Can Non-compete Agreements Explain the Decline in U.S. Job-to-job Mobility?

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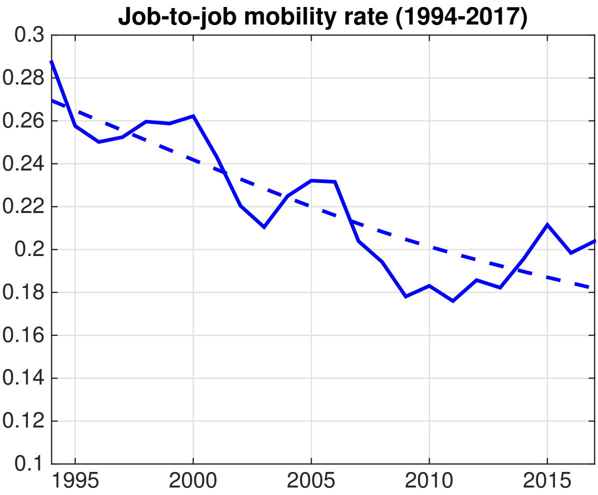
What is a non-compete?

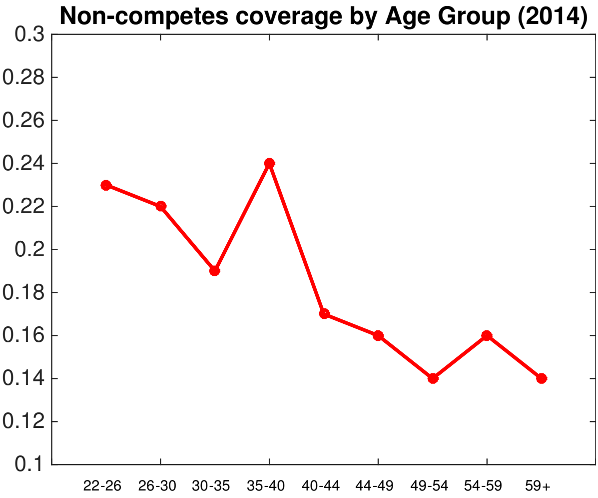
- Non-compete clauses prohibit the employee from going to work for a **competitor** or starting a competing business;
- Non-competes are widely use in the U.S. economy
  - 18.1$\%$ of the labor force in 2014 (Starr, Prescott, Bishara (2017))
- **Amazon Example :**
  "4.1, Non-competition: During employment and for 18 months after the Separation Date, Employee will not, directly or indirectly, whether on Employee's own behalf or on behalf of any other entity (for example, as an employee, agent, partner, or consultant), **engage in or support the development, manufacture, marketing, or sale of any product or service that competes or is intended to compete with any product or service sold, offered, or otherwise provided by Amazon** (or intended to be sold, offered, or otherwise provided by Amazon in the future) that Employee worked on or supported, or about which Employee obtained or received Confidential Information."

Overall decline in job-to-job mobility



Author's calculation, CPS

Increasing coverage of non-competes by cohort



Starr, Prescott & Bishara (2017)

Introduction

- **Motivation:**
  - The U.S. worker mobility is declining over the past decades;
  - Data suggests there is a rise of non-compete coverage.
- **Question:**
  - Can the rise in non-competes explain the declining worker mobility?
- **This paper:**
  - Decompose the worker mobility to document the source of the decline;
  - Develop a labor search model to find that the rise in non-competes can explain around
    - 1/2 of the decline in intra-industry mobility
    - 1/3 of the rise in inter-industry mobility

Related Literature

- **Non-competition agreements:**
  - **Pervasive Usage** Starr, Prescott,& Bishara (2017), Johnson & Lipsitz (2017), Krueger & Ashenfelter (2017);
  - **Industry Dynamics and Entrepreneurship** Fallick (2005), Franco & Mitchell (2008), Jeffers (2018), Starr, Balasubramanian, & Sakakibara (2017);
  - **Human Capital Investment** Garmise (2011), Shi (2018);
  - **Mobility and Productivity Spillover** Starr, Prescott,& Bishara (2016), Heggedal, Moen, & Preugschat (2017)

