

The Long-Term Decline of the U.S. Job Ladder

Niklas Engbom, New York University & NBER

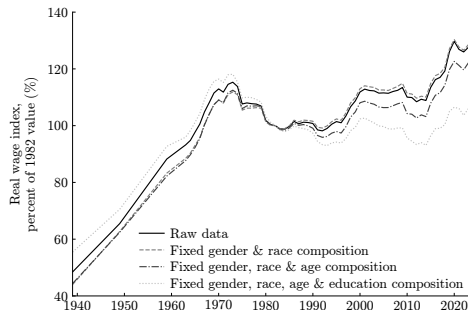
Aniket Baksy, University of Melbourne

Daniele Caratelli

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What Has Caused Wages to Stagnate over the Past 40 Years?

Real Wage Index, 1939–2023



- A vast literature highlights several factors
 - Techn. change (e.g. Acemoglu & Restrepo, '20)
 - Globalization (e.g. Autor, Dorn & Hanson, '13)
 - Institutional (e.g. Autor, Manning & Smith, '16)
- Less attention paid to labor market structure
- Mobility toward higher paying jobs is a critical determinant of individual wage growth
 - e.g. Topel & Ward (1991)

The Structure of the U.S. Labor Market & Wage Stagnation

We quantify how structural changes have reduced wage growth by weakening the job ladder

1. The arrival rate of better-paying outside offers halved from the 1980s to the 2010s
 - CPS microdata, 1982–2023, interpreted through a job-ladder model
2. The data suggest that the decline stems from less efficient search in employment
 - Not primarily from aggregate matching efficiency, labor demand or worker acceptance
 - State-level variation links this to increases in employer concentration and noncompetes
3. Changes in LM structure explain 1/3 of post-1980 slowdown
 - Burdett & Mortensen (1998) wage posting model predicts response of offered pay
 - Of 0.68 p.p. decline in annual wage growth, 2/3rd due to firms' equilibrium response

Theory

A Partial Equilibrium Job Ladder Model

► active reservation wage

► extension with age

- A unit mass of workers move in and out of employment & across jobs; earn log wage

$$W = \underbrace{\mathbf{X}}_{\text{gender, race, education, state, occupation}} + \underbrace{h(a)}_{\text{human capital via age/experience}} + \underbrace{w}_{\text{residual piece rate}}$$

- When not employed, a worker receives job offers at rate p
 - A job is a piece rate w drawn from the **offer distribution $F(w)$**
 - We assume that parameters are such that the non-employed accept all offers
- When employed, she earns the wage w until one of three events happens
 - **Directed outside offers** at rate λ^e with a wage from $F(w)$ that she may accept
 - **Undirected outside offers** at rate λ^f with a wage from $F(w)$ that she always accepts
 - **Job loss** at rate δ lead to exit from employment

Law of Motion for the Wage Distribution

- Let $G(w)$ be the wage distribution and n the non-employment rate

$$0 = - \underbrace{(\delta + \lambda^f)G(w)}_{\text{job loss+undirected offer}} - \underbrace{\lambda^e(1 - F(w))G(w)}_{\text{directed outside offers}} + \underbrace{pF(w)\frac{n}{1-n}}_{\text{hires from non-empl.}} + \underbrace{\lambda^f F(w)}_{\text{undirected offer}}$$

- The wage distribution is a function of the offer distribution and net upward mobility

$$G(w) = \frac{F(w)}{1 + \underbrace{\kappa}_{\text{net upward mobility rate}}(1 - F(w))}, \quad \equiv \frac{\lambda^e}{\delta + \lambda^f}$$

- Net upward mobility rate, $\kappa = \#$ of directed outside offers between two separation events
- Greater upward mobility $\Rightarrow$ faster wage growth $\Rightarrow$ larger gap btw offer & wage distributions

Data

Non-Parametric Estimates of the Wage and Offer Distributions

- CPS microdata on employment status and wages from January 1982 to March 2023
- Project log hourly wages on observables separately by year

$$\ln W_{it} = \underbrace{\alpha_{ry}}_{\text{race}} + \underbrace{\alpha_{gy}}_{\text{gender}} + \underbrace{\alpha_{ey}}_{\text{education}} + \underbrace{\alpha_{sy}}_{\text{state}} + \underbrace{\alpha_{oy}}_{\text{occupation}} + \underbrace{\alpha_{my}}_{\text{survey month}} + \tilde{w}_{it}$$

and express relative to hires from non-employment of the same age ► microfoundation

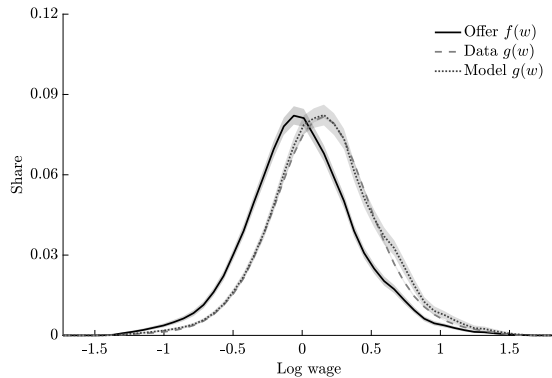
$$w_{it} = \tilde{w}_{it} - \underbrace{\overline{\tilde{w}}_{a(i,t)t}}_{\text{average residual wage of hires from non-employment}}$$

- Estimate $G(w)$ and $F(w)$ non-parametrically
 - **Wage distribution $G(w)$** : relative wages among all workers
 - **Offer distribution $F(w)$** : among those who were non-employed in the previous month

