Careers in Organizations

Literature Review on Internal Labor Market

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Outline

Introduction

- ”Black Box”: an IO operation; a unitary agent for profit maximization, an one-multiple contract designer...
- the internal market: an administrative unit within which the **pricing and allocation of labor** is governed by **a set of administrative rules and procedures (institutions)**
    1. **Market**: pricing-wage and allocation-career/promotion
    2. **institutions**: design sectors, institutions, policies to incentivze/match human resources
- We will later see the internal labor market featuring both market functioning (especially the lemon) and mechanism design

Empirical Facts-Market

Before introducing the theoretical models, review some common phenomena in internal labor market (BGH,1994)

- Many workers begin employment at the firm at a small number of positions
- dynamic: Nominal wage decreases and demotions are rare (but real wage decreases are not)
- Correlations:
  1. serial correlations: wage and promotion
  2. Large wage increases early on in a workerís tenure predict promotions
  3. a positive relationship between seniority and wages
  4. Promotions tend to be associated with large wage increases, but these wage differences are small relative to the average wage differences across levels within the firm

Empirical Facts-Institutions

- Institutions: tradition v.s. innovative (CIA) (Osterman, 1994, 2000; Lawler et al., 1995)
    1. (no) problem-solving teams and quality circles (information sharing)
    2. (no) job rotation
    3. much/little effort and resources put into worker screening during the recruitment process
    4. incentive pay v.s. hourly pay
    5. much/little on-the-job training
    6. high/low job security
- Policies: Peter Principle, compensation profile, mandatory retirement, up-or-out promotion policy, exchange of cadres, skill development etc.
- Sector Divisions and Organization Hierarchies

Theortical Models

- Theortical Models:
  1. identify and model a fundamental factor concerning the operation of internal labor markets
  2. capture important empirical relationships
- How are wages/careers decided given some properties of firms and workers?
  1. How does information asymmetry affect the market allocation?
  2. How to design optimal mechnism to match workers with firms/incentivize workers?
- Key assumptions:
  1. homo/hetero workers
  2. multiple careers(hierarchies)
  3. complete/incomplete information
  4. static/dynamic setting

Candid Models: Markets

- Candid Models (revised from(Waldman,2012)):
  1. ”endogenous growth”: human (specific) capital accumulation
  2. Information: promotions as signals; symmetric learning and insurance
- Now increasing newly-emerged models incoporate these models to better explain more empirical conclusions

Basic Model: Notations

- Betrand setting: F_0, F_1
- heterogenous workers: ability $\theta \sim F$
- dynamic setting: q_t, ω_t $(t = 1, 2)$
- workers' utility: $u_A = \omega_1 + \omega_2$
- firms' profit: $\pi_{it} = q_t - \omega_t$

Human Capital Acquisition (Gibbons and Waldman, 1999)

- binary distribution: $\theta \in \{\theta_H, \theta_L\}$, $\Pr(\theta = \theta_H) = p$
- work experience l and effective productivity $\eta_t = \theta f(l) = \theta(1 + gl)$
- two activities: $q^i = d^i + b^i(\eta_t + \epsilon_t)$ $(i = 0, 1)$ with $d^0 > d^1 > 0, b^1 > b^0 > 0$
- job assignment $j_t \in \{0, 1\}$ and output $q_t = (1 - j_t)q^0 + j_t q^1$
  promotion if $j^1 < j^2$ demotion if $j^1 > j^2$
- public signal: $\phi_0 \subset \{\eta\}$, $\phi_1 = \{q_1, j_1\}$

Human Capital Acquisition (Gibbons and Waldman, 1999)

1. θ realized and private, ϕ_0 public
2. ω_1^i: simultaneous offer
3. A chooses firm $d_1 \in \{0, 1\}$ and recevies $\omega_1^{d_1}$ (suppose $d_1 = 1$)
4. F_{d_1} chooses j_1, output realized and ϕ_1 observed
5. ω_2^i: simultaneous offer
6. A chooses firm $d_2 \in \{0, 1\}$ and recevies $\omega_2^{d_2}$ ($d_2 = 1$ when indifferent)
7. F_{d_2} chooses j_2, output realized

Human Capital Acquisition (Gibbons and Waldman, 1999)

- subgame-perfect equilibrium: $\{\omega_t, d_t, j_t^{d_t}\}$
- $\eta_2^e(\phi) = E(\eta_2|\phi)$, $\phi = \{\phi_0, \phi_1\}$