  My contribution: measurement and economic impact over time
- **Labor market power:**
  - **Measurement** Azar, Marinescu, Steinbaum, & Taska (2018), Benmelech, Bergman, & Kim (2018), Rinz (2018)
  - **Economic impacts** Berger, Herkenhoff, and Mongey (2019), Jarosch, Nimczik, & Sorkin (2019), Macaluso, & Hershbein (2018)

  My contribution: specific channel of mobility restriction

Outline

A closer inspection of the decline in job-to-job mobility

Divide job-to-job transitions according to industry and occupation mixes

- 1950 industry code : 10 industries

  Professional,Technical; Farmers; Managers, Officials and Proprietors; Clerical and Kindred; Sales workers; Craftsman; Operatives; Service; Farm labors; Laborers

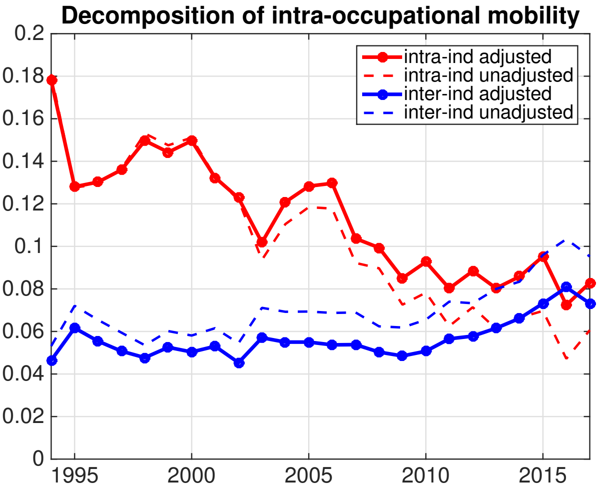
- 1950 occupation code : 12 occupations

  Agriculture, Forestry, and Fishing; Mining; Construction; Manufacturing; Transportation, communication, and other utilities; Wholesales and retail trade; Finance, insurance and real estate; Business and repair services; Personal services; Entertainment and recreation services; Professional and related services; Public administration

Similar patterns hold for 3-digit occupation/industry codes

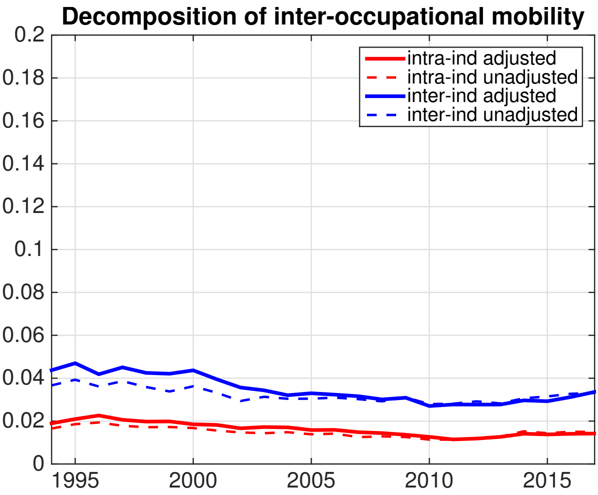
		Occupation: $Intra$	Occupation: $Inter$
Industry	$Intra$	$\downarrow$	$-$
	$Inter$	$\uparrow$	$-$

Intra-industry-intra-occupation mobility is the driver



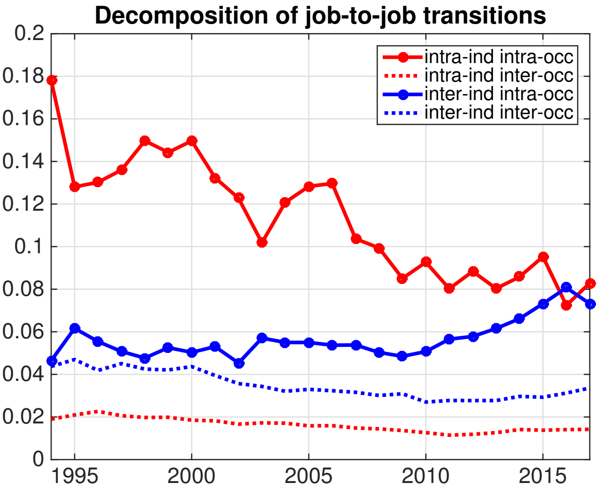
Author's calculation, CPS

Inter-occupational Mobility : Low and Constant



Author's calculation, CPS

Putting Together



Author's calculation, CPS

Model Features

- Random search;
- Exogenous non-compete provision over time;
- Two-sided heterogeneity;
- Multi-industries;
- Risk neutral firms and risk averse workers;
- Endogenous firm investment in workers' human capital.

