Monopsony and Backloaded Compensation: Theory and Evidence from Public Accountants

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July 28, 2026

Wage Markdowns: Market Power vs. Incentives

Wage markdown: Wage/MRPL < 1

Monopsony models: Card et al. '18, Berger et al. '22, Lamadon et al. '22

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- *Assumption:* Competitive labor markets

This paper

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Decompose markdowns into monopsony vs. backloaded efficiency pay

- Policy implications: pay ratio caps, effects of collective bargaining (wage compression)

Literature

Presentation Outline

Setting & Data: U.S. Public Accounting Firms

Auditing, tax compliance, and other advisory services; \$100B+ industry in USA

Annual survey data of 480-569 U.S.firms; excludes the 'Big-4' (KPMG, Deloitte, EY, PwC)

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Variables observed:

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- Caveat: data aggregated over bins of 20 firms on average, by size and location

summary statistics

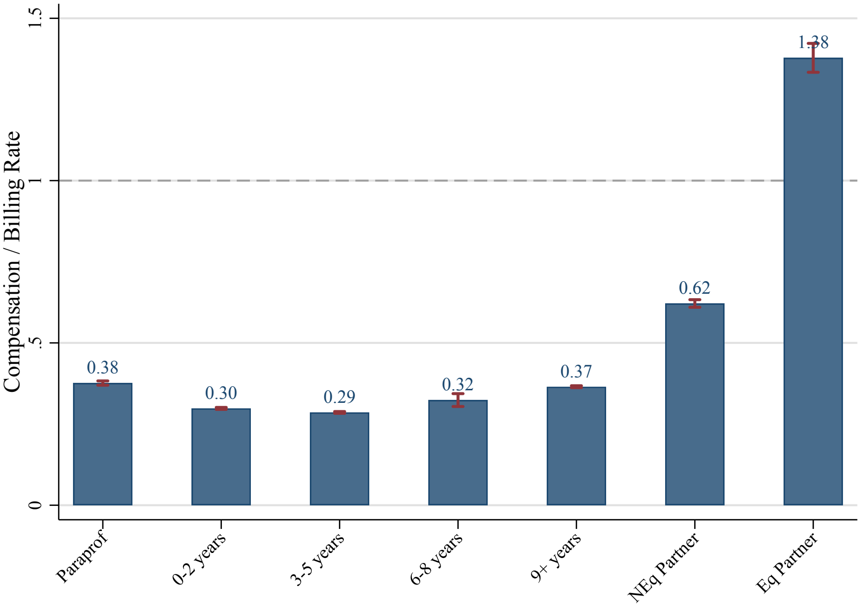
Compensation / Billing Ratio

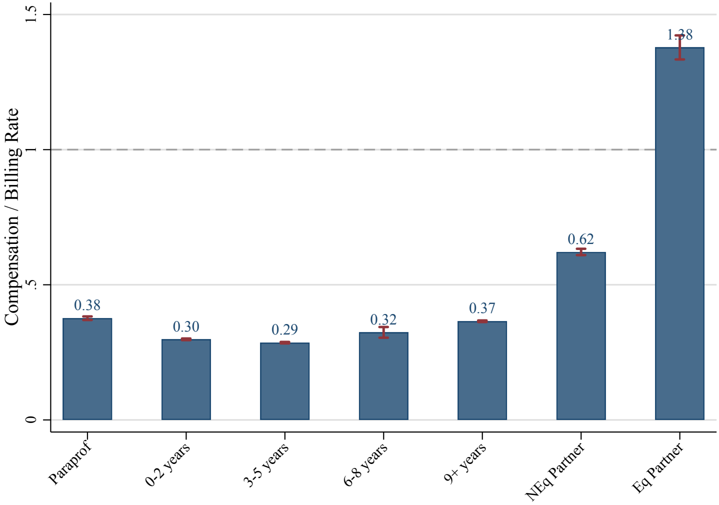
Billing–salary spread by worker seniority:

$$\frac{\text{compensation}}{\text{billing revenue}}$$

Compute for 7 categories of 'billable' workers:

- Professional staff with 0-2, 3-5, 6-8, 9+ years of experience
- Non-equity partners
- Equity partners
- Paraprofessionals


Compensation / Billing Rate
0
.5
1
1.5
0.38
0.30
0.29
0.32
0.37
0.62
1.38
Paraprof
0-2 years
3-5 years
6-8 years
9+ years
NEq Partner
Eq Partner



Spreads can be only interpreted as wage markdowns if ARPL=MRPL (linear production, competitive product market) $\rightarrow$ Need model with nonlinear production + market power

Model Overview

'Up-or-out' promotion schedule suggests partnership **tournament** promotion rates

$\Rightarrow$ Model à la Lazear and Rosen (1981) and Malcomson (1984), but with:

- **Nonlinear team production:** each output depends on all labor types' hours and effort hours
- **Multi-product firms**: different accountants produce differentiated services
- **Monopsony power:** upward-sloping residual labor supply

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Overlapping-generations environment: firms (infinitely-lived) design wages and promotion policies to **attract, retain, and incentivize** workers (finitely-lived)

We use the model to deliver two empirical tests for:

1. **Dynamic incentive contracting**
2. **Monopsony power**

Environment and Timing

Workers ('i'):

- Two levels: juniors ($s = 1$) and seniors ($s = 2$) **Extension:** N levels
- Each period a mass $\mathcal{L}$ of new (*ex-ante* identical) juniors enters and joins firm $f \in \mathcal{F}_t$
- Live/work for two periods: enter as juniors in t, become seniors in $t+1$ if promoted, retire at $t+2$
- Earn compensation $W_{s(i,t),f,t}$, exert effort $e_{i,f,t}$

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Flow Utility of Working at Firm f:

$$U_{i,f,t} = \alpha_f W_{s(i,t),f,t} - C(e_{i,f,t}) + \xi_{s(i,t),f} + \epsilon_{i,f,t}, \qquad C' > 0,\ C'' > 0$$

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Signal: Firm observes noisy, non-contractible signal of effort $e_{i,t}$

$$\theta_{i,f,t} = e_{i,f,t} + \kappa_{i,f,t}, \qquad \kappa_{i,f,t} \sim \Phi(\cdot),\ \text{density } \phi(\cdot),\ \text{i.i.d. across } i, f, \text{and } t$$

Production and Contract

Production: firm employs $L_{1,f,t}$ juniors and $L_{2,f,t}$ seniors

Average effort of level s: $\bar{e}_{s,f,t}$

$$Q_{s,f,t} = F_s(L_{s,f,t}, L_{-s,f,t}, \bar{e}_{s,f,t}, \bar{e}_{-s,f,t}), \quad s \in \{1, 2\}$$

with $\partial F_s / \partial \bar{e}_{k,f,t} \geq 0$

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Contract/policy committed at junior hiring:

- $W_{1,f,t}$: junior wage in t
- $W_{2,f,t+1}$: senior wage (promoted juniors) in $t+1$

Extension: seniors as residual profit claimants

- $\tau_{f,t}$: promotion cutoff = share dismissed

$$\theta_{i,f,t} \geq \theta_t^P(\tau_{f,t}) \implies \text{promoted},$$

where $\theta_t^P(\tau_{f,t})$ is the $\tau_{f,t}$-quantile of junior signals in t

Outside Options and Timing

Outside option $\ddot{U}^{alt}_{s,i,f,t} \equiv$ worker i's utility at most attractive firm other than f

