtain the following indirect utility*
(5)

$$V_{jmkt} = -b_t \alpha_{jmk}^{\frac{\lambda_t}{bt}} (\alpha_{mkt}^{t+1,,j})^{1-\frac{\lambda_t}{b_t}} \exp\left(-\frac{\lambda_t}{b_t}\varepsilon_{mkt}\right) \alpha_0^{\prod_{s=t+1}^{T-1}\left(1-\frac{\lambda_s}{b_s}\right)} \exp\left(-\frac{a_t+\rho\lambda_t e_t}{b_t}\right) \times E_t\left[\upsilon_{k,m,t+1}|l_{k,m,j}=1\right]^{1-\frac{\lambda_t}{b_t}}$$

Where $\upsilon_{mkt+1} \equiv \exp\left(-\frac{\rho\lambda_{t+1}w_{mkt+1}}{b_{t+1}}\right)$ is the value of the expected compensation based on period t contract,and future job choice probabilities are defined as

$$\Upsilon_{jmk}^{(s)}(z'|z_{mt}, l_{jmk}, I_{mkt}) \equiv \Pr(I_{m'k't+s} = 1, z_{m'k't+s} = z', l_{jmkt+s} = 1|z_{mt}, l_{jmk}, I_{mkt})$$

The term $\alpha_{mkt}^{t+1,,j}$ represents the differences in life-time utility associated with differences in career paths across the different jobs

$$\alpha_{mkt}^{t+1,,j} = \sum_{m',k',z',s} \left\{ \begin{array}{l} {\alpha_{m'k't+1}^{t+2,s}}^{1-\frac{\lambda_{t+2}}{b_{t+1}}} (\alpha_{sm'k'})^{\frac{\lambda_{t+2}}{b_{t+2}}} \Upsilon_{sm'k'}^{(1)}(z'|z_{mt}, l_{jmkt}, I_{mkt}) \times \\ E\left[\exp\left(-\frac{\lambda_{t+2}}{b_{t+2}} \varepsilon_{m'k't+2}\right)|z', I_{m'k't+2}, l_{sm'k't+2}\right] \upsilon_{m'k't+3}^{1-\frac{\lambda_{t+2}}{b_{t+2}}} \end{array} \right\}$$

Next, we begin by describing the managers' optimal job choice, given the vector of available contracts. Note that we can write the indirect utility

$$\begin{aligned} \frac{b_t}{\lambda_t} \log(-V_{jmkt}) \quad &= \quad \frac{b_t}{\lambda_t} \log\left(\alpha_{jmk}^{\frac{\lambda_t}{bt}} (\alpha_{mkt}^{t+1,,j})^{1-\frac{\lambda_t}{b_t}} E_t \left[\upsilon_{k,m,t+1} | l_{k,m,j} = 1\right]^{1-\frac{\lambda_t}{b_{t\bar{n}}}}) \right) \\ &+ \frac{b_t}{\lambda_t} \log\left(b_t \alpha_0^{\prod_{s=t+1}^{T-1} (1-\frac{\lambda_s}{b_s})} \exp\left(-\frac{a_t + \rho\lambda_t e_t}{b}\right)\right) + \varepsilon_{mkt} \end{aligned}$$

By normalizing $\alpha_0 = 1$, and noting that retirement is an absorbing state, we can express the indirect utility function for all $m \neq 0$ as

$$\begin{aligned} &\frac{b_t}{\lambda_t} \log(-V_{jmkt}) = \frac{b_t}{\lambda_t} \log\left(\alpha_{jmk}^{\frac{\lambda_t}{bt}} (\alpha_{mkt}^{t+1,,j})^{1-\frac{\lambda_t}{b_t}} E_t \left[\upsilon_{k,m,t+1} | l_{k,m,j} = 1\right]^{1-\frac{\lambda_t}{b_{t\bar{n}}}} \right) \\ &+ \frac{b_t}{\lambda_t} \log\left(b_t \exp\left(-\frac{a_t+\rho\lambda_t e_t}{b_t}\right)\right) + \varepsilon_{mkt} \end{aligned}$$

and for the retirement $m = 0$,

$$\frac{b_t}{\lambda_t} \log(-V_{0t}) = \frac{b_t}{\lambda_t} \log\left(b_t \exp\left(-\frac{a_t+\rho\lambda_t e_t}{b_t}\right)\right) + \varepsilon_{0t}$$

Therefore given a vector of contracts an executive faces and given the distribution of the preferences shocks the conditional choice probabilities of each job is given by

$$\Pr(I_{mkt}^0 = 1 | l_{k,m,2} = 1, z_m) = \Pr\left(-\frac{b_t}{\lambda_t} \log(-V_{2mkt}) \geq -\frac{b_t}{\lambda_t} \log(-V_{2m'k't}) \; \forall (m,k) \neq (m',k') | z_m \right)$$

Under the assumption that ε_{mkt} are independently and identically distributed type I extreme value we get that the choice probability if each job is

(6)
$$\Pr(I_{mkt}^0 = 1 | l_{k,m,2} = 1, z_m) = \frac{\alpha_{2mk} (\alpha_{mkt}^{t+1,,2})^{(b_t-\lambda_t)/\lambda_t} E_t \left[\upsilon_{k,m,t+1} | l_{k,m,2} = 1\right]^{(b_t-\lambda_t)/\lambda_t}}{1 + \sum_{m'=1}^{M} \sum_{k'=1}^{K} \alpha_{2m'k'} (\alpha_{m'k't}^{t+1,2})^{(b_t-\lambda_t)/\lambda_t} E_t \left[\upsilon_{k',m',t+1} | l_{k',m',2} = 1\right]^{(b_t-\lambda_t)/\lambda_t}}$$

and the choice of retirement is

(7)
$$\Pr(I_{0t}^0 = 1 | z_m) = \frac{1}{1 + \sum_{m'=1}^{M} \sum_{k'=1}^{K} \alpha_{2m'k'} (\alpha_{m'k't}^{t+1,2})^{(b_t-\lambda_t)/\lambda_t} E_t \left[\upsilon_{k',m',t+1} | l_{k',m',2} = 1\right]^{(b_t-\lambda_t)/\lambda_t}}$$

3.8.2 The firm's Maximization Problem

We next turn to the firms' problem. The firm maximization problem for the short-term contracts can be decomposed into two stages. In the first stage the firm chooses, period by period, the managers' effort level and offering them feasible contracts that minimize the sum of the discounted expected wage bill $\sum_{k=1}^{K} E_t(w_{mkt+1})$ or equivalently, maximizes $\sum_{k=1}^{K} E_t(\ln \upsilon_{mkt+1})$, for a given mixes of managers characteristics z_m. Given any combination of managerial skill in each position in the hierarchy, the firm determines the effort level in each positing. Shareholders compare the costs and benefits of an incentive compatible compensation package that elicits diligent work versus a (lower cost) scheme that provides some or all managers with the nonpecuniary benefit of low effort.. In the second stage given the optimal solution to first stage of the problem, the firm chooses the mix of managers characteristics to maximize it profits. We show that given the markets' contracts and workers' choice probabilities, a firm cannot increase its profit by offering a different contract from the equilibrium contract. We begin by deriving the cost minimizing contract that elicits high effort from any possible manager, firm and job. The lifetime utility from low-effort is weakly smaller than the lifetime utility from working. That is $V_{2mkt} \geq V_{1mkt}$,

Lemma 3 (Lem:IC)**.** *The cost minimizing contract which implements high-effort is given by*

$$E_t\left[\upsilon_{k,m,t+1}(x)\{g_{m2k}(x|z_{lt}^{(k)}; h_t^{(k)}; z_{ft}) - (\alpha_{2mk}/\alpha_{1mk})^{\lambda_t/(b_t-\lambda_t)}(\alpha_{mkt}^{t+1,2}/\alpha_{mkt}^{t+1,1})\}|l_{k,m,2}= 1\right] \geq 0 \tag{8}$$