Model environment

- Time is continuous
  - ρ : discount factor;
  - d : worker death hazard;
  - δ : exogenous job destruction rate;
  - λ : job arrival rates (specified later)
  - $r = \rho + d$
- **Techonology** $f_h(p) = p + ah$
  - Worker skill : $h \in \{0, 1\}$
  - Skilled worker productivity : a
  - Firm productivity : $p \sim$ Pareto
- **Preference**
  - Worker utility : $u(c) = \frac{c^{1-\sigma}}{1-\sigma}$
  - Firms maximize DPV of profits

Job arrival rates

- Job arrival rates depend on worker employment status and sectors
  - λ^0 : unemployed workers
  - λ^1 : on-the-job search, intra-industry
  - λ^2 : on-the-job search, inter-industry
- Fixed for now, will be relaxed later

Unemployed worker's problem

- Unemployed workers
  - Zero bargaining power
  - Fixed amount of unemployment benefit flow b
  - Fully depreciation of skills upon unemployment
- Value function :

$$rU = u(b)$$

Contracts

Contracts are provided in two stages:

- Stage 1: firms $s = \{C, F\}$ are created exogenously with time-varying probability
  - C: covenant-not-to-compete;
  - F: free firms;
  - intra-industry mobility is prohibited with probability ξ in C firms

    (Heggedal, Moen, & Preugschat (2017))
- Stage 2: firms offer contracts $\mathcal{C} = (w, \eta, V)$ that specify wages, training and continuation values contingent on employment history
  - training cost $c(\eta)$ associated with training intensity η (Lentz, & Roys (2015))

$$c(\eta) = c_0 \eta^{1+c_1} \quad c_1 > 0$$

Bargaining and Value Determination

- Denote firm profits as $\Pi(s, p, h, V)$;
- Firms compete over promised values under **Bertrand competition**

  Postel-Vinay & Robin (2002)
- The **maximum** value a firm can promise is $\bar{V}(s, p, h)$ that solves

$$\Pi(s, p, h, \bar{V}(s, p, h)) = 0$$

Bargaining and Value Determination

Three cases for Bertrand competition :

- worker's current value : V
- current employer : (s, p, h)
- poacher : (s', p', h')

1. $V \geq \bar{V}(s', p', h')$:
   – worker stays with the current employer, value is unchanged;
2. $\bar{V}(s, p, h) > \bar{V}(s', p', h') > V$:
   – worker stays with the current employer, value changes to $\bar{V}(s', p', h')$;
3. $\bar{V}(s', p', h') > \bar{V}(s, p, h)$:
   – worker moves to the poacher, value changes to $\bar{V}(s, p, h)$.

Employed Workers' Value Function

- Worker's value function V depend on the contract $\mathcal{C} = (w, \eta, H)$ and $s \in \{C, F\}$

$$
\begin{aligned}
(r+\delta)V = u(w) + & \overbrace{\delta U}^{\text{Exogeneous Separation}} + \overbrace{\eta(H-V)}^{\text{Value Jumps at Skill Change}} \\
& + \lambda^1(1-\mathbb{1}_{\{s=C\}}\xi)\underbrace{[\overbrace{\int_V^{\bar{V}_h(p)}(V'-V)dF^h(V')}^{\text{Stay, but value changes}} + \overbrace{\bar{V}_h(p)\hat{F}^h(\bar{V}_h(p))}^{\text{Move to another firm}}]}_{\text{Poached by firms from the same industry}} \\
& + \underbrace{\lambda^2[\int_V^{\bar{V}_0(p)}(V'-V)dF^0(V') + \bar{V}_0(p)\hat{F}^0(\bar{V}_0(p))]}_{\text{Poached by firms from other industries}} \\
& = u(w) + \delta U_h + \eta(H-V) \\
& + \lambda^1(1-\mathbb{1}_{\{s=C\}}\xi)\int_V^{\bar{V}_h(p)}\hat{F}^h(V')dV' + \lambda^2\int_V^{\bar{V}_0(p)}\hat{F}^0(V')dV'
\end{aligned}
$$