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'Net' outside options:

$$U^{alt}_{s,i,f,t} \equiv \ddot{U}^{alt}_{s,i,f,t} - \epsilon_{i,f,t}$$

$$U^{alt}_{s,i,f,t} \sim G^{alt}_{s,f}, \quad \text{density } g^{alt}_{s,f}$$

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- Independent across s, i, f and t
- Conditional on s and f: identically distributed across i and t

- Juniors observe $U^{alt}_{1,i,f,t}$ before accept/effort
- Seniors observe $U^{alt}_{2,i,f,t+1}$ at start of $t+1$ before stay/leave
- No lateral market inside the industry: firms cannot hire seniors directly

Extension: Lateral mobility

Behavior

Workers: Worker's optimization problem

- Juniors choose firm and effort
- Seniors choose between staying at firm and outside option (exogenous effort)

Firms: Firm's optimization problem

- Choose junior + senior wage and promotion rate
- Maximize expected profits for each cohort

Equilibrium: Equilibrium conditions

- Monopsonistic competition
- Allow for market power on product market

Result 1: Efficiency Wages (Backloading)

Compare two regimes:

- **Irrelevant Effort:** $\forall s : dF_s/de_1 = 0$ (no incentive role)
- **Productive Effort:** $\exists s : dF_s/de_1 > 0$ (firm uses incentives)

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Proposition 1:

- Irrelevant Effort: $\boxed{W_{2,f,t} = MRPL_{2,f,t}} \quad \longrightarrow H_0$
- Productive Effort: $\boxed{W_{2,f,t} > MRPL_{2,f,t}} \quad \longrightarrow H_1$

Rejecting H_0 implies <u>backloaded efficiency-wage contracts</u>

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No senior markdown under H_0 despite monopsony; similar to Ioannides & Pissarides (1985)

Result 2: Monopsony Power and Lifecycle Markdown

Define net-present values for a new hire:

$$NPV_{W,f,t} \equiv W_{1,f,t} + \rho(1-\tau_{f,t})G^{alt}_{2,f}(U_{2,f,t+1})\,W_{2,f,t+1}$$

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Empirical test:

$$\begin{cases} H_0 : \psi_{PD} = \infty & \iff \quad NPV_W = NPV_{MRPL} \\ H_1 : 0 < \psi_{PD} < \infty & \iff \quad NPV_W < NPV_{MRPL} \end{cases}$$

Welfare Implications of Eliminating Wage Markdowns

Suppose one would enforce $W_1 = MRPL_1$

1. **Monopsony + Irrelevant Effort**:
   - Outputs (Q_1, Q_2) increase, prices (P_1, P_2) decrease
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3. **Monopsony + Productive Effort**: ambiguous

In reality, policies realistically don't force $W_1 = MRPL_1$, but constrain W_2/W_1 (pay ratio caps)

Empirical Specification

Demand/Markups: details

Loglinear demand + monopolistic competition:

$$\mu_{s,f} \equiv \frac{P_{s,f}}{MC_{s,f}} = \frac{\eta}{1+\eta}$$

Use $\eta = -1.827$ from Gerakos and Syverson (2015) $\Rightarrow$ Lerner index $= 0.55$ (non-Big-4 firms)

Team production:

$$Q_{s,f} = \left(\prod_{k \in S} L_{k,f}^{\beta^l_{s,k}}\right) \boldsymbol{O}_f^{\boldsymbol{\beta}^o_s} \Omega_{s,f}(\bar{e}_{s,f}) \exp(\varepsilon_{s,f})$$

- Employee hours $\boldsymbol{L}_f$, other inputs $\boldsymbol{O}_f$
- TFP residuals $\Omega_{s,f}(\bar{e}_{s,f})$, measurement error $\varepsilon_{s,f}$

Production Function Estimation

We estimate $|S|$ production functions (one per seniority s):

$$q_{s,f} = \sum_{k \in S} \beta^l_{s,k} l_{k,f} + \boldsymbol{\beta}^o_s \boldsymbol{o}_f + \omega_{s,f} + c_s + \varepsilon_{s,f}$$

Identification: flexible inputs chosen after productivity shock $\nu_{s,f}$ observed, predetermined inputs before (Ackerberg, Caves, Frazer, 2015)

- Flexible: interns, admin staff, intermediate inputs
- Predetermined: everyone else

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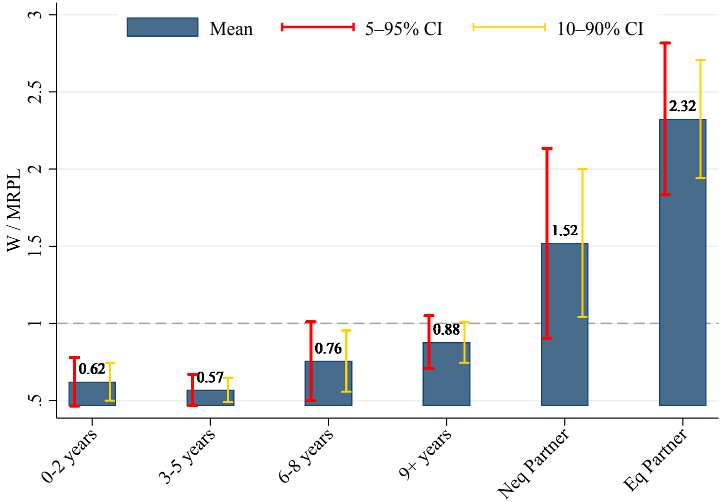
Bins: observe firm bins g rather than firms f. Identification achieved at bin-year when: (i) common input prices / residual supply elasticities within bin-year, and (ii) entry/exit orthogonal ν

	0–2 yr	3–5 yr	6–8 yr	9+ yr	N-eq. par.	Eq. par.	Paraprof.
0–2 years	1.000*	0.020	0.027	−0.011	0.008	0.008	0.029
3–5 years	0.040*	1.026*	−0.014	0.016	0.025	0.025	−0.016
6–8 years	−0.002	−0.012	0.997*	−0.050*	0.022	0.022	0.066
9+ years	−0.010	−0.018	−0.014	0.962*	−0.012	−0.012	−0.033
Non-eq. partners	0.021*	0.009	0.007	−0.011	0.974*	−0.026*	0.005
Eq. partners	−0.022	0.037*	0.076*	0.095*	0.051	1.051*	0.118
Paraprof.	−0.039*	−0.030*	−0.020*	−0.032*	−0.006	−0.006	1.010*

non-billable inputs

standard errors

Instantaneous Wage Markdowns and Markups



Test 1: Irrelevant vs. Productive Effort

- Junior professional staff face large wage markdowns (accept lower current pay in anticipation of future rewards)
- Non-equity partners earn wage markups; equity partners earn very large markups
- Pattern rejects effortless model, and shows junior markdowns are (at least partially) due to **backloaded efficiency wages**