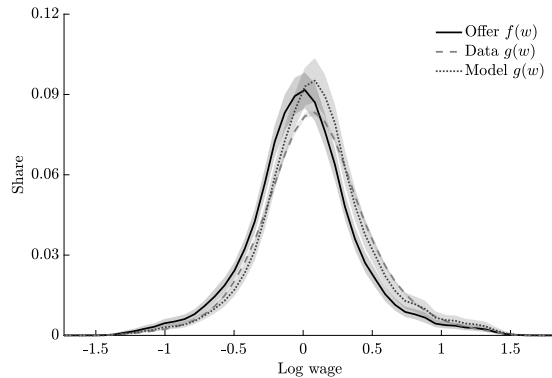
The Long-term Decline of the U.S. Job Ladder

Wage & Offer Distributions By Decade

► overidentifying test



(a) 1980s



(b) 2010s

The Decline Mainly Reflects Fewer Discretionary Offers

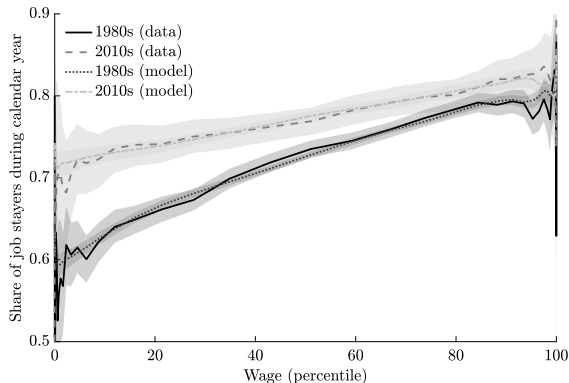
[▶ demographic groups](#)[▶ extensions](#)

	δ	ρ	κ	ν	λ^f	λ^e
1980s	0.007 (0.000)	0.020 (0.000)	1.083 (0.023)	0.097 (0.005)	0.016 (0.000)	0.025 (0.001)
1990s	0.007 (0.000)	0.020 (0.000)	0.842 (0.027)	0.134 (0.009)	0.016 (0.000)	0.020 (0.001)
2000s	0.008 (0.000)	0.018 (0.000)	0.753 (0.030)	0.174 (0.013)	0.014 (0.000)	0.016 (0.001)
2010s	0.008 (0.000)	0.018 (0.000)	0.528 (0.036)	0.216 (0.017)	0.017 (0.001)	0.013 (0.001)

Net upward mobility roughly halves, driven primarily by fewer voluntary offers

Support I: More Job Stayers, In Particular at Bottom of Wage Distribution

- The share of job stayers has risen
 - Lower δ ? No ▶ EN rate
- Could reflect lower λ^f or lower λ^e
 - Look at share of stayers by wage
 - Lower $\lambda^f \rightarrow$ more stayers everywhere
- Rising share of workers “stuck” at low wages is consistent with falling λ^e



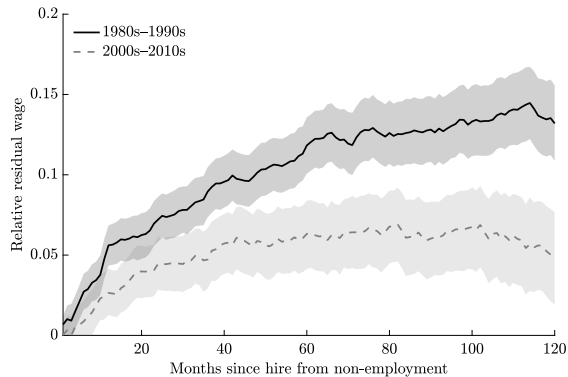
Share of 12-Month Job Stayers by Wage

Support II: Direct Evidence of a Decline in Upward Job Mobility from NLSY

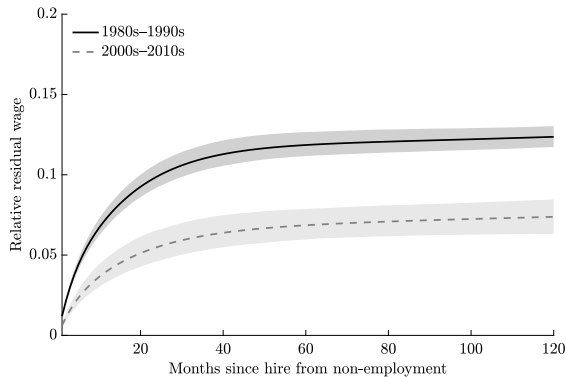
- Use data on employment *and* wage dynamics from the NLSY 1979 and 1997
- Residualize off person FEs, deflate with residual wage of hire from non-empl. of that age
- Follow workers for up to 120 months after a spell of non-employment

$$\begin{aligned}\bar{w}_t = & \sum_{\tau=1}^t \left\{ \text{stayer}_{\tau} \Delta w_{\tau}^{\text{stayer}} + \text{mover}_{\tau} \Delta w_{\tau}^{\text{mover}} \right. \\ & + \text{hire}_{\tau} \Delta w_{\tau}^{\text{hire}} + \text{separator}_{\tau} \Delta w_{\tau}^{\text{separator}} \\ & \left. + \text{from missing}_{\tau} \Delta w_{\tau}^{\text{from missing}} + \text{to missing}_{\tau} \Delta w_{\tau}^{\text{to missing}} \right\}\end{aligned}$$

Support II: Direct Evidence of a Decline in Upward Job Mobility from NLSY



(a) Data



(b) Model

Fewer Moves and Smaller Conditional Wage Gains

	1980s–1990s		2000s–2010s		Change	
	Model	Data	Model	Data	Model	Data
$\bar{w}_{120} - \bar{w}_1$	0.074 (0.002)	0.109 (0.010)	0.047 (0.004)	0.048 (0.012)	-0.027 (0.005)	-0.061 (0.016)
Δw^{stayer}	-0.002 (0.000)	-0.000 (0.000)	-0.002 (0.001)	-0.001 (0.000)	0.000 (0.001)	-0.000 (0.000)
Share movers	0.020 (0.000)	0.022 (0.000)	0.019 (0.001)	0.018 (0.000)	-0.001 (0.001)	-0.004 (0.001)
Δw^{mover}	0.135 (0.015)	0.099 (0.005)	0.108 (0.020)	0.081 (0.009)	-0.027 (0.024)	-0.018 (0.011)