Notation: $\hat{F}(x) = 1 - F(x)$

Firms' Problem

- Firms choose (w, η, H) to maximize profits

$$(r+\delta)\Pi(s,p,h,V) = \max_{(w,\eta,H)\in\Gamma(s,p,h,V)} \{f_h(p) - w - \overbrace{c_h(\eta)}^{\text{Training Cost}}$$

$$+ \overbrace{\eta(\Pi(s,p,1,H) - \Pi(s,p,h,V))}^{\text{Profits Change at Skill Change}}$$

$$+\lambda^1(1 - \mathbb{1}_{\{s=C\}}\xi) \overbrace{\int_V^{\bar{V}_h(p)} (\Pi(s,p,h,V') - \Pi(s,p,h,V))dF^h(V')}^{\text{Betrand Competition}}$$

$$+\lambda^2 \overbrace{\int_V^{\bar{V}_0(p)} (\Pi(s,h,V',p) - \Pi(s,h,V,p))dF^0(V')}^{\text{Bertrand Competition}}\}$$

$$s.t. \quad \Gamma(s,p,h,V) = \{\text{PK constraint} \quad U < V < \bar{V}_h(p)\}$$

Definition of Equilibrium

Given an initial distribution of $\{\mu_0^{sh}, G_0^{sh}(V,p)\}_{s\in\{C,F\},h\in\{0,1\}}$ and a time path of non-compete provision shocks $\{\epsilon_t\}_{t=0}^{\infty}$ over time, a competitive equilibrium consists of value functions $V_t, \Pi_t, \bar{V}_t(s,p,h)$, optimal contracts $\mathcal{C}$ and value distribution $F_t^h(V), h \in \{0,1\}$ worker distribution$\{\mu_t^{sh}, G_t^{sh}(V,p)\}_{s\in\{C,F\},h\in\{0,1\}}$ such that

- Worker value function is consistent with the contract;
- Firm's value function and contract policy function solve the optimal contract problem;
- Law of motion of worker distribution holds ;
- Distributions of maximum value are determined by individual firm's maximum value, i.e.

$$F_t^h(V) = \int_{\underline{p}}^{\bar{p}} \mathbb{1}\{\bar{V}_t(s,p,h) \leq V\} d\Lambda(p)$$

where h denotes the skills that the poacher can utilize.

A steady state competitive equilibrium is similarly defined but over a constant path of $\{\epsilon_t\}_{t=0}^{\infty} = \epsilon$, which implies a stationary distribution of workers over firm type, firm productivity and worker value.

Aggregation

Givenworker distribution $\{\mu_t^{sh}, G_t^{sh}(V,p)\}_{s\in\{C,F\},h\in\{0,1\}}$

- Aggregate intra-industry mobility

$$\text{intra}_t = \lambda^1 \sum_{s\in\{C,F\}} \sum_{h\in\{0,1\}} \mu_t^{sh} \int\int \hat{F}^h(\bar{V}^h(p))(1 - \mathbb{1}_{\{s=C\}}\xi)dG_t^{sh}(V,p)$$

- Aggregate inter-industry mobility

$$\text{inter}_t = \lambda^2 \sum_{s\in\{C,F\}} \sum_{h\in\{0,1\}} \mu_t^{sh} \int\int \hat{F}^0(\bar{V}^h(p))dG_t^{sh}(V,p)$$