Wage Markdowns: Net Present Value

We compute NPVs of wage and MRPL at start of career

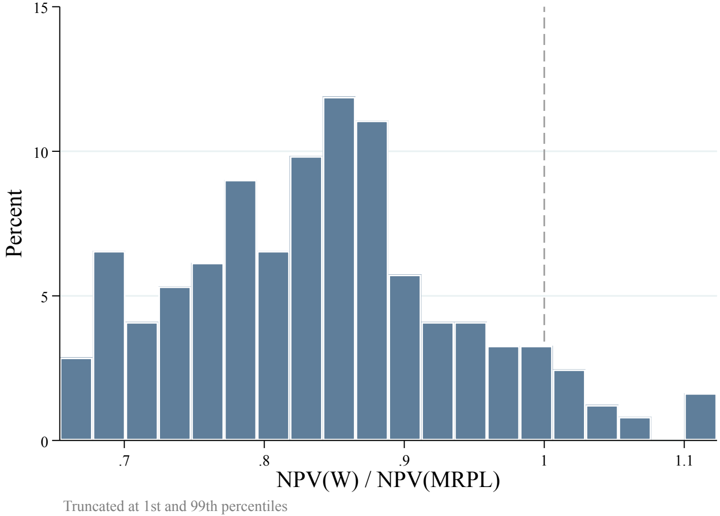
- Years t = 1, ..., T (mandatory retirement)
- $\lambda_{f,t}$: prob. of still being at firm in year t
  - Estimated from worker stocks under steady-state assumption
- Discount factor $\rho = 0.95$

Alternative discount factors

$$\text{NPV}_{W_f} = \sum_{t=0}^{T} \rho^{t-1} \lambda_{f,t} W_{f,t}$$

$$\text{NPV}_{MRPL_f} = \sum_{t=0}^{T} \rho^{t-1} \lambda_{f,t} MRPL_{f,t}$$

Test 2: Monopsony vs. Perfect Competition



Mean [CI]: 0.85
[0.76,0,93]

Labor Supply Elasticities: Present-Discounted vs. Current Compensation

$$\boxed{\psi_{PD} = \frac{\text{NPV}_W}{\text{NPV}_{MRPL} - \text{NPV}_W}}$$

$$\boxed{\psi_1 = \frac{W_1}{\text{NPV}_W}\psi_{PD}}$$

	Elasticities of Labor Supply (n=175)			
	Curr. comp.		PD comp.	
	Est.	S.E.	Est.	S.E.
Average	0.413	0.141	5.355	2.241
1st Quartile	0.271	0.137	2.790	2.539
Median	0.398	0.121	4.563	1.453
3rd Quartile	0.586	0.213	7.399	2.624

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- Labor supply very inelastic w.r.t. current compensation
- More elastic w.r.t. PD comp.; range consistent with Card (2022) and Azar and Marinescu (2024)
- Explains high 'production-approach' markdown estimates

Markdown Decomposition

To what extent are junior markdowns due to monopsony power vs backloading?

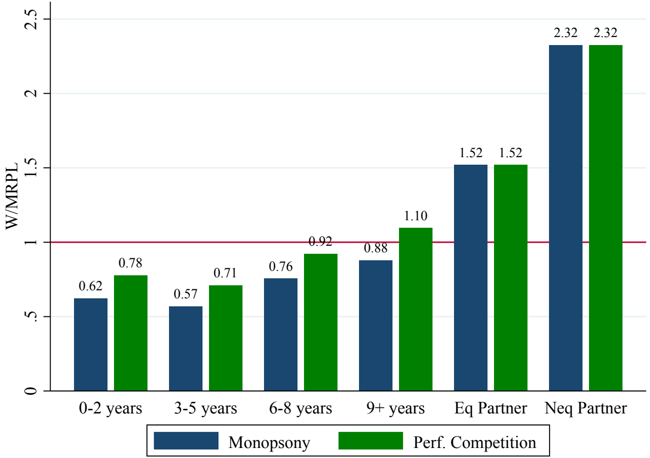
- Compute non-partner wage change χ_f such that:

$$\sum_{t=1}^{T^{sen}} \chi_f \rho^{t-1} \lambda_{f,t} W_{f,t} + \sum_{t=T^{sen}+1}^{T} \rho^{t-1} \lambda_{f,t} W_{f,t} = \text{NPV}_{MRPL}$$

- Caveat: only change junior compensation, not employment or senior wages

Markdown Decomposition

To what extent are junior markdowns due to monopsony power vs backloading?



40% of junior wage markdown attributed to monopsony

Robustness

Bundle pricing vs. line pricing results

Firm-level production function results

Allowing for differentiated accountants results

Different discount factors results

Equity partner compensation: lump-sum vs. profit distributions results

Conclusion

- Construct dynamic model of labor supply and demand with **endogenous worker effort**, **backloaded compensation**, and **monopsony power**
- Use model to derive **empirical tests** for monopsony and incentive-contracting
- Empirically implement model for U.S. public accountants
- Find 40% of junior markdown due to monopsony, remainder wage backloading
  - Interpreting through static model $\longrightarrow$ overestimating monopsony power
  - Static labor supply very inelastic due to expectation of future rewards
  - Policies that compress wage distribution: account for incentive effects

Compute transition rates: non-partners

back to main deck

Denote transition probability as $\lambda_t = (1 - \tau_t)s_t$

Compute transition rates: non-partners

back to main deck

Denote transition probability as $\lambda_t = (1 - \tau_t)s_t$ 'Up-or-out' implies different transition probabilities before and after equity partner promotion (t=15).

Assume: $\begin{cases} \lambda_t = \lambda_{prof} \text{ if } t < 15 \\ \lambda_t = \lambda_{part} \text{ if } t \geq 15 \end{cases}$

Compute transition rates: non-partners

back to main deck

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Assume steady-state labor force. Probability of partner promotion $= \frac{L_{15}}{L_1}$
$\Rightarrow (1 - \lambda_{prof})^{14} = \frac{L_{15}}{L_1}$

Compute transition rates: non-partners

back to main deck

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Assume steady-state labor force. Probability of partner promotion $= \frac{L_{15}}{L_1}$
$\Rightarrow (1-\lambda_{prof})^{14} = \frac{L_{15}}{L_1}$ We observe L_{15}(newly promoted partners) but not L_1: only $L_1 + L_2$

Use $L_1 + L_2 = L_1(1 + (1-\tau_{prof}))$:

$$\Rightarrow \boxed{\frac{(1-\lambda_{prof})^{14}}{2-\lambda_{prof}} = \frac{L_{15}}{L_1 + L_2}}$$

back to main deck

Compute transition rates: partners

back to main deck

Setup: Partners can leave each year with probability λ_{part}, but anyone who survives to year 25 must exit. This implies a truncated geometric tenure.

Let $r = 1 - \tau$. Then

$$\mathbb{E}[T] = \sum_{t=1}^{24} t\tau r^{t-1} + 25r^{24} = \frac{1-(1-\tau)^{25}}{\tau}.$$

In steady state:

$$N = N_{\text{new}} \times \mathbb{E}[T] \quad \Rightarrow \quad N = N_{\text{new}} \frac{1-(1-\tau)^{25}}{\tau}.$$

Define $\lambda \equiv \frac{N_{\text{new}}}{N}$. Then

$$\boxed{\lambda = \frac{\tau}{1-(1-\tau)^{25}}} \quad \text{or equivalently} \quad \boxed{\tau = \lambda\left[1-(1-\tau)^{25}\right]}.$$

No closed-form for τ — solve numerically (monotone equation).