Causes of the Decline of the U.S. Job Ladder

Endogenizing the Job Finding Rates

- Incorporating an aggregate matching function

$$\underbrace{\hat{p}}_{\text{true job-finding rate}} = \underbrace{\chi}_{\text{matching efficiency}} \times \frac{1}{S} \times \mathcal{M}\left(\underbrace{V}_{\text{vacancies}}, \underbrace{S}_{\text{searching workers}}\right)$$

Endogenizing the Job Finding Rates

- Incorporating an aggregate matching function and an active reservation wage r

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$$\underbrace{p}_{\text{small decline}} = \underbrace{\hat{p}}_{\text{true job-finding rate}} \times \underbrace{(1 - \hat{F}(r))}_{\text{acceptance rate}}$$

$$\underbrace{\lambda^e}_{\text{large decline}} = \underbrace{\phi^e}_{\text{search efficiency of employed}} \times \underbrace{\hat{p}}_{\text{true job-finding rate}} \times \underbrace{(1 - \hat{F}(r))}_{\text{acceptance rate}}$$

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- **Reservation wage**, matching efficiency, labor demand affect p and λ^e proportionally

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- Reservation wage, matching efficiency, labor demand affect p and λ^e proportionally
- Large fall in λ^e , small fall in p suggests decline in **efficiency of employed search**

- Recent literature: the efficiency of on-the-job search may be negatively impacted by
 - Increased employer concentration (Bagga, 2023; Berger et al, 2023)
 - Rising use of noncompete agreements (Lipsitz and Starr, 2022; Gottfries and Jarosch, 2023)
- Re-estimate the model at state-decade level to obtain $(\delta_{sp}, p_{sp}, \lambda_{sp}^f, \kappa_{sp})$
- Project long-difference on prevalence of non-competes & change in employer concentration

$$\Delta\phi_s^e = \beta_0 + \beta_1\Delta concentration_s + \beta_2 noncompete_s + \varepsilon_s.$$

	κ	λ^e	p	ϕ^e
Employment share of 100+ estab.	-2.207** (1.073)	-0.061*** (0.023)	0.017*** (0.006)	-3.031*** (1.170)
Share of workers with non-compete	-1.776* (0.976)	-0.032 (0.021)	0.007 (0.006)	-1.809* (1.064)

Consequences of the Decline of the U.S. Job Ladder

Endogenizing the Offer Distribution

So far, offer distribution is given $\implies$ now endogenize following Burdett & Mortensen (1998)

- Unit mass of ex ante homogenous workers maximize lifetime income discounted at rate ρ
- Nonemployed workers follow a reservation rule, accepting only offers paying $w \geq r$

$$r = b + (p - \lambda^e - \lambda^f) \int_r^{\bar{w}} \frac{1 - F(w)}{\rho + \delta + \lambda^f + \lambda^e(1 - F(w))} dw$$

- Let $w_0 = \max\{r, \underline{w}\}$ be the maximum of the reservation wage and a potential minimum wage

Firms' Problem

- Firms differ in productivity z , distributed according to CDF $\Gamma(z)$ over $[\underline{z}, \bar{z}]$
- Set wages to maximize flow profit

$$\max_{w \geq w_0} \left(\underbrace{z + H(w) - w}_{\text{profit per worker}} \right) \underbrace{l(w)}_{\text{size given wage}}$$

- $H(\cdot)$ captures efficiency gains from higher pay
- Higher pay $\implies$ lower profits per worker, but larger workforce

The Impact of Lower Efficiency of On-the-Job Search on Offered Wages

Lower efficiency of on-the-job search affects offered wages through two channels

1. The competition channel

- Fewer outside offers reduce quit risk and firms' incentive to pay more to attract and retain workers

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- **McCall:** $\downarrow \phi^e \implies \uparrow \text{option value of search} \implies \uparrow r \implies \text{upward pressure on offered wages}$

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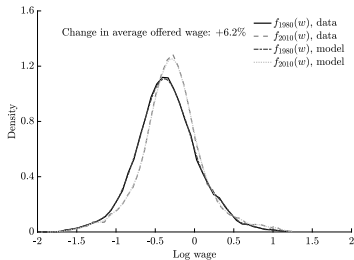
- **McCall:** $\downarrow \phi^e \implies \uparrow \text{option value of search} \implies \uparrow r \implies \text{upward pressure on offered wages}$
- **Diamond:** $\downarrow \phi^e \implies \text{less wage dispersion} \implies \downarrow r \implies \text{downward pressure on offered wages}$

The reservation effect is ambiguous and affects offers only if the reservation wage binds.

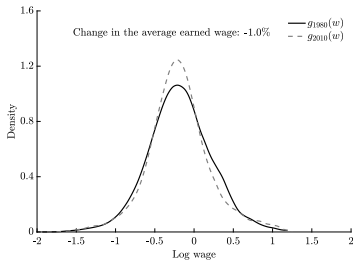
Estimating the Remaining GE Parameters

[details](#)

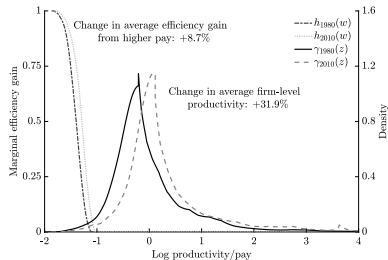
- We estimate the remaining GE parameters decade-by-decade by inverting the model
 - Observed offer distribution implies a particular firm productivity distribution
- There exists a productivity distribution $\Gamma(\mathbf{z})$ that rationalizes $\mathbf{F}(\mathbf{w})$ every decade