Steady State : Predetermined

Parameter	Value	Description	Source
Environment	$\rho = 0.05$	Discounting	Annual risk free rate : 5%
	$d = 0.025$	Death hazard	Average working life : 40 yrs
	$\delta = 0.24$	Exogenous separation	Lentz $\&$ Roys (2015)
	$\lambda^0 = 4$	Job arrival : unemployed	Lentz $\&$ Roys (2015)
Firm Productivity	$\bar{p} = 24.6$	Pareto : Upper bound	Lentz $\&$ Roys (2015)
	$\underline{p} = 1$	Pareto : Lower bound	Lentz $\&$ Roys (2015)
	$\sigma = 0.29$	Pareto : Curvature	Lentz $\&$ Roys (2015)
Training Cost	$c_0 = 37.41$	Training cost : scaling	Lentz $\&$ Roys (2015)
	$c_1 = 0.81$	Training cost : variable	Lentz $\&$ Roys (2015)

Table: Predetermined Parameters

Steady State : Calibrated

Parameter	Value	Description	Source
Fixed search effort			
Job arrival	$\lambda^1 = 0.9$	OJS job arrival : intra-industry	Intra-ind-intra-occ = 0.15
	$\lambda^2 = 0.5$	OJS job arrival : inter-industry	Inter-ind-intra-occ = 0.05
Worker skill	$a = 7.3$	Skilled labor productivity	Gross labor share = 0.63

Table: Calibrated Parameters

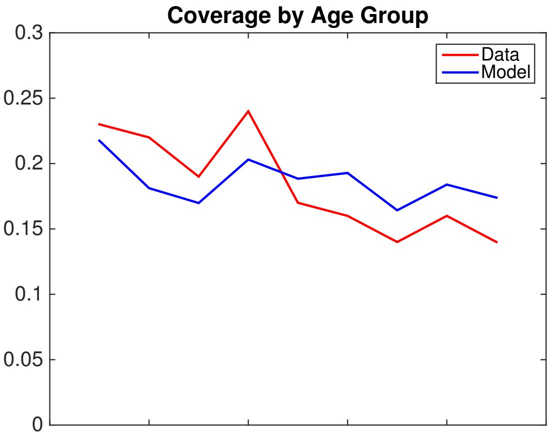
Inferring Non-compete Provision Over Time

- Assuming enforcement constant, simulate the economy for a sequence of 6 shocks, each lasting 4 years (1994 - 2017);
- Baseline : $\xi = 1$
- **Target** : age-coverage correlation in 2014

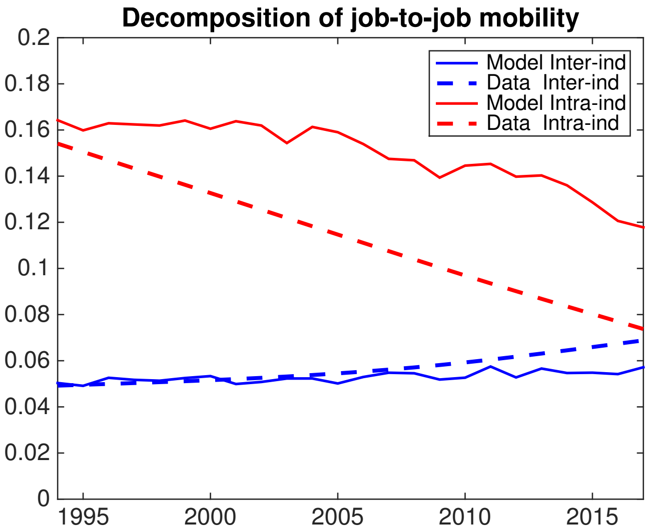
Model	ϵ_1	ϵ_2	ϵ_3	ϵ_4	ϵ_5	ϵ_6
Fixed Effort	0.10%	0.13%	1.50%	12.05%	13.70%	25.24%