Bundle pricing vs. line pricing

We impose that clients consume a CES bundle of accountants, with shares a_i and elasticity of substitution σ:

$$Q_f = [\sum_{i=1}^{I} a_i Q_{if}^{\frac{\sigma-1}{\sigma}}]^{\frac{\sigma}{\sigma-1}} \tag{1}$$

The implied bundle price is:

$$P_f = [\sum_{i=1}^{I} a_i^{\sigma} P_{if}^{1-\sigma}]^{\frac{1}{1-\sigma}}$$

Demand for the bundle is

$$Q_f = \overline{Q}\left(\frac{P_f}{\overline{P}}\right)^{\eta} \zeta_f. \tag{2}$$

Bundle pricing vs. line pricing

The marginal revenue product of labor for each accountant type becomes:

$$\mathrm{MRPL}_{if} = P_f \left(1 - \frac{1}{\eta}\right) \sum_{k=1}^{I} \alpha_k \left(\frac{Q_f}{Q_{kf}}\right)^{\frac{1}{\sigma}} \beta_{ki} \frac{Q_{kf}}{L_{if}}$$

Choose good 7 as the comparison good. Define the observable constants

$$\kappa_i \equiv \left(\frac{Q_i}{Q_7}\right)^{1/\sigma} \frac{P_i}{P_7}, \qquad i = 1, \ldots, 6. \tag{3}$$

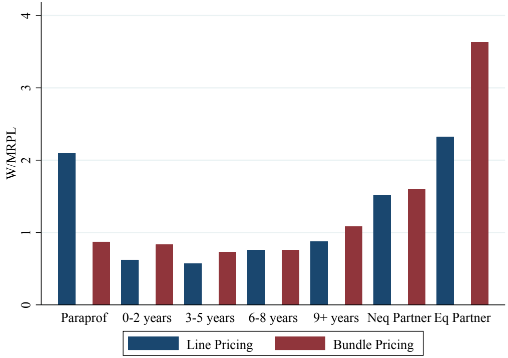
Solve for a_i:

$$a_i = \frac{\kappa_i}{1 + \sum_{k=1}^{6} \kappa_k}. \tag{4}$$

for each $i = 1, \ldots, 6$, and $a_7 = \frac{1}{1+\sum_{i=1}^{6} \kappa_i}$

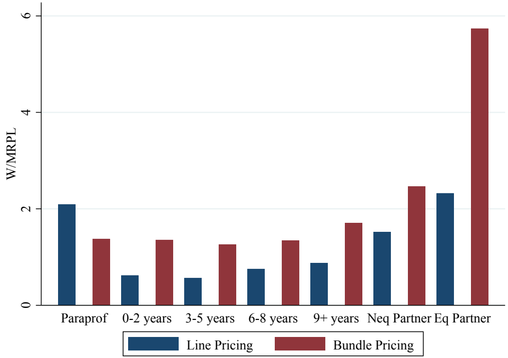
Bundle Pricing: Results for $\sigma = 0.5$

((a)) $\sigma = 0.5$



Bundle Pricing: Results for $\sigma = 2$

((a)) $\sigma = 2$



back to main deck

Revenue Production Function

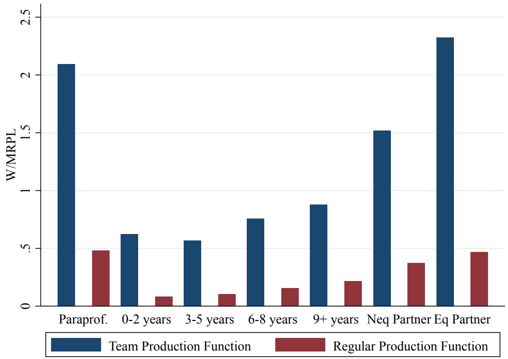
Cobb-Douglas:

$$r_f = \sum_{k \in I} \left(\beta_k l_{kf}\right) + \beta^o \boldsymbol{o}_f + \omega_f + \varepsilon_f. \tag{5}$$

Translog:

$$\begin{aligned} r_f = \beta_0 &+ \sum_{k \in I} \beta_k \, l_{kf} + \beta^o \, o_f \\ &+ \frac{1}{2} \sum_{k \in I} \sum_{j \in I} \gamma_{kj} \, l_{kf} l_{jf} \\ &+ \omega_f + \varepsilon_f. \end{aligned} \tag{6}$$

Revenue Production Function



Notes: Average wage markdowns by seniority level when using a team production function and a revenue production function.

back to main deck

back

	Avg.	Med.	S.D.
Revenue (100 millions USD)	0.695	0.188	1.271
No. Employees (1000s)	0.239	0.080	0.397
Interns (Share of Employment)	0.017	0.017	0.008
Paraprofessionals (Share of Employment)	0.055	0.052	0.025
Admin staff (Share of Employment)	0.166	0.168	0.020
Professionals 0-2 Years (Share of Employment)	0.156	0.155	0.025
Professionals 3-5 Years (Share of Employment)	0.157	0.156	0.027
Professionals 6-8 Years (Share of Employment)	0.107	0.103	0.023
Professionals 9+ Years (Share of Employment)	0.178	0.179	0.033
Non-Equity Partners (Share of Employment)	0.049	0.049	0.019
Equity Partners (Share of Employment)	0.117	0.115	0.026
Labor Expenditure (Share of Revenue)	0.482	0.482	0.028
Technology Expenditure (Share of Revenue)	0.045	0.045	0.008

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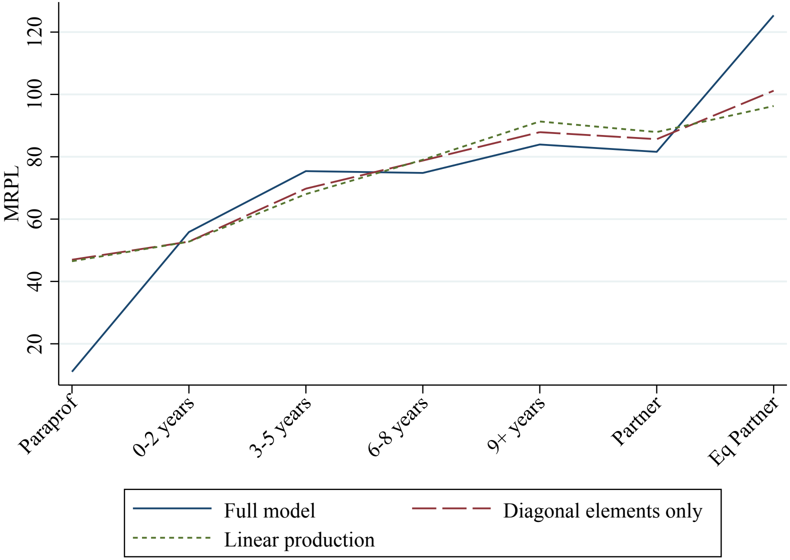
Technology Expenditure (Share of Revenue)	0.045	0.045	0.008
Marketing Expenditure (Share of Revenue)	0.019	0.019	0.005
Training Expenditure (Share of Revenue)	[illegible]	[illegible]	[illegible]