(a) Offer Distributions, Model vs Data



(b) Wage Distributions, Model



(c) Efficiency Pay and Productivity

The Sources of Real Wage Stagnation

Consider the following counterfactual exercises

1. Let aggregate TFP A_d follow its estimated path while holding fixed
 - (a) The efficiency-pay schedule and productivity distribution, $(\Psi_{1980}(w - w_0), \gamma_{1980}(z))$
 - (b) The parameters governing the lowest admissible wage, $(\underline{w}_{1980}, b_{1980}, \tau_{1980})$
 - (c) The labor-market structure $(\delta_{1980}, p_{1980}, \kappa_{1980}, \lambda_{1980}^f)$

2. Then let also the structure of the labor market $(\delta_d, p_d, \kappa_d, \lambda_d^f)$ evolve as estimated
 - Still holding fixed $(\Psi_{1980}(w - w_0), \gamma_{1980}(z))$ and $(\underline{w}_{1980}, b_{1980}, \tau_{1980})$

The Sources of Real Wage Stagnation

- **Changes to TFP** (automation, globalization, etc): $\approx$ half of wage stagnation

Realized annual wage growth between 1940 and 1970	2.08
Realized annual wage growth between 1980s and 2010s	0.07

	Log	Linear
Changing TFP only		1.16

The Sources of Real Wage Stagnation

- **Changes to TFP** (automation, globalization, etc): $\approx$ half of wage stagnation
- **Changes to LM structure**: $\approx$ 1/3rd of stagnation from 1st to 2nd half of post-WWII period

Realized annual wage growth between 1940 and 1970	2.08	
Realized annual wage growth between 1980s and 2010s	0.07	
	Log	Linear
Changing TFP only	1.16	
Changing TFP and labor market structure ($\delta, p, \kappa, \lambda^f$)		
Binding minimum wage	0.45	
Binding reservation wage with fixed flow value of leisure	0.67	0.97
Binding reservation wage with fixed replacement rate	0.48	0.73

Changing structure reduces annual wage growth by $1.16 - 0.48 = 0.68$ percentage points.

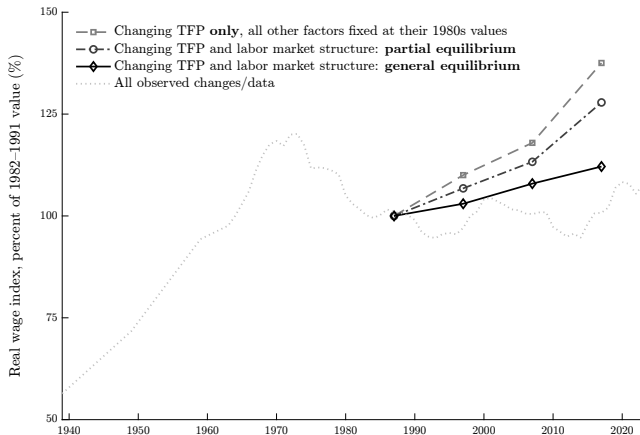
Firms' Wage Responses Account for Most of the Effect

► state-level

Wages are lower since workers

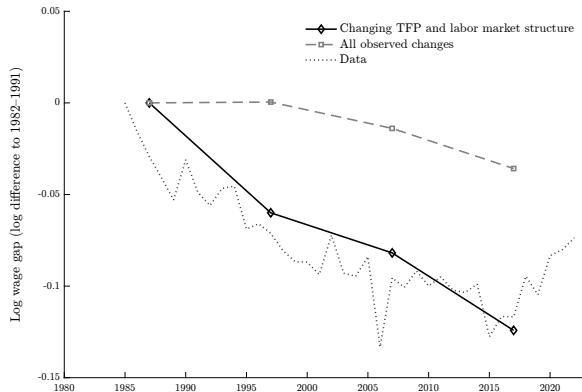
1. Move up the job ladder less:
smaller $F(w)$ - $G(w)$ gap
2. Firms post lower wages:
 $F(w)$ shifts to the left

GE effect is 2/3rd of total



The Declining Firm-Size Pay Premium

- High-prod firms particularly lower pay
- Leads to falling firm-size pay premium
- Consistent with decline in the U.S.



Conclusion

The Structure of the U.S. Labor Market & Wage Stagnation

We quantify how structural changes have led to wage stagnation by weakening the job ladder

- The arrival rate of better-paying outside offers halved since the 1980s
- Declining efficiency of on-the-job search linked to higher concentration & noncompetes
- Between 1980s and 2010s, these changes have:
 1. Reduced annual real wage growth by 0.68 p.p (1/3rd of the post-1980 slowdown)
 2. 2/3rd operating through equilibrium wage setting rather than mechanical reallocation
 3. Consistent with a decline in the firm size wage premium

Appendix

The Offer and Wage Distributions

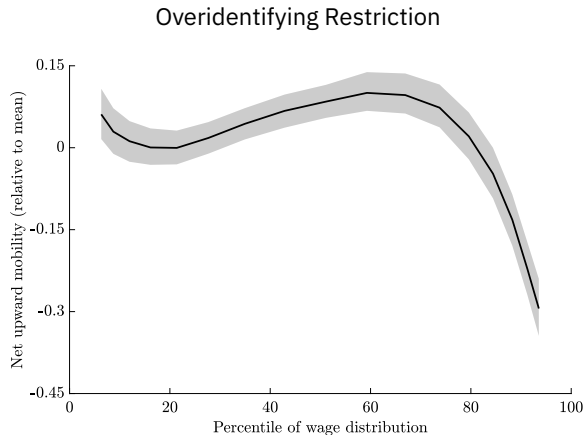
- Recent hires from non-employment earn less than their otherwise identical peers