Table: Estimated Shocks

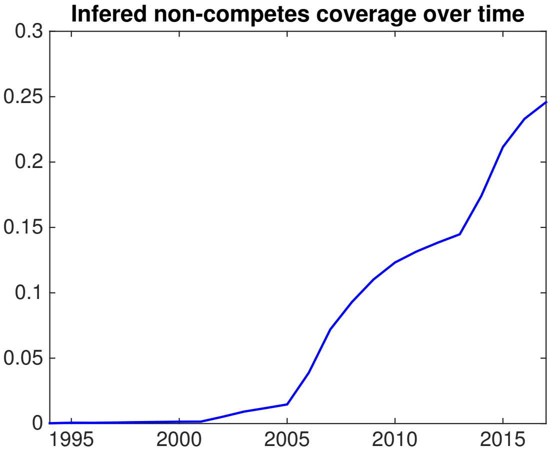
Model Fit : Age Correlation



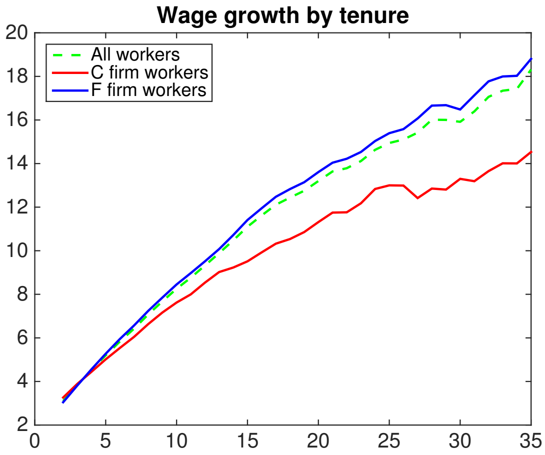
Model Fit : Job-to-job Mobility



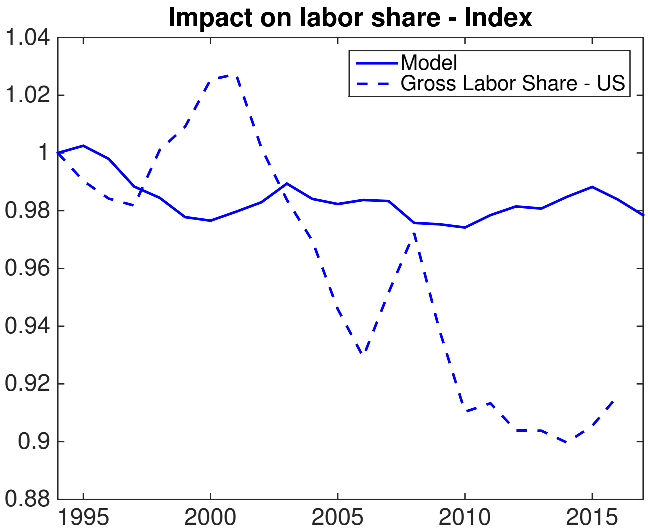
Implied Non-compete Coverage



Impact on Lifecycle Wage Growth



Impact on Labor Share



Extension - Variable Search Effort

- 1 unit total search effort endowment per unit of time
- Allocated to **intra-industry search** and **inter-industry search**
- Search efficiency function :

$$\lambda^i(e) = \gamma_0^i e^{\gamma_1} \qquad i \in \{1, 2\},\ \gamma_1 < 1$$

- Value function :

$$(r+\delta)V = \max_e \{u(w) + \delta U + \eta(H - V) + (1 - \mathbb{1}_{\{s=C\}}\xi)\lambda^1(e)\int_V^{\bar{V}_h(p)} \hat{F}^h(V')dV' + \lambda^2(1-e)\int_V^{\bar{V}_0(p)} \hat{F}^0(V')dV'\}$$

- Optimal search strategy :

$$\frac{e}{1-e} = \{\frac{\int_V^{\bar{V}_h(p)} \hat{F}^h(V')dV'}{\int_V^{\bar{V}_0(p)} \hat{F}^0(V')dV'} \frac{\gamma_0^1}{\gamma_0^2}(1 - \mathbb{1}_{\{s=C\}}\xi)\}^{\frac{1}{1-\gamma_1}}$$