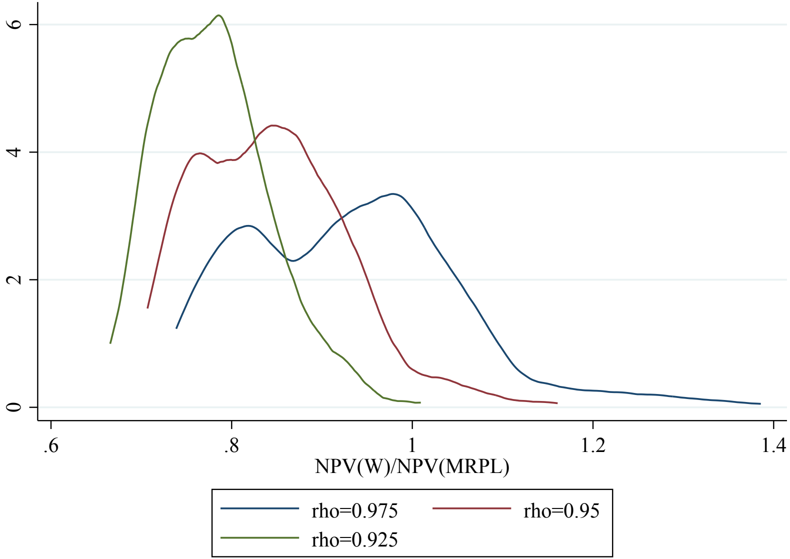
Productivity vs. MRPL: Importance of Team Production

back



Discount factors: robustness

back to main deck



NPV(W) and NPV(MRPL) with residual profit claimants

Suppose L_2 are residual claimants of profits (partners)

For simplicity, assume MRPL=ARPL Zero profit condition:

$$W_1L_1 + W_2L_2 = MRPL_1L_1 + MRPL_L2$$

However, with $\rho < 1$:

$$W_1L_1 + \rho W_2L_2 \neq MRPL_1L_1 + \rho MRPL_L2$$

Depending on W_1/W_2, can be $<$ or $>$ back

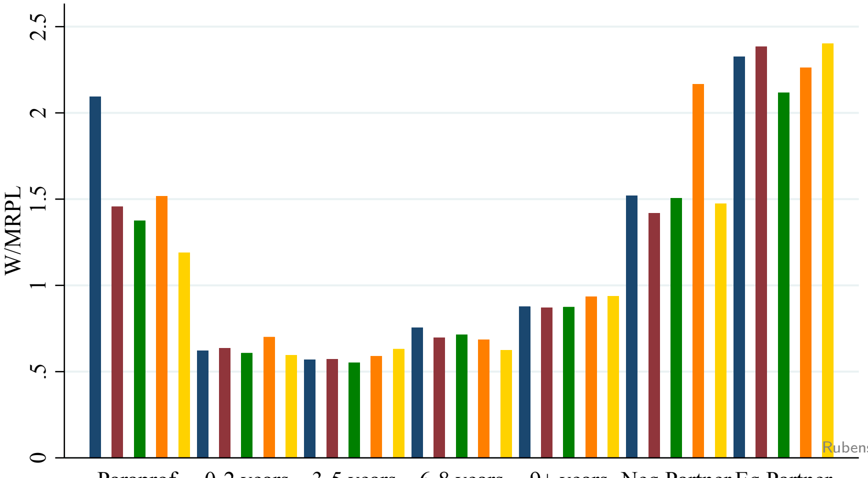
Differentiation

Allow for vertical differences in accountant quality between firms, conditional on seniority. Include price control:

$$q_{if} = \sum_{k \in I} \left(\beta_{ik} l_{ikf}\right) + \beta_i^v \boldsymbol{v}_{if} + \beta^p \ln(p_{if}) + \omega_{if} + \varepsilon_{if}. \tag{7}$$

The resulting wage markdowns are very similar to those estimated without price control, as shown in Figure 3.

Figure: Including Price Controls



Demand for Accounting Services

We assume log-linear demand:

$$Q_{s,f,t} = \overline{Q}_{s,f} \left(\frac{P_{s,f,t}}{\overline{P}_{s,f,t}} \right)^{-\eta} \zeta_{s,f,t}.$$

Market structure: Monopolistic competition $\Rightarrow$ constant markups:

$$\mu_{sf} = \frac{P_{sf} - MC_{sf}}{MC_{sf}} = \frac{1}{\eta - 1}.$$

η is the demand elasticity for service type s.

back to theory back to empirics

Alternative Productivity Process

Back

Alternative: separate TFP into effort-induced productivity term:

$$\omega_{s,f} = \tilde{\omega}_{s,f} + h_s(e_{s,f})$$

with:

$$h_s(e_{s,f}) = c_s + \beta_s^w \ln(W_{s=part,f}) + \beta_s^\tau \ln(\tau_{s=part,f})$$

Then estimate $(\sigma_s, \boldsymbol{\beta}_s)$.

$$\nu_{s,f} = q_{s,f} - \sigma_s \hat{q}_{s,f} - \Big(\sum_k \beta_{s,k}^l l_{k,f} - \sigma_s \sum_k \beta_{s,k}^l \hat{l}_{k,f} \Big) - (\beta_s^o \boldsymbol{o}_f - \sigma_s \beta_s^o \hat{\boldsymbol{o}}_{s,f})$$
$$-\beta_s^w \big(\ln(\hat{W}_{s=part,f}) - \sigma_s \ln(W_{s=part,f}) \big) - \beta_s^\tau \big(\ln(\tau_{s=part,f}) - \sigma_s \ln(\hat{\tau}_{s=part,f}) \big) - (1-\sigma_s)c_s.$$

Include equity partner compensation and transition rates as pre-determined inputs.

Production Function: Identification and Estimation

Denote the one-year lag by $\hat{X}$.

We impose AR(1) on productivity and measurement error:

$$\omega_{s,f} + \varepsilon_{s,f} = \sigma_s(\hat{\omega}_{s,f} + \hat{\varepsilon}_{s,f}) + \nu_{s,f}$$

Alternative TFP transitions

With predetermined vs flexible inputs, we use moment conditions:

$$E(\nu_{s,f} \mid \hat{\boldsymbol{X}}_f^{\text{flex}}) = 0$$

$$E(\nu_{s,f} \mid \boldsymbol{X}_f^{\text{pre}}, \hat{\boldsymbol{X}}_f^{\text{pre}}) = 0$$

Estimation: one-step GMM, heteroskedasticity-robust SEs; lag structure: flexible inputs instrumented with one lag; predetermined with current + one lag

more details

Data Construction and Bin-Level Estimation

Measurement:

- Outputs $Q_{s,f}$: billable hours per worker $\times$ headcount.
- Labor inputs $L_{s,f}$: worked hours per worker $\times$ headcount.
- Non-equity partners: assume same hours (worked and billed) as equity partners; variation driven by headcounts.
- Admin staff / interns: measured in headcounts (hours not observed).
- Intermediate inputs: training + recruiting + technology shares $\times$ total revenue (log dollars in PF).

Bins: we observe firm bins g rather than firms f. In paper, shows identification achieved at bin-year when: (i) common input prices / residual supply elasticities within bin-year, and (ii) entry/exit orthogonal to transient shocks ν. back

Labor Supply Elasticities: Heterogeneity

	(I)		(II)	
	log(Labor Supply Elast.)			
	Est.	S.E.	Est.	S.E.
Medium-size firm	0.373	0.126	0.396	0.148
Small-size firm	-0.495	0.093	-0.438	0.124
Year = 2016	0.007	0.124	0.021	0.120
Year = 2017	0.027	0.134	0.065	0.132
Year = 2018	0.148	0.153	0.192	0.153
Year = 2019	0.108	0.158	0.164	0.163
Year = 2020	0.212	0.180	0.312	0.186
Year = 2021	0.026	0.148	0.204	0.188
Year = 2022	0.357	0.181	0.539	0.210
Year = 2023	0.673	0.242	0.900	0.326
Year = 2024	0.614	0.183	0.871	0.238

Seniors as residual claimants of profits

Partnerships: equity partners are residual claimants of profits

Upon promotion in period t+1, a new partner's present-discounted income is

$$-b^{in}_{t+1} + \pi^{s}_{t+1} + \xi^{lump}_{t+1} + \rho\, b^{out}_{t+2},$$

with

- b^{in}_{t+1}: partnership buy-in
- π^{s}_{t+1}: expected share of one-period profits
- ξ^{lump}: lump-sum transfer
- b^{out}_{t+2}: buy-out received upon retirement in the following period.