Next, suppose that the firm's beliefs that offering the contract $\upsilon_{k,m,t+1}(z_m)$ will attract a manager with skills z_m with a probability of $P_{mk}^E(z_m)$. Suppose first that given the market prices and the firm' beliefs, it is optimal for each firm to hire a team for the hierarchy such that each position k in the hierarchy will be filled with an executive with skills z_m with probability $P_{mk}^E(z_m)$, and an executive with skills z'_m with probability $P_{mk}^E(z'_m)$ etc. (we will prove that below). Given the market prices, and the manager's choice rule in equation 6, and given that firms' expectations are rational, $\Pr(I_{mkt}^0= 1|l_{k,m,2}= 1, z_m) = P_{mk}^E(z_m)$, the contract offered by the firm to a manager with skills z_m needs to satisfy

$$\begin{aligned} &\alpha_{2mk}(\alpha_{mkt}^{t+1,,2})^{(b_t-\lambda_t)/\lambda_t} E_t\left[\upsilon_{k,m,t+1}^*|l_{k,m,2} = 1\right]^{(b_t-\lambda_t)/\lambda_t} \\ &= \left(\frac{P_{mk}^E(z_m)}{1 - P_{mk}^E(z_m)}\right) \times \left(1+ \sum_{\substack{m'=1 \\ (m,k)\neq(m',k')}}^{M} \sum_{k'=1}^{K} \alpha_{jm'k'}(\alpha_{m'k't}^{E,t+1,j})^{(b_t-\lambda_t)/\lambda_t} E_t^E\left[\upsilon_{k',m',t+1}|l_{k',m',j} = 1\right]^{(b_t-\lambda_t)/\lambda_t}\right) \end{aligned} \tag{9}$$

Then, the Lagrangian for the problem can be written as

$$\begin{aligned} &\sum_{k=1}^{K} E_t[\ln(\upsilon_{k,m,t+1}|z_m] + \sum_{k=1}^{K} \eta_{1k}\left[\frac{1}{\alpha_{mkt}^{t+1,2}}\left(U_{mk}^E(z_m)/\alpha_{2mk}\right)^{\lambda_t/(b_t-\lambda_t)} - \sum_{k=1}^{K} E_t[\upsilon_{k,m,t+1}|, z_m]\right] \\ &+\sum_{k=1}^{K} \eta_{2k} E_t\left[\upsilon_{k,m,t+1}\left\{g_{2mk}(x|z_m) - (\alpha_{2mk}/\alpha_{1mk})^{\lambda_t/(b_t-\lambda_t)}(\alpha_{mkt}^{t+1,2}/\alpha_{mkt}^{t+1,1})\right\}|z_m\right] \end{aligned} \tag{10}$$

Lemma 4 (Lem:CostMin)**.** *In the equilibrium where all size of firms elicit high effort for all managers in the hierarchy, the optimal contract is*

$$\begin{aligned} w_{2mkt+1}(x, z_m) &= (\lambda_t b_{t+1}/(\rho(b_t - \lambda_t)\lambda_{t+1})) \log\left(U_{mk}^E(z_m)/\alpha_{2mk}\right) \\ &+ (b_{t+1}/\rho\lambda_{t+1}) \log\left[1 + \eta_k\left\{(\alpha_{2mk}/\alpha_{1mk})^{\lambda_t/(b_t-\lambda_t)}(\alpha_{mkt}^{t+1,2}/\alpha_{mkt}^{t+1,1}) - g_{2mk}(x|z_m)\right\}\right] \end{aligned} \tag{11}$$

where

$$U^E_{mk}(z_m) \equiv$$

$$\left(\frac{P^E_{mk}(z_m)}{1-P^E_{mk}(z_m)}\right) \times \left(1+ \sum_{\substack{m'=1 \\ (m,k)\neq(m',k')}}^{M} \sum_{k'=1}^{K} \alpha_{jm'k'}(\alpha^{E,t+1,j}_{m'k't})^{(b_t-\lambda_t)/\lambda_t} E^E_t \left[\upsilon_{k',m',t+1} | l_{k',m',j}=1\right]^{(b_t-\lambda_t)/\lambda_t}\right)$$

and η_k *is the unique positive root to*

$$\int \left[\frac{f_{2m}(x|z_m)}{\eta_k \left\{(\alpha_{2mk}/\alpha_{1mk})^{\lambda_t/(b_t-\lambda_t)}(\alpha^{t+1,2}_{mkt}/\alpha^{t+1,1}_{mkt}) - g_{2mk}(x|z_m)\right\}}\right] dx = 1$$

Equation 11 is the optimal contract that elicits high-effort and induces a probability $P^E_{mk}(z_m)$ of hiring a manager with characteristics z_m for position k in the firm. It is derived by solving the cost minimization problem, in which the incentive compatibility constraint in 8 and the probabilistic participation constraint in equation 9 bind. It implies an expected utility level $U^E_{mk}(z_m)$ required to attract a manager with characteristics z_m to a job k in firm m with probability $P^E_{mk}(z_m)$. In order to complete the analysis we need to first derive the contracts available for each combination of job-effort-firm and manager's characteristics. Second, we need to characterize the optimal choice of combination of managers for each type of firm.

3.8.3 Stage two: Optimal Mix of Talent

Each firm posts a contract schedule for each position, $k = 1, ..K$, and skill sets. We assume a large number of identical firms. Note that given the market contracts, each contract a firm posts implies a probability that a manager with certain characteristics will choose the contract. Because output in one position depends on the skills and effort of all managers, the firms choose between optimal mix of managerial skills for each position.

The salaries in equilibrium $w^*_{mkt+1}(x, z_{lkt})$, equate profits given a specific type of firm across the different possible combinations of managerial skill sets. Each type of firm across the workers' types'. The following is sufficient condition for optimally. Let Z^g_m denote the $K*1$ vector of managerial talent in each type of job for all z_m for which $P^E_{mk}(Z^g_m) > 0$, And $W^g_{mt+1}(\forall Z^g_m)$ is the costs of market contracts of the corresponding managerial talents. A sufficient condition for equilibrium is that $\forall Z^g_m \neq \forall Z'^g_m$

(12)
$$\int_x \left(\vartheta_{mt-1}(x+\pi_t) - W^g_{mt+1}(x, Z^g_m)\right) \; f_{m2}(x|Z^g_m; h_t; z_{ft}) = asq$$
$$\int_x \left(\vartheta_{mt-1}(x+\pi_t) - W^g_{mt+1}(x, Z'^g_m)\right) \; f_{m2}(x|Z'^g_m; h_t; z_{ft}) \; \forall Z^g_m \neq \forall Z'^g_m$$

That is, given the market contracts for all possible configuration of talent in the firm the chooses the optimal mix. Because the firm is indifferent between all the possible teams, it has no incentives to deviate from the market contracts and raise the compensation of certain types of managers in order to attract certain types with higher probability. Reducing the value of the contract implies an acceptance probability of zero.

Equilibrium

In equilibrium, the contracts clear the market. Suppose $P^E_{mk}(z_m)$ is the equilibrium fraction of managers with observable characteristics z_m that will work for a firm of type m in rank k. The market clearing requires that

$$\sum_{m=0}^{M}\sum_{k=1}^{K}\sum_{z_m} P^E_{mk}(z_m) = 1$$

Lemma 5. *There exists an equilibrium which satisfies the above conditions.*

4 Identification and Estimation

To be completed

Assume that diligence is enforced in every position.

