The dynamics of promotions, quits and layoffs

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NASM
Boston, June 2009
Motivation

- How does the firm-wide distribution of attributes of executives affect
  1. Firms’ placement and wage offers, and
  2. Managers’ quit decisions?
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  1. Firms’ placement and wage offers, and
  2. Managers’ quit decisions?

- How do the incentives generated by the tournament (competition for promotions) vary with an executive’s age/career stage and ability?
Motivation

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- For example, promoting a young “hot shot” manager is likely to lock up the CEO position for years
  - Promotion of one manager can influence probability of turnover of other managers.
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- For example, promoting a young “hot shot” manager is likely to lock up the CEO position for years
  - Promotion of one manager can influence probability of turnover of other managers.

- More subtly, the wage offer to one manager may affect his probability of turnover, and hence stay/quit decisions of other managers who could be promoted to CEO in the future.
Motivation

Complex Dynamic Optimization Problem

- The firm must take into account:
  - How its placement and wage offers to one manager affects not only that manager’s own quit decision, but also the quit decision of other managers.
  - How decisions made today affect who will be future managers and possible CEO candidates.
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  - How its placement and wage offers to one manager affects not only that manager’s own quit decision, but also the quit decision of other managers.
  - How decisions made today affect who will be future managers and possible CEO candidates.
- The same is true for managers.
Main Contributions

- Integrate multiple sources of heterogeneity (career stage and ability) into a rich dynamic model.
- We fully endogenize
  - Firm’s placement and wage offers to experienced managers,
  - Managers’ quit decisions.
- Provide a host of characterizations of equilibrium outcomes.
- Link to empirical findings.
Focus

Our equilibrium characterizations focus on economies where:

1. The CEO position is important:
   ▶ For the firm (CEO’s skill has higher impact on output);
   ▶ For managers (promotion to CEO is a large prize).

2. Thin market for CEOs/experienced executives:
   ▶ Substantial uncertainty over quality of outside executives;
   ▶ Important for firm to learn about quality of potential future CEOs.

3. Uncertainty about executives’ outside options:
   ▶ Executives may leave the firm for better outside employment offers, affecting competition for future CEO prize.
Focus

We take these features of the economy as given, and show how they affect

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Tractability demands

- Outside hires are at the entry level.
- CEO compensation and CEO turnover probability integrated in reduced form.
Model - Agents

Firm
- Firm maximizes discounted expected profits.
- Time discount factor $\beta \in (0, 1)$.
- Firm lives for $N$ periods, where $N$ is arbitrarily large.
- Firm Structure:

```
             CEO
            ↙    ↙
Manager 1  Manager 2
```
- Tournament.
Model - Agents

Executives

- Each executive maximizes discounted lifetime expected wages.
- Time discount factor $\beta \in (0, 1)$.
- Executive’s productive life has 3 periods:
  $a \in \{1, 2, 3\}$, (young, middleaged and old).
Model - Productive Characteristics of Executives

- Executive Learn-by-Doing $l_a \in \{l_1, l_2, l_3\}$
  - Assume $l_3 \geq l_2 \geq l_1$

- Executive-Skill $s \in S = [\underline{S}, \overline{S}]$
  - When hired by the firm, a young employee draws skill $s$.
  - Skill $s$ is an i.i.d. random variable.
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- Manager type $(a, s)$ produces: $l_a + s$.

- CEO type $(a, s)$ produces: $\rho[l_a + s]$ for $a \in \{2, 3\}$, $\rho > 1$
  - Assume never optimal to have untested young CEO
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Firm with executive-profile $z = (a^c, s^c, a^1, s^1, a^2, s^2)$ produces:

$$Y(z) = \rho [l_{a^c} + s^c] + [l_{a^1} + s^1] + [l_{a^2} + s^2].$$

Production function has no cross-manager interlinkages.
Timing of Game

1. At start of period, firm sees ages and skills of current executives, and which executive positions are vacant.

2. Firm chooses which manager(s) to retain, and which one(s) to lay off.
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5. Each manager then receives a wage offer from an outside firm
   - Distribution over outside wage offer is public information
   - Realization is private information to the manager.
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7. After managers’ quit decisions, the firm hires outside executives for the vacant managerial position(s).
External Hiring

- All external hiring is of young executives:
  - Each period, there is a large set of ex ante identical young executives, willing to work at the firm for initial wage $W^m$.
  - Young executive’s skill only revealed after he works one period.
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- This assumption maintains the fundamental feature of uncertainty regarding the skill/match of external hires.
  - Managers uncertain about competition for CEO prize.
  - Firm is uncertain about quality of replacements.
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- Abstracting away from outside senior search reduces the firm’s state space partition from 216 to 8.