Accounting identity:

$$b^{in}_{t+1} = \pi^{s}_{t+1} + \rho\, b^{out}_{t+2}.$$

$\rightarrow$ Partner's present-discounted income simplifies to $\xi^{lump}_{t+1} \rightarrow W_{2,t}$.

Product Market and Revenue

Loglinear product demand with elasticity $\eta < -1$:

$$Q_{s,t} = \overline{Q}_t \left(\frac{P_{s,t}}{\overline{P}_t} \right)^{\eta}.$$

Let $P_s(Q_{s,t})$ be the implied inverse demand. Firm revenue from service s can be written as

$$R_s(\cdot) = d_t \left[F_s(L_{s,t}, L_{-s,t}, \bar{e}_{s,t}, \bar{e}_{-s,t}) \right]^{\frac{1+\eta}{\eta}},$$

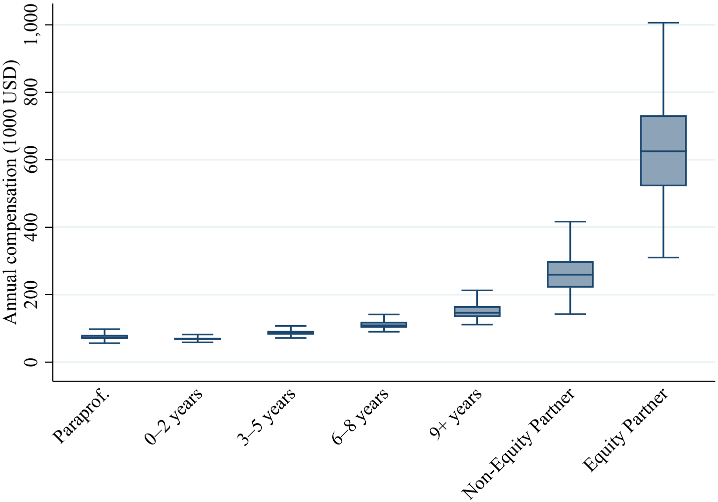
where $d_t \equiv \overline{P}_t / \overline{Q}_t^{1/\eta}$. (In steady state we suppress t.)

Marginal revenue products of labor $MRPL_1 \equiv d(R_1 + R_2)/dL_1$ and $MRPL_2 = d(R_1 + R_2)/dL_2$

back

Annual Salary by Title

Back



Literature

Back

1. **Monopsony Models**

   Static: Card et al. '18, Azar et al. '22, Berger et al. '22, Lamadon et al. '22, Roussille & Scuderi '21, Goolsbee & Syverson '23, Volpe '24;

   Dynamic: Jungerman '23, Berger et al. '24, Agostinelli et al. '25

   Efficiency pay: Bowles '85, Manning '03, Emanuel & Harrington '26, Caldwell, Dube, & Naidu '26

   → Introduce backloaded incentive contracts with endogenous effort into monopsony model

2. **Backloaded Pay and Incentive Contracting**

3. **Production Approaches to Markdown Estimation**

4. **Competition in Public Accounting**

Literature

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1. **Monopsony Models**
2. **Backloaded Pay and Incentive Contracting**

   Theory: Lazear '81, Lazear & Rosen '81, Malcomson '84, Harris & Nguyen '25;

   Evidence: Medoff & Abraham '80, '81, Kotlikoff & Gokhale '92, Hellerstein & Neumark '95, Hellerstein et al. '99, Flabbi & Ichino '01, Dohmen '04

   → Add monopsony, nonlinear/team production, and estimate MRPL directly
3. **Production Approaches to Markdown Estimation**
4. **Competition in Public Accounting**

Literature

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1. **Monopsony Models**

2. **Backloaded Pay and Incentive Contracting**

3. **Production Approaches to Markdown Estimation**

   Brooks et al. '21; Morlacco '19; Yeh et al. '22; Mertens '22; Delabastita & Rubens '25; Syverson '25

   → Multi-output team production with seniority-specific outputs

   → Professional services rather than manufacturing

4. **Competition in Public Accounting**

Literature

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1. **Monopsony Models**
2. **Backloaded Pay and Incentive Contracting**
3. **Production Approaches to Markdown Estimation**
4. **Competition in Public Accounting**

   Numan & Willekens '12; Gerakos & Syverson '15

   → Shift focus from product-market power to labor-market power

Effort Monotonicity

Lemma (Effort Monotonicity): if $\tau_t \in (0, 1)$, then $\tilde{e}_t$ is strictly increasing in $W_{2,t}$

Intuition: higher promised senior compensation raises the return to effort in the junior period by increasing promotion incentives

Back

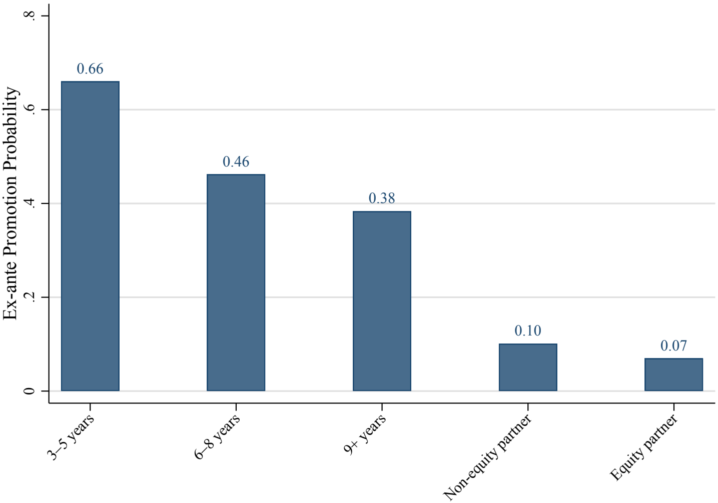
Caveats

Caveats:

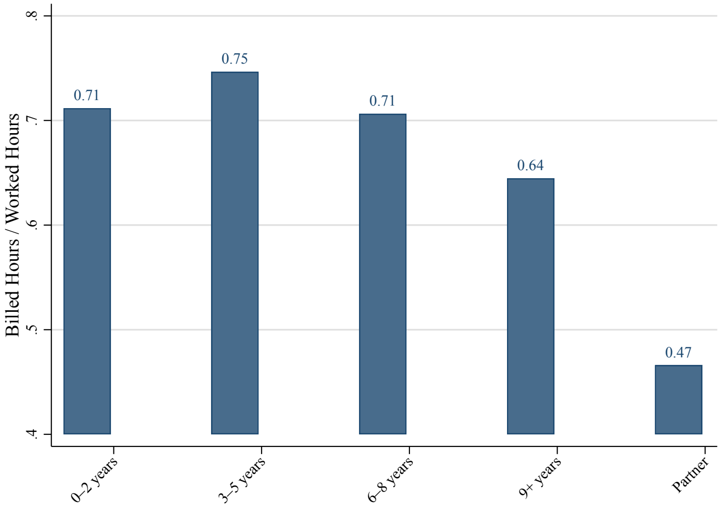
- Model cross-effects via <u>hours</u> of other types, not via <u>outputs</u>
- Allow differentiation across seniority types, not across firms (relaxed in Appendix)
- Fixed assets are not observed (relaxed in Appendix)