Lemma 6. *The the model is overidentificed and can be estimated using the following moment conditions:*

$$E_t\left[\frac{1}{\alpha_{mkt}^{t+1,2}}\left(U_{mk}^E(z_m)/\alpha_{2mk}\right)^{\lambda_t/(b_t-\lambda_t)} - \upsilon_{k,m,t+1}(x,z)\middle| z_m\right] = 0 \text{ for all } m,k \text{ and } z \tag{13}$$

$$\begin{aligned} & E\Big[\upsilon_{k,m,t+1}^{-1}(x,z)\left(1+(\alpha_{2mk}/\alpha_{1mk})^{\lambda_t/(b_t-\lambda_t)}\right) - \alpha_{mkt}^{t+1,2}\left(\alpha_{2mk}/U_{mk}^E(z_m)\right)^{(b_t-\lambda_t)/\lambda_t} \\ & -\upsilon_{k,m,t+1}^{-1}(x,z)(\alpha_{2mk}/\alpha_{1mk})^{\lambda_t/(b_t-\lambda_t)}(\alpha_{mkt}^{t+1,2}/\alpha_{mkt}^{t+1,1})\Big| z_m\Big] \\ = & \ 0 \text{ for all } m,k \text{ and } z \end{aligned} \tag{14}$$

$$\eta_{2k} = \lim_{x\to\infty}\upsilon_{k,m,t+1}^{-1}(x,z) - E_t[\upsilon_{k,m,t+1}^{-1}(x,z)|z] \tag{15}$$

and

$$g_{2mk}(x|z) = \frac{\lim_{x\to\infty}\upsilon_{k,m,t+1}^{-1}(x,z) - \upsilon_{k,m,t+1}^{-1}(x,z)}{\lim_{x\to\infty}\upsilon_{k,m,t+1}^{-1}(x,z) - E_t[\upsilon_{k,m,t+1}^{-1}(x,z)|z]} \tag{16}$$

5 Estimation results

In progress

6 Appendix

Deriving the indirect utility for T periods by induction.

Suppose we model the problem of working for T periods, and then retiring. We extend to the case where there are multiple jobs. Choosing (c_t, e_{t+1}) and working in job n, and then accepting job k yields utility for choices (c_t, e_{t+1}).

The problem of working one period in k, and then retiring, for choices (c_t, e_{t+1}) yields a utility of

$$-b_t\alpha_{jmk}^{\frac{\lambda_t}{b_{tn}}}(\alpha_{0k})^{1-\frac{\lambda_t}{b_{tn}}}\exp\left(-\frac{a_t+\rho\lambda_t e_t}{b_{nt}}\right)\exp\left(-\frac{\lambda_t}{b_{tn}}\varepsilon_{mkt}\right)E_t[\upsilon_{mkt+1}|z_{mlt};h_{mt};z_{mft};l_{jmkt}=1,I_{mkt}=1]^{1-\frac{\lambda_t}{b_{tn}}}$$

Suppose we model the problem of working for two periods, and then retiring. We extend to the case where there are multiple jobs. If a manager works in job k in period t the probability of him accepting job k' in firm m in period t is $p_{km}^{k'm'}$. Choosing (c_t, e_{t+1}) and working in job n, and then accepting job k yields utility for choices (c_t, e_{t+1}) of

$$\begin{aligned} & -\alpha_{jmk}\beta^t\exp(-\rho c_t)\exp\left(\frac{\lambda_t}{b_{tn}}\varepsilon_{mkt}\right) - E_t\{(\alpha_0)^{1-\frac{\lambda_{t+1}}{b_{nt+1}}}\exp\left(-\frac{a_{t+1}+\rho\lambda_{t+1}e_{t+1}}{b_{nt+1}}\right)b_{nt+1} \\ & \times\sum_{m'=0}^{M}\sum_{k'=1}^{K}\sum_{z'\in\mathbb{Z}}\sum_{s=1}^{2}\alpha_{sm'k'}^{\frac{\lambda_{t+1}}{b_{nt+1}}}E[\exp\left(\frac{\lambda_{t+1}}{b_{t+1}}\varepsilon_{m'k't+1}\right)|z', I_{m'k't+1}, l_{sm'k't+1}] \\ & \times E_{t+1}[\upsilon_{mkt+2}|z', I_{m'k't+1}, l_{sm'k't+1}]^{1-\frac{\lambda_{t+1}}{b_{nt+1}}}\Upsilon_{sm'k'}^{(1)}(z'|z_{mt}, l_{jmk}, I_{mkt})\} \end{aligned}$$

where

$$\Upsilon^{(s)}_{jmk}(z'|z_{mt}, l_{jmk}, I_{mkt}) = \Pr(I_{m'k't+s} = 1, z_{m'k't+s} = z', l_{jmkt+s} = 1|z_{mt}, l_{jmk}, I_{mkt})$$

and define:

(17) $$\alpha^{T-2,,j}_{mkT-1} \equiv$$

(18) $$\sum_{m'=0}^{M} \sum_{k'=1}^{K} \sum_{z'\in\mathbb{Z}} \sum_{s=1}^{2} \alpha_{sm'k'}^{\frac{\lambda_{T-1}}{b_{nT-1}}} E[\exp\left(\frac{\lambda_{T-1}}{b_{T-1}}\varepsilon_{m'k'T}\right)|z', I_{m'k'T-1}, l_{sm'k'T-1}]$$

(19) $$\times E_{T-1}[\upsilon_{mkT}|z', I_{m'k'T-1}, l_{sm'k'T-1}]^{1-\frac{\lambda_{T-1}}{b_{T-1}}} \times \Upsilon^{(1)}_{sm'k'}(z'|z_{mT-2}, l_{jmkT-2}, I_{mkT-2})$$

so we can write the two period and then retirement condition as:

(20) $$-\alpha_{jmk}\beta^{T-2}\exp\left(-\rho c_{T-2}\right)\exp\left(\varepsilon_{mkT-2}\right) - E_t\left[\exp\left(-\frac{a_{T-1}+\rho\lambda_{T-1}e_{T-1}}{b_{T-1}}\right) b_{T-1}\left(\alpha_0\right)^{1-\frac{\lambda_{T-1}}{b_{T-1}}}\alpha^{T-2,j}_{mkT-1}\right]$$

inutility for two and the retirement is

$$-b_{T-2}\left(\alpha_{jmk}\right)^{\frac{\lambda_{T-2}}{b_{T-2}}}\exp\left(\frac{\lambda_{T-2}}{b_{T-2}}\varepsilon_{mkT-2}\right)\left(\alpha_0\right)^{1-\frac{\lambda_{T-1}}{b_{T-1}}}\alpha^{T-2,j}_{mkT-1})^{1-\frac{\lambda_{T-2}}{bT-2}}\exp\left(-\frac{a_{T-2}+\rho\lambda_{T-2}e_{T-2}}{b_{T-2}}\right)\upsilon_{mkT-1}^{1-\frac{\lambda_{T-2}}{b_{T-2}}}$$

$$-b_{T-2}\left(\alpha_{jmk}\right)^{\frac{\lambda_{T-2}}{b_{T-2}}}\exp\left(\frac{\lambda_{T-2}}{b_{T-2}}\varepsilon_{mkT-2}\right)\left(\alpha_0\right)^{(1-\frac{\lambda_{T-1}}{b_{T-1}})(1-\frac{\lambda_{T-2}}{bT-2})}\alpha^{T-2,j}_{mkT-1})^{1-\frac{\lambda_{T-2}}{bT-2}}$$
$$\times\exp\left(-\frac{a_{T-2}+\rho\lambda_{T-2}e_{T-2}}{b_{T-2}}\right)E_t\left[\upsilon_{k,mT-1}^{1-\frac{\lambda_{T-2}}{b_{T-2}}}|l_{k,m,j}\right]$$