⇒ Consistent with upward job mobility

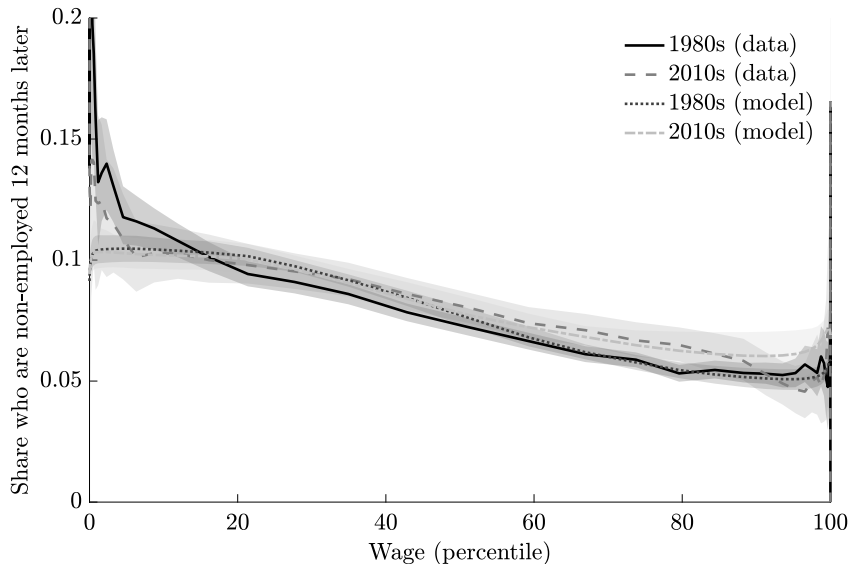
- An infinite number of equations identify κ

$$\kappa^r(w) = \frac{F(w) - G(w)}{G(w)(1 - F(w))}$$

⇒ Canonical model is rejected



Employment-to-Nonemployment (EN) Rate by Wage

[▶ back](#)

Workers enter non-employed with human capital $h(0) = 0$ and retire at age $\bar{A}$

- Log wage of worker i at age a :

$$\underbrace{W(i, t)}_{\text{wage}} = \underbrace{X(i, t)}_{\text{gender, race, education, occupation, state}} + \underbrace{h(a)}_{\text{human capital evolves flexibly with age } a} + \underbrace{r}_{\text{piece rate offered by firm}}$$

- Non-employed workers contact open jobs at rate $\hat{p}$
 - Each job associated with a draw of a piece rate from $\hat{F}(r)$; accept jobs with $r \geq \hat{R}$
- Employed workers subject to three type of events
 - Job loss** at rate $\hat{\delta} \implies$ non-employment
 - Directed outside offer** from $\hat{F}(r)$ at rate $\phi^e \hat{p} \implies$ accepted if pays better
 - Undirected outside offer** from $\hat{F}(r)$ at rate $\phi^f \hat{p} \implies$ accepted regardless of pay

Let $n(a)$ be the non-employment rate at age a and $\hat{x}(r, a)$ the distribution over piece rates:

$$\begin{aligned}
 0 = & \underbrace{- \frac{\partial}{\partial a} ((1 - n(a)) \hat{x}(r, a))}_{\text{aging}} - \underbrace{\left(\hat{\delta} + \phi^f \hat{p} + \phi^e \hat{p} (1 - \hat{F}(r)) \right) (1 - n(a)) \hat{x}(r, a)}_{\text{outflows: job loss, undirected JJ, directed JJ}} \\
 & + \underbrace{\hat{f}(r) \hat{p} n(a)}_{\text{hires from nonemployment}} + \underbrace{\hat{f}(r) \phi^f \hat{p} (1 - n(a))}_{\text{inflows from undirected JJ}} + \underbrace{\hat{f}(r) \phi^e \hat{p} (1 - n(a)) \int_{\hat{R}}^r \hat{x}(u, a) du}_{\text{inflows from directed JJ from lower } r}.
 \end{aligned}$$

subject to $\lim_{a \rightarrow 0} \hat{x}(r, a) = \hat{f}(r)$ for all r , and $\int_{\hat{R}}^{\infty} \hat{x}(r, a) dr = 1$ for all a .

$$\underbrace{w}_{\text{relative wage}} = \hat{w}(i, a) - \underbrace{\bar{w}^h(a)}_{\text{average wage of hire from non-employment}},$$

$$\underbrace{F(w)}_{\text{distribution of truncated offered relative wages}} = \frac{\hat{F}(w + \bar{r}) - \hat{F}(\hat{R})}{1 - \hat{F}(\hat{R})},$$

$$\underbrace{p}_{\text{effective JFR of non-employed}} = \hat{p}(1 - \hat{F}(\hat{R})),$$

$$\underbrace{\delta}_{\text{effective separation rate}} = \hat{\delta} + \phi^f \hat{p} \hat{F}(\hat{R}),$$

$$\underbrace{\lambda^f}_{\text{effective undirected offer rate}} = \phi^f \hat{p}(1 - \hat{F}(\hat{R})),$$

$$\underbrace{\lambda^e}_{\text{effective directed offer rate}} = \phi^e \hat{p}(1 - \hat{F}(\hat{R}))$$

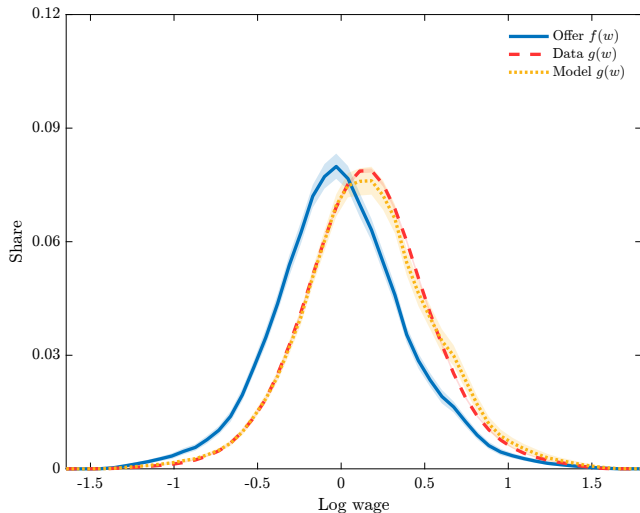
The Distribution of Relative Wages

- Let $G_{\bar{A}}(w)$ be the overall share of employed **workers earning less than relative wage w**
- In paper: $G_{\bar{A}}(w)$ depends on $F(w)$, a **key ratio of parameters κ** , and a **finite-life adjustment**

$$G_{\bar{A}}(w) = \frac{F(w)}{1 + \underbrace{\kappa}_{\text{net upward mobility rate}}(1 - F(w))} \left(1 + C_{\bar{A}}(w)\right), \quad \text{where} \quad \lim_{\bar{A} \rightarrow \infty} C_{\bar{A}}(w) = 0$$
$$= \frac{\lambda^e}{\underbrace{\delta + \lambda^f}_{\text{\# of directed offers between 2 events that set workers back}}}$$