- Examples of possible age-profile of executives:
  
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$(1) \quad (2) \quad (3) \quad (4) \quad (5)$
Model - Simplifying Assumptions

CEO Wage Offer and Turnover

Because CEOs are only selected from experienced internal managers, must treat CEO wage and turnover in reduced form.

\[ W^c(a^c, s^c) = \bar{W}^c + w^c(a^c, s^c), \]

- Wage can depend on CEO’s age and skill.

- A Middleaged CEO leaves the firm at the end of the period with exogenous probability \( \pi \in [0, 1) \).
Definition: A PBE is monotone if

1) Firm’s placement offer to manager $d$ takes the form of cutoff rules on his skill:
   - Promotion Cutoff: $s^C_{tEO}(a^d, z^-d)$;
   - Layoff Cutoff: $s^m_t(a^d, z^-d)$.

2) Each manager’s quit strategy takes the form of a cutoff rule on outside offer.

3) Each manager’s expected lifetime payoff from staying at firm is non-decreasing in his skill.

4) Firm’s expected discounted profits are non-decreasing in an executive’s skill.
Perfect Bayesian Equilibrium

**Definition:** A PBE is monotone if

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   - **Promotion Cutoff:** $s_t^{CEO}(a^d, z_t^{-d})$;
   - **Layoff Cutoff:** $s_t^m(a^d, z_t^{-d})$.

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3) Each manager’s expected lifetime **payoff** from staying at firm is non-decreasing in his skill.

4) Firm’s expected discounted **profits** are non-decreasing in an executive’s skill.

The equilibrium is **unique** and **symmetric** if the cutoffs are unique and symmetric (label of division is irrelevant).
Monotonicity requires some structure on the distribution of outside wage offers.

For example, if the outside wage offers rise more than one-for-one with skill, then the firm’s profits might be non-monotone in the manager’s skill.
Equilibrium

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  - For example, if the outside wage offers rise more than one-for-one with skill, then the firm’s profits might be non-monotone in the manager’s skill.

- In the paper, we first present an existence/monotonicity result for a large class of outside wage offer distributions.
We then focus on outside wage offer distributions that

1. May be correlated with a manager’s own skill, but are
2. Independent of the characteristics of other executives and firm’s employment offer.
Equilibrium

- We then focus on outside wage offer distributions that
  1. May be correlated with a manager’s own skill, but are
  2. Independent of the characteristics of other executives and
     firm’s employment offer.

- Outside wage offer to old manager with skill $s$:
  \[ q^{\text{old}} = \lambda s + \xi^{\text{old}}. \]  \hspace{1cm} (1)

- Outside wage offer to middle-aged manager with skill $s$:
  \[ q^{\text{mid}} = (1 + \beta)[\lambda s + \xi^{\text{mid}}] \]  \hspace{1cm} (2)

- $\lambda \in [0, 1)$ captures general/transferable component of skill.
- $\xi^{age}$ is uniformly distributed on $[0, \hat{q}^{age}]$, $age \in \{\text{mid, old}\}$.
  - captures realized match of manager with outside firm.
- $(1 + \beta)$ reflects middleaged manager’s two-period work horizon.
Main Results

Theorem
Consider a perfectly flexible wage structure, any feasible collection of firm technology parameters, and let the distribution of outside wage offers be given by equations (1) and (2). If

C1. There are sufficiently attractive outside wage offers, i.e., the supports of $\xi_{\text{mid}}$ and $\xi_{\text{old}}$ are sufficiently large; and
C2. The CEO position is sufficiently important, i.e., $\rho, W^c$ and $\rho - \partial w^c(a, s^c)$ are sufficiently large,
then there is a unique PBE. This equilibrium is symmetric, monotone and features pure-strategies. C1, C2 ensure (i) someone who is not promoted is more likely to quit, (ii) experienced manager accepts CEO promotion, (iii) firm's expected profit increases sufficiently fast with CEO skill.

Further, the following three central analytical results hold...
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R1. The firm has a bias toward promoting old executives to CEO.

Consider a firm with (i) a vacant CEO position, (ii) an old manager, and (iii) a talented middleaged manager.
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Consider a firm with (i) a vacant CEO position, (ii) an old manager, and (iii) a talented middleaged manager.