Three period work then retirement

$$-\alpha_{jmk}\beta^{T-3}\exp\left(-\rho c_{T-3}\right)\exp\left(\frac{\lambda_{T-3}}{b_{T-3}}\varepsilon_{mkT-3}\right)$$
$$-E_{T-3}\{b_{T-2}\left(\alpha_0\right)^{(1-\frac{\lambda_{T-1}}{b_{T-1}})(1-\frac{\lambda_{T-2}}{bT-2})}\exp\left(-\frac{a_{T-2}+\rho\lambda_{T-2}e_{T-2}}{b_{T-2}}\right)\times$$
$$\sum_{m'=0}^{M}\sum_{k'=1}^{K}\sum_{z'\in\mathbb{Z}}\sum_{s=1}^{2}\alpha^{T-2,s}_{m'k'T-1}{}^{1-\frac{\lambda_{T-2}}{b_{T-2}}}\Upsilon^{(1)}_{sm'k'}(z'|z_{mT-3}, l_{jmkT-3}, I_{mkT3})\left(\alpha_{sm'k'}\right)^{\frac{\lambda_{T-2}}{b_{T-2}}}$$
$$\times E[\exp\left(\frac{\lambda_{T-2}}{b_{T-2}}\varepsilon_{m'k'T-2}\right)|z', I_{m'k'T-2}, l_{sm'k'T-2}]\upsilon_{m'k'T-1}^{1-\frac{\lambda_{T-2}}{b_{T-2}}}\}$$

$$\alpha^{T-3,,j}_{mkT-2} \equiv \sum_{m'=0}^{M}\sum_{k'=1}^{K}\sum_{z'\in\mathbb{Z}}\sum_{s=1}^{2}\alpha^{T-2,s}_{m'k'T-1}{}^{1-\frac{\lambda_{T-2}}{b_{T-2}}}\Upsilon^{(1)}_{sm'k'}(z'|z_{mT-3}, l_{jmkT-3}, I_{mkT-3})\left(\alpha_{sm'k'}\right)^{\frac{\lambda_{T-2}}{b_{T-2}}}$$
$$\times E[\exp\left(\frac{\lambda_{T-2}}{b_{T-2}}\varepsilon_{m'k'T-2}\right)|z', I_{m'k'T-2}, l_{sm'k'T-2}]\upsilon_{m'k'T-1}^{1-\frac{\lambda_{T-2}}{b_{T-2}}}\}$$

Let

$$\alpha^{t+1,,j}_{mkt} = \sum_{m'=0}^{M}\sum_{k'=1}^{K}\sum_{z'\in\mathbb{Z}}\sum_{s=1}^{2}\alpha^{t+2,s}_{m'k't+1}{}^{1-\frac{\lambda_{t+2}}{b_{t+1}}}\left(\alpha_{sm'k'}\right)^{\frac{\lambda_{t+2}}{b_{t+2}}}\Upsilon^{(1)}_{sm'k'}(z'|z_{mt},l_{jmkt},I_{mkt})$$
$$\times E[\exp\left(\frac{\lambda_{t+2}}{b_{t+2}}\varepsilon_{m'k't+2}\right)|z',I_{m'k't+2},l_{sm'k't+2}]\upsilon^{1-\frac{\lambda_{t+2}}{b_{t+2}}}_{m'k't+3}\}$$

The problem of working for T periods and then retiring , by induction, is:

$$-\alpha_{jmk}\beta^t\exp\left(-\rho c_t\right)\exp\left(-\varepsilon_{mkt}\right)-E_t\left\{b_{t+1}\alpha_0^{1-\frac{\lambda_t}{b_{tn}}}\alpha^{T,j}_{mkt+1}\exp\left(-\frac{a_{t+1}+\rho\lambda_{t+1}e_{t+1}}{b_{t+1}}\right)\right\}$$

Maximizing the utility subject to the budget constraint in 2 gives the following indirect utility

$$V_{jmkt} = -b_t\alpha_{jmk}^{\frac{\lambda_t}{bt}}(\alpha^{t+1,,j}_{mkt})^{1-\frac{\lambda_t}{b_t}}\exp\left(-\frac{\lambda_t}{b_t}\varepsilon_{mkt}\right)\alpha_0^{\prod_{s=t+1}^{T-1}(1-\frac{\lambda_s}{b_s})}\exp\left(-\frac{a_t+\rho\lambda_t e_t}{b_t}\right)$$
$$\times E_t\left[\upsilon_{k,m,t+1}|l_{k,m,j}=1\right]^{1-\frac{\lambda_t}{b_t}})$$

Q.E.D

of Lemma 8. Simply imposing that the value of working diligently weakly exceeds the value of shirking is

$$-b_t\alpha_{2mk}^{\frac{\lambda_t}{bt}}(\alpha^{t+1,2}_{mkt})^{1-\frac{\lambda_t}{b_t}}\exp\left(-\frac{\lambda_t}{b_t}\varepsilon_{mkt}\right)^{1-\frac{\lambda_t}{b_t}}\alpha_0^{\prod_{s=t+1}^{T-1}(1-\frac{\lambda_s}{b_s})}\exp\left(-\frac{a_t+\rho\lambda_t e_t}{b_{nt}}\right)E_t\left[\upsilon_{k,m,t+1}|l_{k,m,2}=1\right]^{1-\frac{\lambda_t}{b_{t\overline{n}}}})$$
$$\geq -b_t\alpha_{1mk}^{\frac{\lambda_t}{bt}}(\alpha^{t+1,1}_{mkt})^{1-\frac{\lambda_t}{b_t}}\exp\left(-\frac{\lambda_t}{b_t}\varepsilon_{mkt}\right)^{1-\frac{\lambda_t}{b_t}}\alpha_0^{\prod_{s=t+1}^{T-1}(1-\frac{\lambda_s}{b_s})}\exp\left(-\frac{a_t+\rho\lambda_t e_t}{b_{nt}}\right)E_t\left[\upsilon_{k,m,t+1}|l_{k,m,1}=1\right]^{1-\frac{\lambda_t}{b_{t\overline{n}}}})$$

Simplifying, yields the condition in the Lemma. Q.E.D

CostMin. The Lagrangian can for the problem can be written as

$$\sum_{k=1}^{K}E_t[\ln(\upsilon_{k,m,t+1}|z_m]+\sum_{k=1}^{K}\eta_{1k}\left[\frac{1}{\alpha^{t+1,2}_{mkt}}\left(U^E_{mk}(z_m)/\alpha_{2mk}\right)^{\lambda_t/(b_t-\lambda_t)}-\sum_{k=1}^{K}E_t[\upsilon_{k,m,t+1}|,z_m]\right]$$
$$+\sum_{k=1}^{K}\eta_{2k}E_t\left[\upsilon_{k,m,t+1}\left\{g_{2mk}(x|z_m)-(\alpha_{2mk}/\alpha_{1mk})^{\lambda_t/(b_t-\lambda_t)}(\alpha^{t+1,2}_{mkt}/\alpha^{t+1,1}_{mkt})\right\}|z_m\right] \tag{21}$$