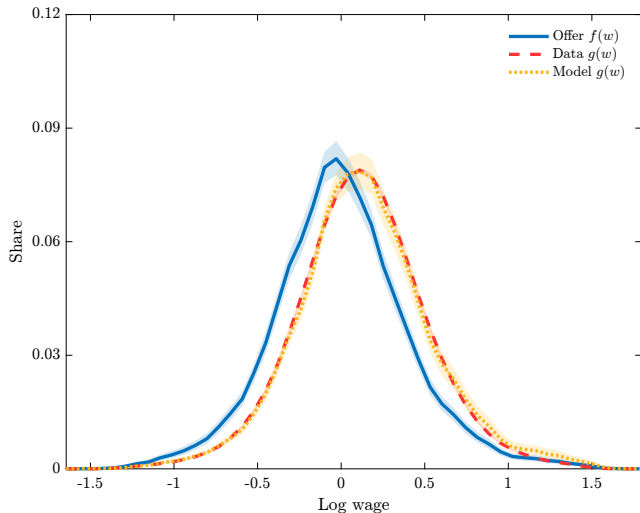
- Faster upward mobility $\implies$ greater wage growth $\implies$ larger gap btw offer & wage distr.

Moments by Decade: 1980s

[▶ back](#)

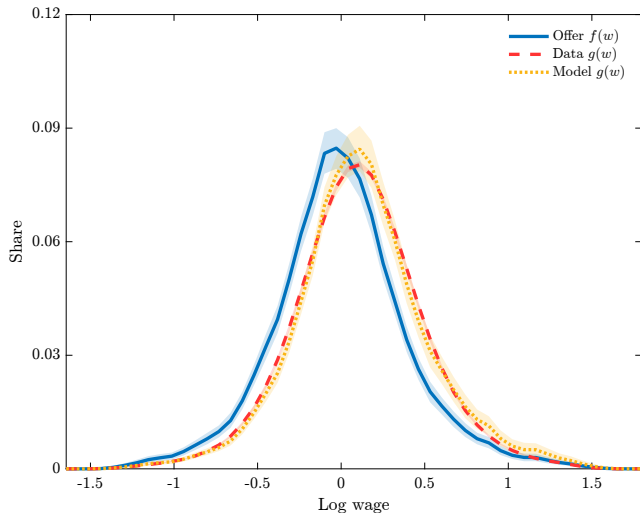
	Data	Model
EN rate	0.074 (0.000)	0.074 (0.000)
NE rate	0.203 (0.001)	0.203 (0.001)
Stayer	0.741 (0.001)	0.741 (0.001)

Moments by Decade: 1990s

[▶ back](#)

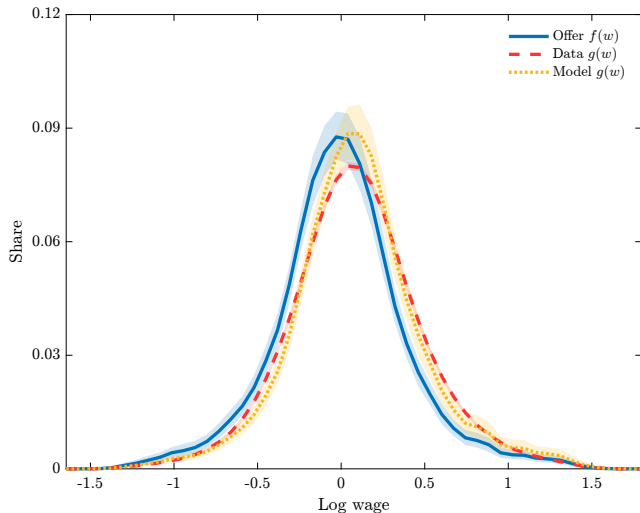
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EN rate	0.074 (0.000)	0.074 (0.000)
NE rate	0.209 (0.001)	0.209 (0.001)
Stayer	0.759 (0.002)	0.759 (0.002)

Moments by Decade: 2000s

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	Data	Model
EN rate	0.079 (0.000)	0.079 (0.000)
NE rate	0.190 (0.001)	0.190 (0.001)
Stayer	0.789 (0.001)	0.789 (0.001)

Moments by Decade: 2010s

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	Data	Model
EN rate	0.081 (0.000)	0.081 (0.000)
NE rate	0.189 (0.001)	0.189 (0.001)
Stayer	0.785 (0.002)	0.785 (0.002)

Net Upward Mobility by Demographic Subgroups

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Decade	Gender		Education		Race		Age	
	Men	Women	No college	College	White	Non-white	Young	All ages
1980s	1.150 (0.036)	1.023 (0.028)	1.026 (0.024)	1.557 (0.072)	1.077 (0.024)	1.099 (0.057)	1.286 (0.035)	1.083 (0.027)
1990s	0.979 (0.040)	0.739 (0.034)	0.833 (0.029)	1.090 (0.062)	0.872 (0.029)	0.725 (0.057)	0.894 (0.037)	0.842 (0.031)
2000s	0.811 (0.042)	0.710 (0.043)	0.750 (0.034)	1.018 (0.060)	0.816 (0.034)	0.497 (0.058)	0.768 (0.045)	0.753 (0.035)
2010s	0.730 (0.060)	0.415 (0.042)	0.521 (0.041)	0.856 (0.060)	0.560 (0.042)	0.423 (0.072)	0.482 (0.049)	0.528 (0.042)

1. On-the-job wage dynamics

$$dw(t) = \theta (\hat{\mu} - w(t)) dt + dJ(t), \quad J(t) = \sum_{n=1}^{N(t)} Y_n, \quad N(t) \sim \text{Poisson}(\Lambda t),$$

where $\hat{\mu} = \int w f(w) dw + \mu$ and Y_n are i.i.d., symmetric around zero, with Pareto tail.