1. Betrand Assumption matters: wage=expected productivity
   $\omega_2^i(\phi) = (1 - j_2^0)(d^0 + b^0\eta_2^e(\phi)) + j_2^0(d^1 + b^1\eta_2^e(\phi))$
2. linear productivity assumption: assignment threshold $\bar{\eta}^e = \frac{d^0 - d^1}{b^1 - b^0}$
3. the first is similar to the second
4. human capital acquisition makes the relative threshold decreasing holding the absolute threshold

Human Capital Acquisition (Gibbons and Waldman, 1999)

- pros：consitent with empirical findings below
  1. a port of entry into the firm with small p
  2. Long-term employment relationships are common (depending on the selection!)
     firm-specific capital acquisition assumption matters
  3. demotions are rare (for the rational updating and human capital acqusition)
  4. positive correlation between promotion and wage (wage inequality and wage jumps)
  5. extensions: multiple stages for serially correlated wage and promotion
- cons:
  1. innate ability is a one-dimensional fixed attribute
  2. empirical findings for older workers can only be explained by assuming learning is significant

Promotions as Signals (Waldman, 1984)

- $\theta \in U[0,1]$
- promotion is publicly observed while output is not
- job assignment: $q_1 = x \in (1/2, 1)$, $q_2(j, \theta, d_2) = (1 + s1_{d_2=d_1})[(1-j)x + j\theta]$

Promotions as Signals (Waldman, 1984)

1. ω_1^i: simultaneous offer
2. A chooses firm $d_1 \in \{0, 1\}$ and recevies $\omega_1^{d_1}$ (suppose $d_1 = 1$)
3. θ realized and observed by F_1, output also observed
4. (j^1, ω_2^1) offered by F_1, j^1 publicly observed while ω_2^1 not
5. (j^0, ω_2^0) offered by F_1
6. A chooses firm $d_2 \in \{0, 1\}$ and recevies $\omega_2^{d_2}$ ($d_2 = 1$ when indifferent)
7. output $q_2(j, \theta, d_2)$ realized

Promotions as Signals (Waldman, 1984)

- PBE: $\{\omega_t^i, d_t, j^i, \mu\}$
- $\omega_2(j^1) = E((1-j^0)x + j^0\theta | j^1(\theta) = j^1)$
  1. (Sequential) Betrand Assumption matters: wage=expected productivity of firm 0
     $\omega_2^0 = \omega_2^1 = \omega_2(j^1)$
  2. (linear) productivity assumption: assignment threshold $\bar{\theta} = \frac{1+2sx}{1+2s}$
  3. compared to first best, information asymmtry induces social efficiency

Promotions as Signals (Waldman, 1984)

- pros:
  1. the importance of history of job assignments and resume design
  2. large wage increases upon promotion
  3. wage increases are small relative to wage differences across adjacent job levels.
- cons:
  1. no promotion is completely determined by observable characteristics
  2. not easily explain why the size of wage increases early at a job level forecast speed of promotion

Candid Models: Institutions

- Candid Models (revised from (Lazear and Oyer,2012)):
  1. Contest Design: induce optimal average efforts, selection
  2. Contract Design: tradeoff between incentives and insurance

     $y = e + \epsilon$ and decompse $\frac{\partial \omega}{\partial y}$
  3. Training Programs, Career Life Design, Organization of Work (Job Design)

Contest Competitiveness (FNS, 2020)

- Incentives vs Discouragement is the key tradeoff when increasing competition in contest theory
  1. Incentives: Increasing competition naturally increases contestants' incentives to exert high effort
  2. Discouragement: Contestants' gains from exerting effort are reduced for beating their rivals harder
  3. the competitiveness of the competition:
     1. the number of contestants (scaling up and contestant entry)
     2. the reward structure (prize inequality)
- With homogeneous contestants and convex effort costs, increasing competitiveness means decreasing average effort.

  Increasing competition $\Rightarrow$ More spread-out distributions(extreme effort levels) $\Rightarrow$ Decreasing expected effort under convex costs

Contest Competitiveness (FNS, 2020)

- Setup:
  1. $n \geq 1$: homogeneous risk-neutral contestants
  2. x_i: efforts, $c(x_i) : R_+ \to R_+$: effort cost (differentiable, strictly increasing and convex)
  3. $v = (v_1, v_2, ..., v_n) \in R^n_+$: an ordered vector of prizes
     where $0 = v_1 \leq v_2 \leq ... \leq v_n$ and $v_1 < v_n$, $F_v(x)$: distriution function
  4. $\pi_v(p) = \sum_{i=1}^n v_i \binom{n-1}{i-1} p^{i-1}(1-p)^{n-i}$: the expected reward
- Formalization
  1. Price Inequality: $w, v \in P^n$ and $\sum_{i=1}^k w_i = \sum_{i=1}^k v_i$. Vector w is more unequal than v if w is more unequal than v in the Lorenz order.
     that is $\sum_{i=1}^k w_i \leq \sum_{i=1}^n v_i$, for all $k = \{1, .., n\}$
  2. Scaling: Let $s > 1$ be an integer; $w \in P^{ns}$ is a scaling of $v \in P^n$ if $w_k = v_{[k/s]}$ for all $k \in \{1, ..., n\}$