back

Fact 1: Up-or-Out: Cumulative Survival Probabilities



Fact 3: Hours Billed / Hours Worked Decreases with Seniority



Workers' Problems

back

Effort Choice

Seniors: no further promotion, exert exogenous $e^*_{2,f,t}$

Juniors:

$$
\begin{aligned}
\bar{U}_{1,f,t} = & \max_{e_{1,f,t}} \ \alpha W_{1,f,t} - C(e_{1,f,t}) + \xi_{1,f} \\
& + \rho \Big\{ [1 - \Phi(\theta^P_t(\tau_{f,t}) - e)] \bar{\bar{U}}_{2,f,t+1} + \Phi(\theta^P_t(\tau_{f,t}) - e_{1,f,t}) \bar{U}^{alt}_{2,f,t+1} \Big\}
\end{aligned}
$$

where

$$
\bar{\bar{U}}_{2,f,t+1} \equiv \mathbb{E}\Big[\max\{U_{2,f,t+1}, U^{alt}_{i,2,f,t+1}\} \Big], \qquad \bar{U}^{alt}_{2,f,t+1} \equiv \mathbb{E}[U^{alt}_{i,2,f,t+1}]
$$

Workers' Problems

back

Effort Choice

Seniors: no further promotion, exert exogenous $e^*_{2,f,t}$

Juniors:

$$\bar{U}_{1,f,t} = \max_{e_{1,f,t}} \underbrace{\alpha W_{1,f,t} - C(e_{1,f,t}) + \xi_{1,f}}_{\text{curr. util.}}$$
$$+ \rho\Big\{[1 - \Phi(\theta_t^P(\tau_{f,t}) - e_{1,f,t+1})]\bar{\bar{U}}_{2,f,t+1} + \Phi(\theta_t^P(\tau_{f,t}) - e_{1,f,t})\bar{U}^{alt}_{2,f,t+1}\Big\}$$

where

$$\bar{\bar{U}}_{2,f,t+1} \equiv \mathbb{E}\Big[\max\{U_{2,f,t+1}, U^{alt}_{i,2,f,t+1}\}\Big], \qquad \bar{U}^{alt}_{2,f,t+1} \equiv \mathbb{E}[U^{alt}_{i,2,f,t+1}]$$

Hours $H_{s,f,t}$ are exogeneous, but 'latent' hours worked enter into effort $\bar{e}_{s,f,t}$

Workers' Problems

back

Effort Choice

Seniors: no further promotion, exert exogenous $e^*_{2,f,t}$

Juniors:

$$\bar{U}_{1,f,t} = \max_{e_{1,f,t}} \underbrace{\alpha W_{1,f,t} - C(e_{1,f,t}) + \xi_{1,f}}_{\text{curr. util.}}$$
$$+ \rho\Big\{\underbrace{[1 - \Phi(\theta^P_t(\tau_{f,t}) - e_{1,f,t})]}_{\text{promo prob.}} \underbrace{\bar{\bar{U}}_{2,f,t+1}}_{\text{FU if promo}} + \Phi(\theta^P_t(\tau_{f,t}) - e_{1,f,t})\bar{U}^{alt}_{2,f,t+1}\Big\}$$

where

$$\bar{\bar{U}}_{2,f,t+1} \equiv \mathbb{E}\Big[\max\{U_{2,f,t+1}, U^{alt}_{i,2,f,t+1}\}\Big], \qquad \bar{U}^{alt}_{2,f,t+1} \equiv \mathbb{E}[U^{alt}_{i,2,f,t+1}]$$

Hours $H_{s,f,t}$ are exogeneous, but 'latent' hours worked enter into effort $\bar{e}_{s,f,t}$

Workers' Problems

back

Effort Choice

Seniors: no further promotion, exert exogenous $e^*_{2,f,t}$

Juniors:

$$\bar{U}_{1,f,t} = \max_{e_{1,f,t}} \underbrace{\alpha W_{1,f,t} - C(e_{1,f,t}) + \xi_{1,f}}_{\text{curr. util.}}$$

$$+ \rho \left\{ \underbrace{[1 - \Phi(\theta^P_t(\tau_{f,t}) - e_{1,f,t})]}_{\text{promo prob.}} \underbrace{\bar{\bar{U}}_{2,f,t+1}}_{\text{FU if promo}} + \underbrace{\Phi(\theta^P_t(\tau_{f,t}) - e_{1,f,t})}_{\text{fire prob.}} \underbrace{\bar{U}^{alt}_{2,f,t+1}}_{\text{FU if fired}} \right\}$$

where

$$\bar{\bar{U}}_{2,f,t+1} \equiv \mathbb{E}\left[\max\{U_{2,f,t+1}, U^{alt}_{i,2,f,t+1}\}\right], \qquad \bar{U}^{alt}_{2,f,t+1} \equiv \mathbb{E}[U^{alt}_{i,2,f,t+1}]$$

Hours $H_{s,f,t}$ are exogeneous, but 'latent' hours worked enter into effort $\bar{e}_{s,f,t}$

Workers' Problems

back

Effort FOC and Employment

Workers' optimal effort, $\tilde{e}_{1,f,t}$, satisfies IC constraint:

$$C'(\tilde{e}_{1,f,t}) = \rho\,\phi(\kappa^P(\tau_{f,t}))\,[\bar{\bar{U}}_{2,f,t} - \bar{U}^{alt}_{2,f,t+1}],$$

where $\kappa^P(\tau_{f,t})$ is the $\tau_{f,t}$-quantile of Φ

Effort Monotonicity

Employment:

$$L_{1,f,t} = G^{alt}_{1,f}(\bar{U}_{1,f,t})\,\mathcal{L}, \qquad L_{2,f,t+1} = (1-\tau_{f,t})G^{alt}_{2,f}(U_{2,f,t+1})\,L_{1,f,t}$$

Workers' Problems

back

Effort FOC and Employment

Workers' optimal effort, $\tilde{e}_{1,f,t}$, satisfies IC constraint:

$$C'(\tilde{e}_{1,f,t}) = \rho\,\phi(\kappa^P(\tau_{f,t}))\,[\bar{\bar{U}}_{2,f,t} - \bar{U}^{alt}_{2,f,t+1}],$$

where $\kappa^P(\tau_{f,t})$ is the $\tau_{f,t}$-quantile of Φ

Effort Monotonicity

Employment:

$$L_{1,f,t} = \underbrace{G^{alt}_{1,f}(\bar{U}_{1,f,t})}_{\text{choice prob. junior}}\ \mathcal{L}, \qquad L_{2,f,t+1} = (1-\tau_{f,t})L_{1,f,t}G^{alt}_{2,f}(U_{2,f,t+1})$$

Workers' Problems

back

Effort FOC and Employment

Workers' optimal effort, $\tilde{e}_{1,f,t}$, satisfies IC constraint:

$$C'(\tilde{e}_{1,f,t}) = \rho\,\phi(\kappa^P(\tau_{f,t}))\,[\bar{\bar{U}}_{2,f,t} - \bar{U}^{alt}_{2,f,t+1}],$$

where $\kappa^P(\tau_{f,t})$ is the $\tau_{f,t}$-quantile of Φ

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Workers' Problems

back

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Employment:

$$L_{1,f,t} = G^{alt}_{1,f}(\bar{U}_{1,f,t})\, \mathcal{L}, \qquad L_{2,f,t+1} = (1-\tau_{f,t})L_{1,f,t}\, \underbrace{G^{alt}_{2,f}(U_{2,f,t+1})}_{\text{choice prob. senior}}$$