2. Recall unemployment & employment status misclassification with probability ε

$$\hat{f}(w) = \frac{npf(w) + (1-n)\varepsilon g(w)}{np + (1-n)\varepsilon}.$$

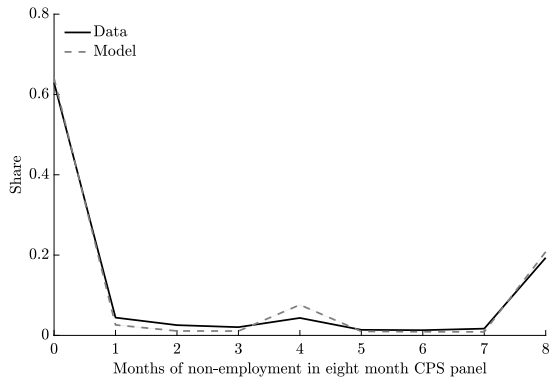
3. Unobserved types differ in incidence of non-employment (δ^k) and offered wages $F^k(w)$

$$f(w) = \frac{n^1}{n} f^1(w) + \frac{n^2}{n} f^2(w).$$

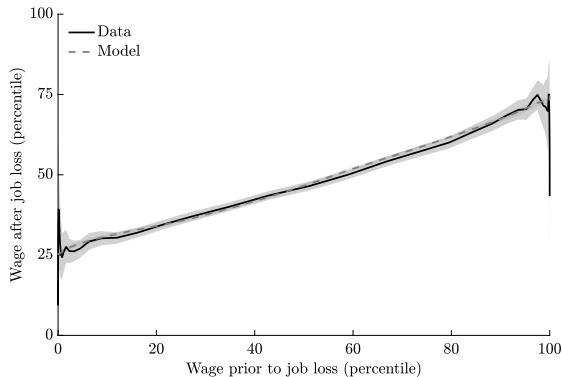
We Continue to Estimate a Large Decline in Upward Mobility

Parameter	Explanation	1980s	1990s	2000s	2010s
ρ	Job finding rate of nonemployed	0.019 (0.000)	0.021 (0.000)	0.018 (0.000)	0.018 (0.001)
δ^1	Separation rate of low type	0.013 (0.001)	0.011 (0.001)	0.014 (0.002)	0.015 (0.006)
δ^2	Separation rate of high type	0.004 (0.000)	0.004 (0.000)	0.004 (0.001)	0.004 (0.001)
κ	Net upward mobility rate	1.651 (0.176)	1.300 (0.208)	0.518 (0.147)	0.899 (0.197)
λ^f	Undirected mobility rate	0.012 (0.001)	0.014 (0.001)	0.016 (0.001)	0.014 (0.002)
μ	Wage growth on-the-job	0.012 (0.030)	0.011 (0.026)	0.004 (0.025)	-0.046 (0.034)
ϵ	Employment status misclassification	0.003 (0.000)	0.003 (0.000)	0.002 (0.000)	0.003 (0.001)

Evidence of Unobserved Heterogeneity

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(a) Too many with a few months of employment

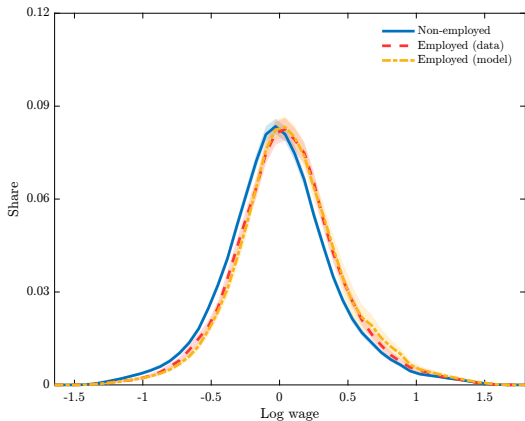


(b) Job loss is not a complete wage reset

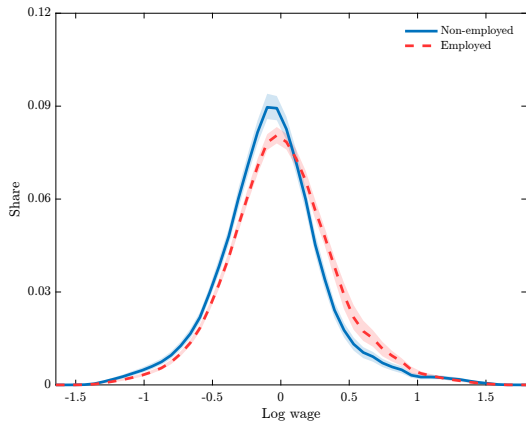
The Offer Distribution of the Employed

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- Model matches well observed wages of hires from **employment**
- No causal effect of status on sampled offers, yet employed sample better offers

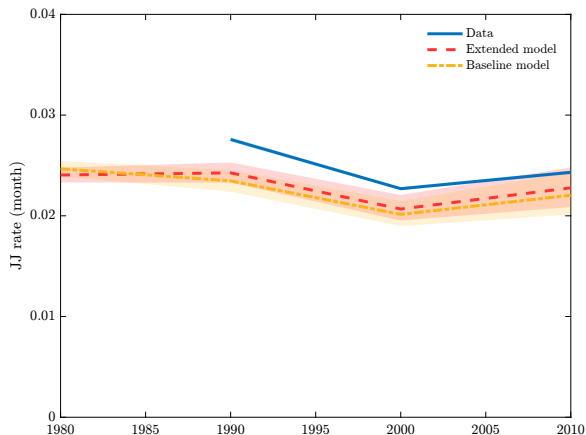


(a) Wages of Hires from Employment



(b) Offer Distribution of Non-employed and Employed

- Can get JJ rate in CPS since 1994
- Model understates somewhat the data
- But matches well the trend