Contest Competitiveness (FNS, 2020)

1. a unique symmetric equilibrium in mixed strategies:
   $\pi \circ F_v(x) - c(x) = 0, x \in [0, c^{-1}(v_n)]$
   $\rightarrow F_v(x) = (\pi^{-1} \circ c)(x)$
2. Suppose vector w is more unequal than (a scaling of) v. For any concave, strictly increasing function, u, of individual contestant effort $E[u(X^v)] \leq E[u(X^w)]$
3. Intuition: contestants face a direct incentive to increase effort but all contestants increasing effort cannot be sustained in equilibrium
   $\Rightarrow$ requiring an increase in the payoff from intermediate effort levels and a decrease in the payoff from high effort levels
   $\Rightarrow$ increasing the likelihood contestants make extreme efforts(more spread-out distributions)
   $\Rightarrow$ cost convexity comes into play

Mandatory Retirement (Waldman, 1984)

- Solution to moral hazard problem: pay less when young, more when old.
  inducing the desire for a long-term contract thus voluatrily avoid shirking
  voluntary in ex-ante sense while mandatory in ex-post sense (T)
- Notations:
  1. $W^*(t)$ wage, $V^*(t)$ VMP (constant), $\tilde{W}(t)$ reservation wage (increasing)
  2. T such that $\tilde{W}(t) = V^*(t)$, $\int_0^T W^*(t)e^{-rt}dt = \int_0^T V^*(t)e^{-rt}dt$

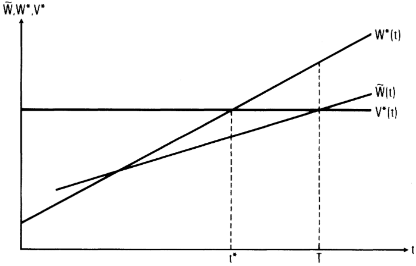

FIG. 1

Mandatory Retirement (Waldman, 1984)

- two cheating: $\tilde{g}(t)$ (bankrupt), $\theta_i \sim f(\theta_i)$ worker's benefit with cost $c(t)$
- expected rent:
  $R(t) = e^{rt} \int_t^T \left\{ W^*(\tau) - \tilde{W}(\tau) - \tilde{g}(\tau) e^{r\tau} \int_\tau^T \left[W^*(\delta) - \tilde{W}(\delta) \right] e^{-r\delta} d\delta \right\} e^{-r\tau} d\tau$
- cheating at t: $\theta_i > R(t)$ determines $\tilde{f}(t)$
- $max \int_0^T \left\{ W^*(t) + \tilde{f}(t)[\theta - e^{rt} \int_t^T W^*(\tau) e^{r\tau} d\tau] - \tilde{g}(t) e^{rt} \int_t^T W^*(\tau) e^{r\tau} d\tau \right\} e^{-rt} dt$
  1. $Wealth = \int_0^T [V^*(t) - \tilde{f}(t) \int_t^T V^*(\tau) e^{r\tau} d\tau - \tilde{f}(t) c(t) - \tilde{g}(t) \int_t^T V^*(\tau) e^{r\tau} d\tau] e^{rt} dt - \epsilon$
  2. the boundary condition: $V^*(T) - \tilde{f}(T) c(T) = \tilde{W}(T)$
- Important Insights:
  1. Mandatory: $W^*(T) > \tilde{W}(T)$, Steeper Wage Path $\Rightarrow$ Less Shirking
  2. $\tilde{g}(t)$ increases: higher payment, shorter T
  3. Endogenous $\tilde{g}(t)$- tradeoff between reduced worker cheating against increased firm cheating as $W^*(t)$ becomes more end weighted (Mandory Still)

Further Readings

- Survey Literature: The Handbook of OE (Personnel Economics by Lazear and Oyer, Internal Labor Market by Waldman)
- Specific Models:
  1. wage and promotion dyanmics: Harris and Holmstrom(1982), Weiss (1984). Rongzhu Ke et.al(2018)
  2. human resources practices: Becker(1962, 1964), Lazear and Rosen(1981), Rosen(1982), Bernhardt (1995), Wu and Fu(2022)
  3. Gibbons, Waldman, Powell