Proof. The kth first order condition is then

$$\upsilon^{-1}_{k,m,t+1}=\eta_{1k}+\eta_{2k}\left\{g_{2mk}(x|z_m)-(\alpha_{2mk}/\alpha_{1mk})^{\lambda_t/(b_t-\lambda_t)}(\alpha^{t+1,2}_{mkt}/\alpha^{t+1,1}_{mkt})\right\} \tag{22}$$

multiplying both sides by $\upsilon_{k,m,t+1}$, adding and subtracting $\frac{\eta_{1k}}{\alpha^{t+1,2}_{mkt}}\left(U^E_{mk}(z_m)/\alpha_{2mk}\right)^{\lambda_t/(b_t-\lambda_t)}$ from both sides of 22 gives

$$1 = \eta_{1k}\left[\upsilon_{k,m,t+1} - \frac{1}{\alpha_{mkt}^{t+1,2}}\left(U_{mk}^{E}(z_m)/\alpha_{2mk}\right)^{\lambda_t/(b_t-\lambda_t)}\right]$$

$$(23) \qquad +\eta_{2k}\upsilon_{k,m,t+1}\left\{g_{2mk}(x|z_m) - (\alpha_{2mk}/\alpha_{1mk})^{\lambda_t/(b_t-\lambda_t)}(\alpha_{mkt}^{t+1,2}/\alpha_{mkt}^{t+1,1})\right\}$$

$$(24) \qquad +\frac{\eta_{1k}}{\alpha_{mkt}^{t+1,2}}\left(U_{mk}^{E}(z_m)/\alpha_{2mk}\right)^{\lambda_t/(b_t-\lambda_t)}$$

Taking expectation conditional on $l_{k,m,2} = 1, z_m$ and noting the the complimentary slackness condition binds gives us

$$(25) \qquad 1 = \frac{\eta_{1k}}{\alpha_{mkt}^{t+1,2}}\left(U_{mk}^{E}(z_m)/\alpha_{2mk}\right)^{\lambda_t/(b_t-\lambda_t)}$$

which implies that

$$(26) \qquad \eta_{1k} = \alpha_{mkt}^{t+1,2}\left(U_{mk}^{E}(z_m)/\alpha_{2mk}\right)^{(b_t-\lambda_t)/\lambda_t}$$

Next substitute 22 into the incentive compatibility constraint we get

$$(27) \qquad E_t\left[\left.\frac{\eta_{2k}\left\{g_{2mk}(x|z_m) - (\alpha_{2mk}/\alpha_{1mk})^{\lambda_t/(b_t-\lambda_t)}(\alpha_{mkt}^{t+1,2}/\alpha_{mkt}^{t+1,1})\right\}}{\eta_{1k} + \eta_{2k}\left\{(\alpha_{2mk}/\alpha_{1mk})^{\lambda_t/(b_t-\lambda_t)}(\alpha_{mkt}^{t+1,2}/\alpha_{mkt}^{t+1,1}) - g_{2mk}(x|z_m)\right\}}\right| z_m\right] = 0$$

Define $\eta_k = \frac{\eta_{2k}}{\eta_{1k}}$ then

$$(28) \qquad \eta_k\int\left[\frac{g_{2mk}(x|z_m) - (\alpha_{2mk}/\alpha_{1mk})^{\lambda_t/(b_t-\lambda_t)}(\alpha_{mkt}^{t+1,2}/\alpha_{mkt}^{t+1,1})}{1 + \eta_k\left\{(\alpha_{2mk}/\alpha_{1mk})^{\lambda_t/(b_t-\lambda_t)}(\alpha_{mkt}^{t+1,2}/\alpha_{mkt}^{t+1,1}) - g_{2mk}(x|z_m)\right\}}\right] f_{m2}(x|z_m)dx = 0$$

or

$$(29) \qquad \int\left[\frac{f_{m2}(x|z_m)}{\eta_k(\alpha_{2mk}/\alpha_{1mk})^{\lambda_t/(b_t-\lambda_t)}(\alpha_{mkt}^{t+1,2}/\alpha_{mkt}^{t+1,1}) - \eta_k g_{2mk}(x|z_m)}\right] dx = 1$$

Finally, using the definition of η_k, the FOC can be written as

$$(30) \qquad \upsilon_{k,m,t+1}^{-1} = \eta_{1k}\left[1 + \eta_k\left\{g_{2mk}(x|z_m) - (\alpha_{2mk}/\alpha_{1mk})^{\lambda_t/(b_t-\lambda_t)}(\alpha_{mkt}^{t+1,2}/\alpha_{mkt}^{t+1,1})\right\}\right]$$

substituting for η_{1k} from equation 26 we get

$$(31) \qquad \upsilon_{k,m,t+1}^{-1} = \alpha_{mkt}^{t+1,2}\left(U_{mk}^{E}(z_m)/\alpha_{2mk}\right)^{(b_t-\lambda_t)/\lambda_t}$$

$$(32) \qquad \times\left[1 + \eta_k\left\{g_{2mk}(x|z_m) - (\alpha_{2mk}/\alpha_{1mk})^{\lambda_t/(b_t-\lambda_t)}(\alpha_{mkt}^{t+1,2}/\alpha_{mkt}^{t+1,1})\right\}\right]$$

Substituting for $\upsilon_{k,m,t+1}^{-1}$ we get

$$\exp\left(\frac{\rho\lambda_{t+1}w_{mkt+1}(x,z_m)}{b_{t+1}}\right) = \alpha_{mkt}^{t+1,2}\left(U_{mk}^{E}(z_m)/\alpha_{2mk}\right)^{(b_t-\lambda_t)/\lambda_t}$$

$$\times\left[1 + \eta_k\left\{g_{2mk}(x|z_m) - (\alpha_{2mk}/\alpha_{1mk})^{\lambda_t/(b_t-\lambda_t)}(\alpha_{mkt}^{t+1,2}/\alpha_{mkt}^{t+1,1})\right\}\right]$$

solving to $w_{mkt+1}(x, z_m)$ we obtain the result.

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Notes

[*]This is consistent with findings in Frydman (2005) which used data on top three executives in 50 firms.

[†]The optimal contract decentralizes (see conditions in Fudenberg, Holmstrom and Milgrom, 1990) despite the private information. Although effort affects human capital contracts and labor market histories are observed, therefore, employers know the effort level the executives exerts given the contract.

Table 1: Clasification of Tiltle into Ranks

Rank		Title1	Title 2	TITLE 3
RANK 1				
	12a	chairman	& vicechair	
	11a	schairman & sceo	chairman & sother	schairman & svicechair
RANK 2				
	9a	chairman	& president	& ceo
	8b	ceo		
RANK 3				
	10a	chairman	& cfo	
	9b	chairman	& execvp	
	9c	chairman	& coo	
	3b	coo		
	8a	president	& coo	
RANK 4				
	7a	execvp		
	6a	execvp	& coo	
	6b	execvp	& cfo	
RANK 5				
	5a	snrvp		
	5b	spresident		
	5c	execvp	& other	
	5d	execvp	& spresident	
	5e	execvp & sceo	execvp & scoo	
	5f	spresident & sceo	spresident & scoo	
	4a	president	& execvp	
	4b	sceo		
RANK 6				
	3a	vp		
	3c	other	& snrvp	
	3d	other	& vp	
	3e	other	& cfo	
	3f	snrvp	& cfo	
	3g	snrvp	& spresident	
	1c	scoo		
	1d	president	& other	
	1e	president	& cfo	
RANK 7				
	2a	snrvp	& coo	
	2b	snrvp & sceo	snrvp & scoo	
	1a	other		
	1b	sceo		
	1f	vp	& cfo	
	1g	vp	& spresident	
	1h	vp & sceo	vp & scoo	
	0a	cfo		

.