Firm's Problem

back

Firms sell each Q_s at price P_s ($\sim$2/3 of sample uses line-pricing, not bundle-pricing)

Monopolistic competition in product market

product demand

Firm's Problem

back

Firms sell each Q_s at price P_s (~2/3 of sample uses line-pricing, not bundle-pricing)

Monopolistic competition in product market product demand

Given incumbent seniors $L_{2,f,t}$, firm solves:

$$V(L_{2,f,t}) = \max_{W_{1,f,t}, W_{2,f,t+1}, \tau_{f,t}} \Big\{ R_1(L_{1,f,t}, L_{2,f,t}, \tilde{e}_{f,t}, e^*_{2,f,t}) + R_2(L_{2,f,t}, L_{1,f,t}, e^*_{2,f,t}, \tilde{e}_{f,t}) \\ - W_{1,f,t}L_{1,f,t} - \rho W_{2,f,t+1}(1-\tau_{f,t})G^{alt}_{2,f}(\bar{U}_{2,f,t+1})L_{1,f,t} + \rho V\left(L_{2,f,t+1}\right) \Big\},$$

subject to IC

Envelope theorem:

$$V'(L_{2,f,t}) = MRPL_{2,f,t}$$

where $MRPL_{2,f,t}$ aggregates marginal revenue products through both outputs

MRPL and Wage Markdowns

back

The marginal revenue product of type-s labor, $\text{MRPL}_{s,f} \equiv \frac{\partial R_f}{\partial L_{s,f}}$, is:

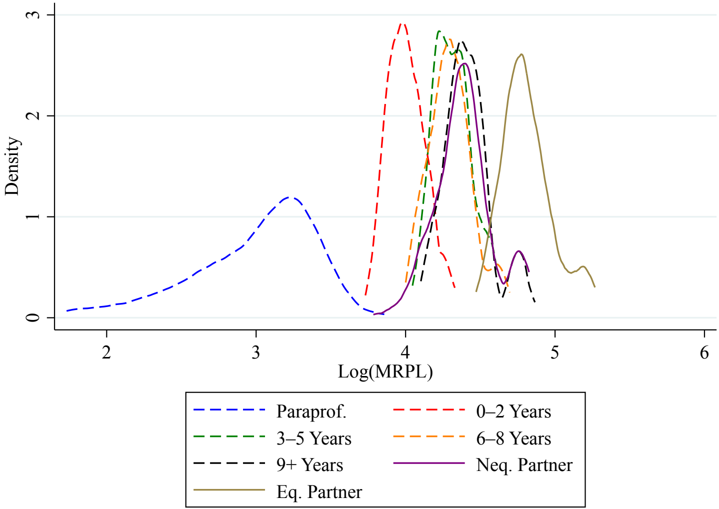
$$\text{MRPL}_{s,f} = \frac{1}{L_{s,f}} \sum_{k \in S} \beta^l_{s,k} P_{s,f} Q_{s,f} \left(\frac{\eta + 1}{\eta} \right)$$

Instantaneous markdown:

$$\delta_{s,f} \equiv \frac{W_{s,f}}{\text{MRPL}_{s,f}} = \frac{W_{s,f} L_{s,f}}{\sum_{k \in S} \beta^l_{s,k} P_{s,f} Q_{s,f} \left(\frac{\eta+1}{\eta} \right)}$$

We estimate $\delta_{s,f}$ using observed revenues and wages plus estimated elasticities $(\boldsymbol{\beta}^l, \boldsymbol{\beta}^o)$ and imposed η

MRPL by Seniority Level



Equilibrium

back

Wage-promotion policies: $\{W_{1,f,t}, W_{2,f,t+1}, \tau_{f,t}\}$, employment: $\{L_{1,f,t}, L_{2,f,t+1}\}$, effort: $\{\tilde{e}_{f,t}\}$

Optimality:

- Wage-promotion policies solve firm problem
- Effort satisfies employees' IC constraint
- Labor quantities satisfy supply equations

Feasibility:

$$\sum_f L_{1,f,t} \leq \mathcal{L}, \quad \sum_f L_{2,f,t} \leq \mathcal{L}$$

Consistency: Outside option distributions align with competitors' policies

	(I)		(II)		(III)		(IV)		(V)		(VI)		(VII)	
	0-2 years		3-5 years		6-8 years		9+ years		Non-eq. Part.		Eq. Part.		Paraprof.	
	Est.	S.E.	Est.	S.E.	Est.	S.E.	Est.	S.E.	Est.	S.E.	Est.	S.E.	Est.	S.E.
0-2 years	1.00	0.02	0.02	0.02	0.03	0.02	-0.01	0.02	0.01	0.03	0.01	0.03	0.03	0.06
3-5 years	0.04	0.02	1.03	0.02	-0.01	0.02	0.02	0.02	0.03	0.03	0.03	0.03	-0.02	0.10
6-8 years	0.00	0.02	-0.01	0.02	1.00	0.02	-0.05	0.02	0.02	0.03	0.02	0.03	0.07	0.08
9 years	-0.01	0.02	-0.02	0.01	-0.01	0.03	0.96	0.03	-0.01	0.04	-0.01	0.04	-0.03	0.05
Non-eq. Partners	0.02	0.01	0.01	0.01	0.01	0.01	-0.01	0.01	0.97	0.02	-0.03	0.02	0.01	0.04
Eq. Partners	-0.02	0.02	0.04	0.02	0.08	0.03	0.10	0.03	0.05	0.05	1.05	0.05	0.12	0.08
Paraprof.	-0.04	0.01	-0.03	0.01	-0.02	0.01	-0.03	0.01	-0.01	0.02	-0.01	0.02	1.01	0.04
Ser. corr.	0.94	0.06	0.94	0.04	0.89	0.05	0.91	0.04	0.93	0.04	0.93	0.04	0.44	0.16
Obs.	174		174		174		174		174		174		174	

	0–2 yr	3–5 yr	6–8 yr	9+ yr	N-eq. par.	Eq. par.	Paraprof.
Interns	0.024	0.016	−0.027	−0.005	−0.023	−0.023	−0.147
Training	−0.011	0.003	0.003	−0.004	0.014	0.014	−0.011
Recruiting	0.006	0.006	0.007	0.007	−0.002	−0.002	0.032
Technology	−0.002	−0.003	0.002	0.021	−0.025	−0.025	−0.025
Admin. staff	−0.001	−0.035	−0.030	0.017	−0.019	−0.019	−0.027

Negative Positive

−0.15 0 0.15

Equity Partner Wage Markups: Correcting for Profit Payouts

back

Equity partners = residual claimants → compensation includes

- lump-sum incentive pay (relevant for MRPL comparison), and
- profit distributions:

$$W^{obs}_{f,t} = W^{lump}_{f,t} + \pi^{s}_{f,t}.$$

Steady-state profits:

$$b^{in}_{f} = b^{out}_{f} = \frac{\pi^{s}_{f}}{1-\rho} \quad \Rightarrow \quad W^{lump}_{f,t} = W^{obs}_{f,t} - (1-\rho)b^{in}_{f}.$$

Empirical implementation:

- Use observed average buy-ins to impute lump-sum compensation.
- Recompute equity partner wage markups using W^{lump}.

Average wage markup: 2.32 → 2.27.