Firms' Problem with Endogenous Search Effort

Firms now offer $\mathcal{C} = (w, \eta, H, e)$

$$
\begin{aligned}
(r+\delta)\Pi(s,p,h,V) = & \max_{(w,\eta,H,e)\in\Gamma(s,p,h,V)} \{f_h(p) - w - c_h(\eta) \\
& + \eta(\Pi(s,p,1,H) - \Pi(s,p,h,V)) \\
& + (1 - \mathbb{1}_{\{s=C\}}\xi)\lambda^1(e)\int_V^{\bar{V}_h(p)} (\Pi(s,p,h,V') - \Pi(s,p,h,V))dF^h(V') \\
& + \lambda^2(1-e)\int_V^{\bar{V}(p)} (\Pi(s,p,h,V') - \Pi(s,p,h,V))dF^0(V')\} \\
s.t.\ \ \Gamma(s,p,h,V) = & \{\text{PK constraint} \\
& \frac{e}{1-e} = \{\frac{\int_V^{\bar{V}_h(p)} \hat{F}^h(V')dV'}{\int_V^{\bar{V}_0(p)} \hat{F}^0(V')dV'} \frac{\gamma_0^1}{\gamma_0^2}(1 - \mathbb{1}_{\{s=C\}}\xi)\}^{\frac{1}{1-\gamma_1}} \\
& U < V < \bar{V}_h(p)\}
\end{aligned}
$$

Aggregation

Recall that worker distribution $\{\mu_t^{sh}, G_t^{sh}(V,p)\}_{s\in\{C,F\},h\in\{0,1\}}$

- Aggregate intra-industry mobility

$$\text{intra}_t = \sum_{s\in\{C,F\}} \sum_{h\in\{0,1\}} \mu_t^{sh} \int\int \lambda(e(s,h,p,V))(1 - \mathbb{1}_{\{s=C\}}\xi)\hat{F}^h(\bar{V}^h(p))dG_t^{sh}(V,p)$$

- Aggregate inter-industry mobility

$$\text{inter}_t = \sum_{s\in\{C,F\}} \sum_{h\in\{0,1\}} \mu_t^{sh} \int\int \lambda(1 - e(s,h,p,V))\hat{F}^0(\bar{V}^h(p))dG_t^{sh}(V,p)$$

Conclusion

- Document new empirical findings that is suggestive for the source of the decline in worker mobility;
- Develop a labor search framework to study the impact of rise in non-competes;
- The rise in non-competes can explain around1/2 of the decline in the intra-industry mobility and around 1/3 of the increase in the inter-industry mobility;
- The current research focuses on workers behavior; in the future, I plan to develop a framework which accounts for
  - endogenous non-compete provision over time
  - general equilibrium effects on firm entry

Appendix - Model Properties

For noncompete enforcement $\xi \in (0, 1]$

Maximum Value Independence

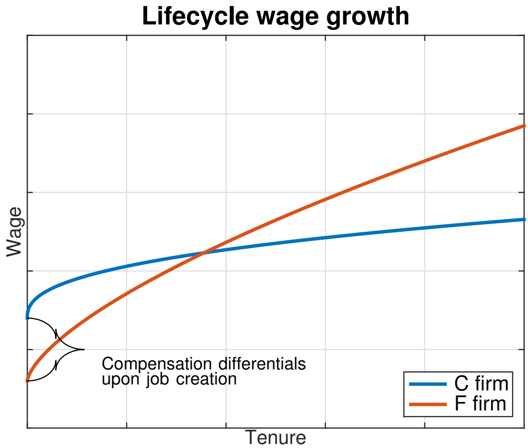
The maximum value that a firm can promise to a worker (skilled and unskilled) are the same for C firms and F firms.

Compensating Differential

As long as $\xi > 0$,conditional on the same states (p, h, V), workers have a higher wage in a C firms has a higher wage

$$w(C, p, h, V) > w(F, p, h, V)$$

Appendix - Graphic Illustration of Wage Growth



Impact on Welfare - Mechanics

Provision	$\epsilon = 0$	$\epsilon = 0.05$	$\epsilon = 0.20$
Coverage	0%	6.69%	24.61%
Utility	100	99.61	99.30
Firm productivity	11.9880	11.8051	11.3040
J2J transition rate	1.84%	1.77%	1.56%
I2I transition rate	0.46%	0.48%	0.51%
Blocked poaching	0%	0.49%	1.80%
Blocked improvement	0%	0.31%	1.17%
Blocked switching	0%	0.12%	0.48%
Skill level	0.0933	0.0944	0.1020
Training 5-years	0.0247	0.0270	0.0330
Training 10-years	0.0290	0.0310	0.0366
Training 15-years	0.0299	0.0315	0.0368
Training 20-years	0.0290	0.0303	0.0350