Table 2a- Internal transitions(percent from base rank)

	RANK 1	RANK 2	RANK 3	RANK 4	RANK 5	RANK 6	RANK 7	Size
RANK 1	88	6	3	1	1	0	0	3995
RANK 2	4	95	0	0	0	0	0	20150
RANK 3	3	14	78	3	1	1	0	6272
RANK 4	1	2	3	86	4	2	1	19359
RANK 5	1	1	2	7	85	2	1	15781
RANK 6	0	0	1	6	6	85	2	14646
RANK 7	0	1	1	6	3	7	81	5581

Table 2b- Internal transitions

	RANK 1	RANK 2	RANK 3	RANK 4	RANK 5	RANK 6	RANK 7	Size	exit	%exit
RANK 1	3508	221	139	59	39	13	16	3995	487	12
RANK 2	735	19221	86	56	35	8	9	20150	929	5
RANK 3	185	868	4902	161	88	39	29	6272	1370	22
RANK 4	198	486	631	16735	786	322	209	19359	2624	14
RANK 5	150	211	382	1109	13425	324	180	15781	2356	15
RANK 6	21	70	130	897	847	12398	283	14646	2248	15
RANK 7	14	34	79	352	186	370	4546	5581	1035	19
entries	1303	1872	1447	2634	1981	1086	726			
%entries	33	9	23	14	13	7	12			

Table 3a- Turnover

	RANK 1	RANK 2	RANK 3	RANK 4	RANK 5	RANK 6	RANK 7	Size
RANK 1	52	36	8	4	1	0	0	165
RANK 2	19	58	9	5	7	1	0	389
RANK 3	10	40	26	14	9	1	1	140
RANK 4	3	21	7	40	12	11	5	281
RANK 5	2	36	10	14	34	3	1	211
RANK 6	0	9	8	30	8	34	10	130
RANK 7	2	13	4	30	6	19	26	53

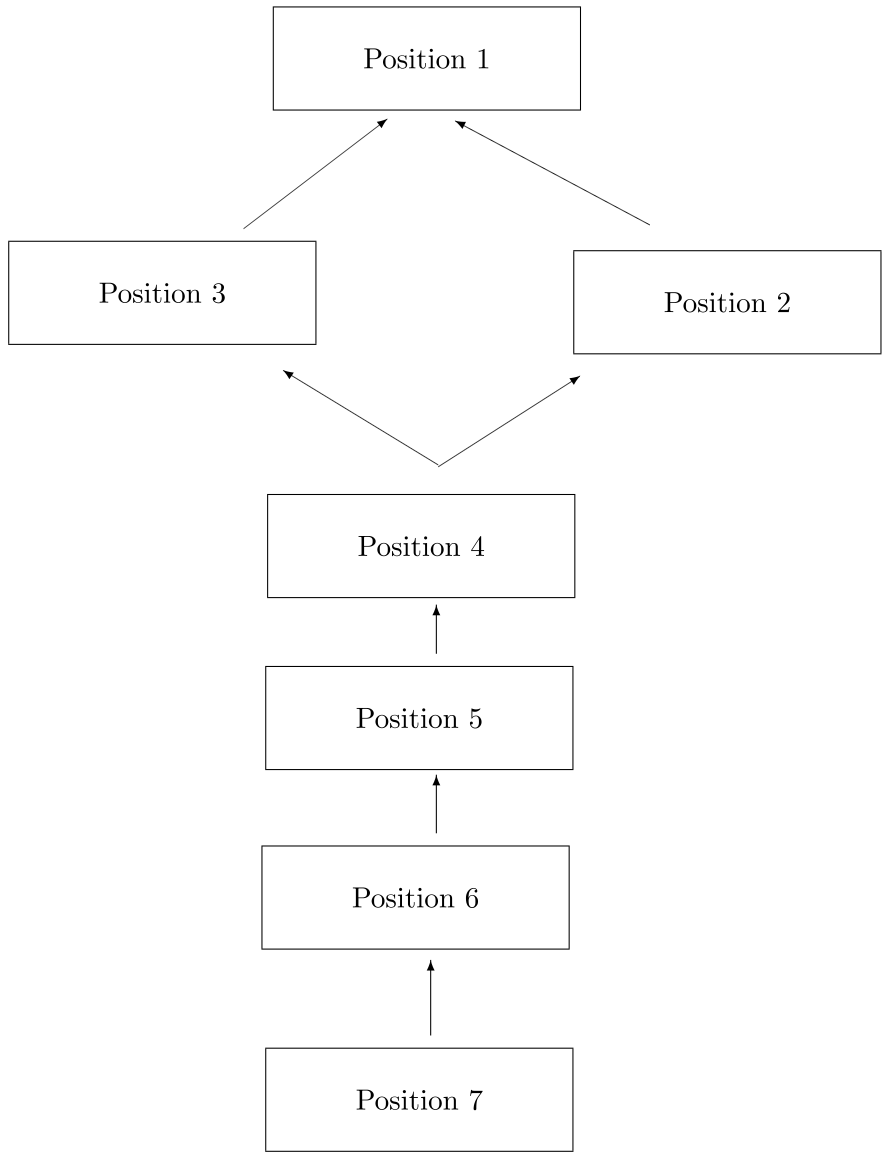

Figure 1: Hierarchy

Table 3b- Turnover

	Transitions	Rank size	Transition rate
RANK 1	165	3995	4.1%
RANK 2	389	20150	1.9%
RANK 3	140	6272	2.2%
RANK 4	281	19359	1.5%
RANK 5	211	15781	1.3%
RANK 6	130	14646	0.9%
RANK 7	53	5581	0.9%
Total	1369	85748	1.6%

Table 4: Summary
Compensation and Salary are measured in Thousand of 2006 US$
Assets are measured in Millions of 2006 US$
Employees are measured in Thousand

Variable	**Mean**	**Std. Dev.**	**N**
Rank 1	0.063	0.243	69408
Rank 2	0.265	0.442	69408
Rank 3	0.077	0.267	69408
Rank 4	0.215	0.411	69408
Rank 5	0.17	0.375	69408
Rank 6	0.153	0.36	69408
Rank 7	0.057	0.231	69408
No. Degree	0.211	0.408	71803
MBA	0.228	0.42	71803
MS/MA	0.188	0.391	71803
Ph.D.	0.176	0.38	71803
Prof. Certification	0.217	0.413	71803
Female	0.041	0.199	71803
Age	53.707	9.345	66854
# of past moves	2.039	1.998	58529
# of Executive Moves	0.822	1.342	71803
Executive Experience	18.336	42.64	58479
Tenure	14.383	11.494	52823
Promotion	0.375	0.484	67421
Turnover	0.027	0.162	69408
Salary	518.108	329.463	59256
Total Compensation	2889.668	13254.345	58110
Primary	0.367	0.482	64806
Consumer Goods	0.281	0.45	64806
Services	0.352	0.478	64806
Assets	18,162	76,2046	69115
Employees	23.659	56.702	67842
Excess Return	-0.005	0.6	59256

Table 5: Executives Characteristics
Compensation and Salary are measured in Thousand of 2006 US$