Then, even without learning-by-doing, the firm promotes the old manager to CEO unless the middleaged manager is sufficiently more skilled.
Main Results

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- An old manager who is not promoted won't have another chance at promotion before retirement.
  - Lost an expected payoff from staying in firm
    ⇒ more likely to quit.

- The middle-aged manager, in contrast, has a high chance of promotion after old CEO retires.
  - High expected value from staying in firm
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Empirical evidence from Belzil and Bognanno (2004): a senior (top 6) executive's promotion probability increases with his age when control for tenure and hierarchical level.
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▶ Can give unpromoted old manager far higher wage, but
  ▶ More profitable to promote old manager.
  ▶ Marginally alter younger manager’s wage to adjust quit probability.
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  ▶ Middle-aged manager is more likely to win future promotion when CEO is old.
  ▶ Result is not trivial, because must consider the firm’s optimal wage offer.
    ▶ Firm recognizes must groom replacement when CEO is old
      ⇒ Gives talented middle-aged manager **higher** expected lifetime compensation.
      ⇒ Talented middle-aged manager more likely to stay.

Empirical evidence from Hayes, Oyler and Schaefer (2006): turnover of top managers is higher when the CEO is younger.
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**R3.** Grooming CEO replacements: Old manager is more likely to leave the firm if CEO is old.

Interpretation of old manager: no longer a candidate for promotion.
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Interpretation of old manager: no longer a candidate for promotion.

- Firm has stronger incentive to identify good replacement when CEO is old
  - Pay old manager less and more likely to fire when CEO is old.
  - Hence, old manager is more likely to leave.

- Impact is less if able middle-aged executive is in place.
  - Value of identifying a new replacement is less.
  - And don’t want able middle-aged executive to quit....
R4. Given any wage offer, a middle-aged manager is more likely to stay if the firm retains another manager who is either (i) older and closer to retirement, or (ii) middle-aged and sufficiently less talented.
Main Results

**R4.** Given any wage offer, a middle-aged manager is more likely to stay if the firm retains another manager who is either (i) older and closer to retirement, or (ii) middle-aged and sufficiently less talented.

- Less competition for future CEO promotion.
Main Results

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Implication:

- Firm can keep old (or less talented middleaged) manager as indirect incentive to talented middleaged manager.
- This reduces the CEO competition and increases talented middleaged manager’s expected payoff from staying.
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Implication:

- Firm can keep old (or less talented middleaged) manager as indirect incentive to talented middleaged manager.
- This reduces the CEO competition and increases talented middleaged manager’s expected payoff from staying.

Serves as imperfect commitment device to future compensation via likelihood of future promotion.
Main Results

**R5.** A firm’s optimal placement/wage offers to a manager can vary non-monotonically with the attributes of *other* executives. Consider old CEO, one old and one middleaged manager: How does old manager’s wage depend on skill of middleaged manager?
Main Results

R5. A firm’s optimal placement/wage offers to a manager can vary non-monotonically with the attributes of other executives. Consider old CEO, one old and one middleaged manager: How does old manager’s wage depend on skill of middleaged manager?

**Figure:** Quit Strategies when skill is firm-specific. Parameters: $\rho = 3$, $s \sim U[0, 2]$, $\hat{q}_2 = \hat{q}_3 = 3$, $\overline{W}^c = 3$, $W^m = 1.5$, $\mathcal{L} = \{0, 1, 1\}$, $\pi = .1$, $\beta = .8$, $\lambda = 0$. 
Summary

We develop a dynamic model of promotions, quits and layoffs to explore how the attributes of a managerial workforce affect firms’ placement decisions and wage offers, and managers’ quit decisions.

▶ Present five analytical results that characterize equilibrium outcomes when the CEO position is important.

▶ Results can reconcile empirical findings.

▶ Analysis highlights importance in turnover regressions of controlling for attributes of CEO and potential competitors for promotion.
  ▶ Likelihood of future promotion is an important part of expected lifetime compensation.
Example: Placement Non-Monotonicity with learning by doing

Figure: Optimal CEO promotion when wages are rigid. Parameters: \( \rho = 2, \overline{S} = 2, \hat{q}^{mid} = \hat{q}^{old} = 1.8, \overline{W}^c = 3, W^m = 1.5, \pi = .9, \beta = .8, \lambda = 0, \mathcal{L} = \{0, 1, 1\} \).