Variable	Rank1	Rank2	Rank3	Rank4	Rank5	Rank6	Rank7
Age	59.6 (9.8)	55.7 (7.6)	52.4 (8.0)	52.0 (8.8)	52.8 (10)	52.4 (10.3)	52.2 (11.2)
Female	0.02 (0.13)	0.02 (0.12)	0.03 (0.16)	0.05 (0.23)	0.06 (0.24)	0.06 (0.24)	0.05 (0.21)
No Degree	0.25 (0.43)	0.21 (0.41)	0.25 (0.43)	0.21 (0.40)	0.21 (0.41)	0.17 (0.37)	0.21 (0.41)
MBA	0.24 (0.42)	0.26 (0.44)	0.23 (0.42)	0.27 (0.44)	0.19 (0.39)	0.18 (0.39)	0.22 (0.41)
MS/MA	0.16 (0.37)	0.17 (0.37)	0.17 (0.37)	0.19 (0.39)	0.21 (0.41)	0.21 (0.40)	0.21 (0.40)
Ph.D.	0.15 (0.37)	0.15 (0.35)	0.14 (0.34)	0.13 (0.33)	0.21 (0.41)	0.27 (0.44)	0.17 (0.38)
Prof. Certification	0.15 (0.36)	0.14 (0.34)	0.15 (0.35)	0.22 (0.42)	0.24 (0.43)	0.37 (0.47)	0.30 (0.45)
Executive Experience	22.3 (13.0)	19.8 (10.5)	16.1 (10.7)	15.9 (11.0)	16.6 (12)	16.5 (11.7)	16.9 (11.7)
Tenure	17.1 (13.5)	15.1 (11.7)	13.7 (11.4)	13.8 (11.2)	14.1 (12)	13.7 (11.0)	14.2 (10.8)
# of past moves	1.9 (2.0)	1.9 (1.9)	1.7 (1.9)	1.9 (1.9)	2.2 (2.0)	2.3 (2.1)	2.3 (2.1)
# of Executive Moves	0.9 (1.4)	0.93 (1.38)	0.73 (1.3)	0.76 (0.13)	0.77 (1.32)	0.80 (1.3)	0.84 (1.4)
Salary	640 (375)	767 (398)	591 (320)	438 (197)	408 (190)	323 (141)	340 (217)
Total Compensation	2682 (18229)	4199 (20198)	4055 (14892)	2587 (8536)	2311 (7319)	1598 (5539)	1867 (6634)

*Standard Deviation in Parenthesis

Table 6: Executives Characteristics by Sector
Compensation and Salary are measured in Thousand of 2006 US$

Variable	Overall	Primary	Consumer	Services
Rank 1	0.06 (0.24)	0.05 (0.22)	0.07 (0.254)	0.05 (0.22)
Rank 2	0.27 (0.44)	0.27 (0.45)	0.263 (0.44)	0.26 (0.44)
Rank 3	0.08 (0.27)	0.06 (0.24)	0.088 (0.284)	0.08 (0.27)
Rank 4	0.22 (0.41)	0.20 (0.40)	0.217 (0.412)	0.22 (0.41)
Rank 5	0.17 (0.38	0.17 (0.36)	0.18 (0.384)	0.17 (0.38)
Rank 6	0.15 (0.36)	0.18 (0.39)	0.139 (0.346)	0.16 (0.36)
Rank 7	0.06 (0.23)	0.06 (0.24)	0.044 (0.204)	0.07 (0.25)
Age	53.7 (9.3)	54.8 (9.23)	53.64 (9.365)	52.7 (9.5)
Female	0.04 (0.20)	0.03 (0.17)	0.057 (0.232)	0.04 (0.20)
No Degree	0.21 (0.41)	0.18 (0.39)	0.263 (0.44)	0.2 (0.37)
MBA	0.23 (0.42)	0.237 (0.42)	0.218 (0.413)	0.23 (0.42)
MS/MA	0.19 (0.39)	0.19 (0.40)	0.149 (0.356)	0.22 (0.42)
Ph.D.	0.18 (0.38)	0.20 (0.42)	0.147 (0.354)	0.19 (0.39)
Prof. Certification	0.22 (0.41)	0.24 (0.42)	0.208 (0.406)	0.21 (0.40)
Executive Experience	18.3 (11.5)	17.6 (11.4)	17.87 (11.41)	17.2 (11.6)
Tenure	14.4 (11.5)	15.0 (11.5)	14.28 (11.5)	13.6 (10.9)
# of past moves	2.01 (2.00)	2.02 (2.01)	2.00 (2.00)	2.12 (1.98)
# of Executive Moves	0.82 (1.34)	0.82 (1.34)	0.846 (1.39)	0.82 (1.32)
Promotion	0.35 (0.48)	0.34 (0.47)	0.34 (0.475)	0.37 (0.48)
Salary	518 (329)	496 (296)	584 (392)	494 (296)
Total Compensation	2,890 (13,254)	2,160 (9,708)	2,292 (14,163)	3,986 (16,124)

*Standard Deviation in Parenthesis

Table 7: Executives Characteristics by Firm Size

Variable	Overall	Asset Small	Asset Large	Employee Small	Employee Large
Rank 1	0.06	0.04	0.06	0.04	0.06
	(0.24)	(0.19)	(0.23)	(0.19)	(0.24)
Rank 2	0.27	0.28	0.26	0.28	0.26
	(0.44)	(0.45)	(0.44)	(0.44)	(0.44)
Rank 3	0.08	0.05	0.08	0.05	0.08
	(0.27)	(0.22)	(0.27)	(0.22)	(0.27)
Rank 4	0.22	0.18	0.22	0.18	0.22
	(0.41)	(0.38)	(0.41)	(0.38)	(0.41)
Rank 5	0.17	0.15	0.18	0.15	0.18
	(0.38)	(0.36)	(0.38)	(0.36)	(0.38)
Rank 6	0.15	0.21	0.15	0.22	0.15
	(0.36)	(0.41)	(0.36)	(0.42)	(0.36)
Rank 7	0.06	0.09	0.05	0.08	0.06
	(0.23)	(0.28)	(0.22)	(0.27)	(0.23)
Age	53.7	53.9	53.7	53.7	53.8
	(9.3)	(10.3)	(9.3)	(11.2)	(9.3)
Female	0.04	0.06	0.04	0.05	0.04
	(0.20)	(0.23)	(0.19)	(0.21)	(0.19)
No Degree	0.21	0.23	0.21	0.21	0.21
	(0.41)	(0.47)	(0.41)	(0.41)	(0.41)
MBA	0.23	0.19	0.23	0.18	0.23
	(0.42)	(0.39)	(0.42)	(0.39)	(0.42)
MS/MA	0.19	0.24	0.18	0.23	0.19
	(0.39)	(0.42)	(0.39)	(0.42)	(0.39)
Ph.D.	0.18	0.18	0.18	0.21	0.17
	(0.38)	(0.38)	(0.38)	(0.41)	(0.37)
Prof. Certification	0.22	0.26	0.21	0.27	0.21
	(0.41)	(0.43)	(0.41)	(0.44)	(0.41)
Executive Experience	18.3	20.6	17.1	19.4	17.2
	(11.5)	(12.3)	(11.3)	(12.1)	(11.3)
Tenure	14.4	16.2	14.1	15.7	14.1
	(11.5)	(12.07)	(11.4)	(12.1)	(11.4)
# of past moves	2.0	2.5	2.0	2.3	2.0
	(2.0)	(2.2)	(2.0)	(2.1)	(2.0)
# of Executive Moves	0.82	0.93	0.81	0.86	0.82
	(1.34)	(1.5)	(1.3)	(1.4)	(1.33)
Promotion	0.35	0.33	0.36	0.34	0.36
	(0.48)	(0.47)	(0.47)	(0.47)	(0.47)
Salary	518	327	544	361	546
	(329)	(185)	(334)	(233)	(334)
Total Compensation	2,890	1,350	3,022	1,538	3,056
	(13,254)	(10,188)	(13,858)	(11,311)	(13,753)

Table 8: Logit and Conditional of Promotion and Turnover

Current Variable	Promotion	Promtion Exec. F.E.	Promotion Company. F.E.	Promotion External.	Turnover
Compensation	-0.001	0.002	-0.002	0.006	0.007
	(0.001)	(0.002)	(0.001)	(0.007)	(0.003)*
Excess return	-0.21	-0.239	-0.168	-0.197	-0.422
	(0.030)**	(0.045)**	(0.034)**	(0.156)	(0.093)**
Excess return Lagged	-0.124	-0.067	-0.082	0.054	-0.229
	(0.025)**	-0.038	(0.028)**	-0.199	(0.076)**
Rank 2	-2.2	-2.282	-2.542	-2.993	-0.434
	(0.058)**	(0.113)**	(0.071)**	(0.496)**	(0.114)**
Rank 3	-0.999	-1.077	-1.209	-1.797	-0.103
	(0.066)**	(0.117)**	(0.081)**	(0.542)**	(0.146)
Rank 4	-0.99	-1.08	-1.198	-1.56	-0.263
	(0.053)**	(0.099)**	(0.068)**	(0.505)**	(0.120)*
Rank 5	-0.658	-0.926	-0.891	-0.471	-0.553
	(0.054)**	(0.102)**	(0.068)**	(0.58)	(0.134)**
Rank 6	-0.743	-0.958	-0.872	-0.963	-0.558
	(0.055)**	(0.102)**	(0.068)**	(0.552)	(0.139)**
Consumer Goods	-0.021	-0.057	0.066	0.318	-0.152
	(0.037)	(0.111)	(0.082)	(0.265)	(0.091)
Services	0.075	0.024	0.211	0.025	-0.001
	(0.034)*	-0.105	(0.078)**	(0.22)	(0.083)
Assets	0.000	0.001	0.000	0.001	0.000
	(0.000)	-0.001	(0.000)	(0.005)	(0.001)
Employees	0.001	0.002	0.001	0.008	0.001
	(0.000)**	(0.001)*	(0.001)	(0.004)*	(0.000)*
Observations	28443	17866	26708	757	30343

Standard errors in parentheses;* significant at 5%; ** significant at 1%

Table 8(continued): Logit and Conditional of Promotion and Turnover

Current Variable	Promotion	Promtion Exec. F.E.	Promotion Company. F.E.	Promotion External.	Turnover
Executive Experience	0.000	0.001	0.000	0.002	0.000
	(0.000)	(0.001)	(0.000)	(0.004)	(0.001)
Tenure	0.011	0.04	0.018	0.000	-0.041
	(0.001)**	(0.004)**	(0.002)**	(0.011)	(0.004)**
# of Executive Moves	0.059	0.101	0.063	-0.227	0.092
	(0.014)**	(0.035)**	(0.018)**	(0.111)*	(0.037)*
# of past moves	0.016	0.058	0.01	0.095	-0.08
	-0.011	(0.025)*	(0.013)	-0.083	(0.030)**
Age	-0.107	-0.396	-0.139	0.008	0.185
	(0.010)**	(0.059)**	(0.013)**	(0.111)	(0.041)**
Age Square	0.001	0.001	0.001	0.000	-0.002
	(0.000)**	(0.001)	(0.000)**	(0.001)	(0.000)**
Female	0.053		-0.041	-1.153	0.012
	(0.071)		(0.091)	(0.483)*	(0.198)
No. Degree	-0.058		0.025	-0.562	0.181
	(0.043)		(0.057)	(0.292)	0.105)
MBA	-0.043		-0.075	-0.255	0.287
	(0.037)		(0.047)	0.235)	(0.086)**
MSMA	0.008		0.043	0.212	-0.11
	(0.037)		(0.048)	(0.26)	(0.098)
Ph.D.	-0.05		-0.04	-0.574	-0.031
	(0.039)		(0.05)	(0.274)*	(0.103)
Prof. Certification	-0.151		(0.149)	-0.538	-0.044
	(0.036)**		(0.046)**	(0.253)*	(0.094)
Turnover	2.14	3.173	2.314		
	(0.088)**	(0.153)**	(0.110)**		
Constant	3.583			3.366	-8.038
	(0.292)**			(3.188)	(1.150)**
Observations	28443	17866	26708	757	30343

Standard errors in parentheses;* significant at 5%; ** significant at 1%

Table 9: Compensation Regressions

	OLS	LAD
Rank 2	2,090.11	1,388.09
	(289.289)**	(39.143)**
Rank 3	896.515	65.889
	(352.374)*	-47.683
Rank 4	-197.024	-767.392
	(302.908)	(40.986)**
Rank 5	-484.074	-932.005
	(308.492)	(41.736)**
Rank 6	-998.282	-1,139.54
	(313.464)**	(42.411)**
Rank 7	-783.61	-1,109.86
	(379.645)*	(51.357)**
Consumer goods	-4.737	83.106
	(161.543)	(21.863)**
Service	965.097	519.103
	(149.900)**	(20.291)**
Age	75.732	20.155
	(47.603)	(6.444)**
Age Square	-0.879	-0.155
	(0.411)*	(0.056)**
Assets	0.029	0.03
	(0.001)**	(0.000)**
Employees	16.82	16.613
	(1.346)**	(0.182)**
Female	355.209	91.731
	(339.929)	(45.917)*
No. Degree	136.194	12.363
	(189.753)	(25.679)
MBA	367.872	130.474
	(162.991)*	(22.060)**
MS/MA	-79.861	-74.731
	(165.083)	(22.344)**
Ph.D.	309.473	32.827
	(172.953)	(23.409)
Prof. Certification	-385.793	-101.85
	(160.076)*	(21.665)**
Executive Experience	-0.977	-0.078
	(1.582)	(0.203)
Tenure	-17.339	-4.573
	(6.709)**	(0.906)**
# of past moves	-32.503	-31.781
	-48.569	(6.574)**
# of Executive Moves	52.739	21.603
	(65.354)	(8.839)*
First Year with Company	994.989	551.859
	(464.134)*	(62.789)**
Constant	964.053	1,222
	(1,417)	(191.9)**

Table 9: Compensation Regressions (continued)

	OLS	LAD
Excess Return	11,636.76	8,478.87
	(967.506)**	(129.384)**
Excess Return Square	-908.68	-238.373
	(27.210)**	(3.649)**
Excess Return× Age	136.767	29.214
	(12.835)**	(1.711)**
Excess Return×Rank 2	-388.042	1,423.73
	-655.597	(88.196)**
Excess Return×Rank 3	-7,142.15	-5,254.64
	(745.473)**	(100.422)**
Excess Return×Rank 4	-12,219.21	-8,068.44
	(665.071)**	(89.477)**
Excess Return×Rank 5	-14,409.11	-8,921.51
	(675.818)**	(90.755)**
Excess Return×Rank 6	-14,047.82	-9,188.51
	(670.508)**	(90.146)**
Excess Return×Rank 2	-13,148.96	-9,227.35
	(748.188)**	(100.593)**
Excess Return×Consumer Goods	2,246.78	334.718
	(353.561)**	(47.699)**
Excess Return×Service	2,694.64	1,427.43
	(288.870)**	(39.047)**
Excess Return×Asset	0.115	0.086
	(0.006)**	(0.001)**
Excess Return×Employees	34.181	32.124
	(4.481)**	(0.606)**
Excess Return×Tenure	15.764	9.271
	-11.078	(1.469)**
Excess Return×Executive Experience	-2.464	-1.086
	-1.891	(0.151)**
Excess Return×# of past moves	-392.886	-80.655
	(84.423)**	(11.360)**
Excess Return×# of Executive moves	153.524	10.868
	(114.343)	-15.297
Excess Return× first year in company	-579.266	-513.588
	(854.534)	(115.601)**
Excess Return×Female	-377.221	-286.293
	(607.244)	(75.045)**
Excess Return×No. Degree	-622.6	-68.224
	(328.146)	(44.118
Excess Return×MBA	-249.712	234.566
	(314.901)	(42.495)**
Excess Return×MS/MA	-64.16	-355.654
	(299.351)	(40.481)**
Excess Return×Ph.D.	-22.42	100.848
	(312.742)	(42.259)*
Excess Return×Prof. Certification	-1,478.81	-199.566
Observations	35893	35893
R-squared	0.25	

Standard errors in parentheses;* significant at 5%; ** significant at 1%