- Several factors could have reduced the efficiency of on-the-job search
 1. Homeowners may be unwilling to move with a higher mortgage rate (Chan, 2001)
 2. Mobility may be more difficult for dual-career households (Costa and Kahn, 2000)
- If these forces have become more acute or shifts in composition may account for decline
- Estimate the model separately for owners/renters and single/dual career households

	Pooled sample	House lock		Dual career lock	
		Renter	Owner	Single	Dual
ϕ^e (1980s)	1.268 (0.027)	1.133 (0.020)	1.324 (0.010)	1.211 (0.008)	1.308 (0.010)
$\Delta\phi^e$ (% change 1980s–2010s)	-44.7 (4.1)	-70.0 (2.6)	-42.2 (1.6)	-53.8 (1.0)	-34.4 (2.0)

- 1 st.d. increase in the empl. share of 100+ establishments = 10% fall in λ^e
 - Berger et al (2023): 1 st.d. increase in concentration = 10% fall in job-to-job mobility
- Reducing non-compete coverage from 12 percent to zero = increase in λ^e of $\approx 15\%$
 - Lipsitz & Starr (2022): Oregon ban on non-competes raised job-to-job mobility by 12–18%
- At national level, log average establishment size increased by about 0.08 while 13 percent of workers report being covered by a non-compete agreement

$$0.08 \times 1.20 + 0.13 \times 1.83 \approx 0.33$$

This corresponds to about 60% of the decline in λ^e between 1980s and 2010s

- **PE channel:** Holding fixed $w(z)$, a lower ϕ^e implies a higher foregone option value of search

$$\left. \frac{\partial r}{\partial \phi^e} \right|_{w(z) \text{ fixed}} = - \underbrace{\frac{a\kappa \int_r^{\bar{z}} \left(\frac{1 - \Gamma(z)}{1 + \kappa(1 - \Gamma(z))} \right)^2 dz}{1 + a(1 - \phi^e - \phi^f) \kappa \left(\frac{1 - \Gamma(r)}{1 + \kappa(1 - \Gamma(r))} \right)^2}}_{\text{under typical parametrizations: } < 0}$$

- **GE channel:** Firms converge toward offering r —no option value of waiting

$$\left. \frac{\partial r}{\partial \phi^e} \right|_{w(z) \text{ only}} = \underbrace{\frac{1}{\frac{1}{a(1 - \phi^e - \phi^f)} + \kappa \left(\frac{1 - \Gamma(r)}{1 + \kappa(1 - \Gamma(r))} \right)^2} \int_r^{\bar{z}} \frac{(1 - \Gamma(z))^2 (1 - \kappa(1 - \Gamma(z)))}{(1 + \kappa(1 - \Gamma(z)))^3} dz}_{\text{under typical parametrizations: } > 0}$$

- Let $z(i)$ be firm i 's *relative* productivity, distributed according to $\gamma_d(z)$ with mean zero in logs
- Let A_d be an aggregate productivity shifter, so that firm i 's absolute productivity in decade d is

$$Z_d(i) = e^{A_d} z$$

- Let b_d and $\underline{w}_d$ be the relative flow value of nonemployment/minimum wage in decade d

$$B_d = e^{A_d} b_d, \quad \text{and} \quad \underline{W}_d = e^{A_d} \underline{w}_d$$

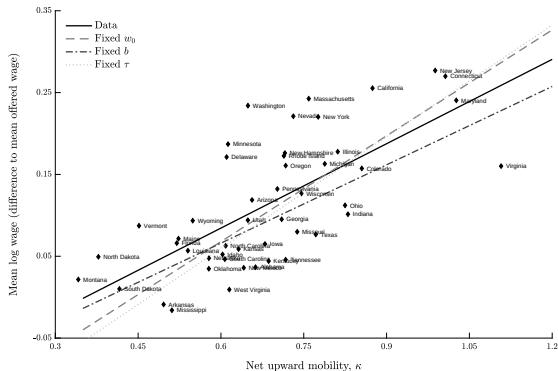
- Given $(\delta_d, p_d, \kappa_d, \lambda_d^f)$, we recover $(\gamma_d(z), \Phi_d(w - w_0), \underline{w}_d, b_d, \tau_d)$ to match offer distribution
- And A_d to match composition-adjusted real wages

- We first recover $(\Phi(w - w_0), \gamma(z), \underline{w}, b, \tau)$ using pooled data at the national level
- Holding fixed these objects, we feed in state-level estimates $(\delta_s, p_s, \kappa_s, \lambda_s^f)$
- We contrast predicted wages and offered wages with cross-state variation

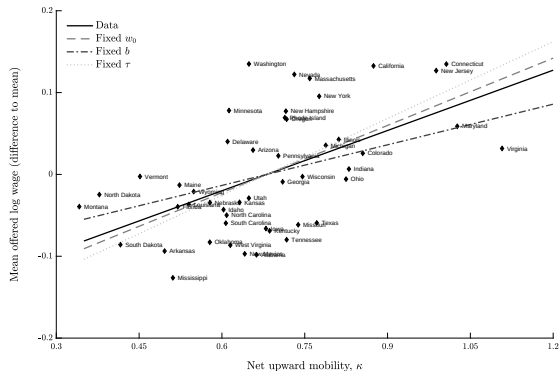
The Impact of Lower Efficiency of On-the-Job Search across Space

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Wages are higher in high- κ states, with $\approx 2/3$ rd due to higher offered wages



(a) Earned wages

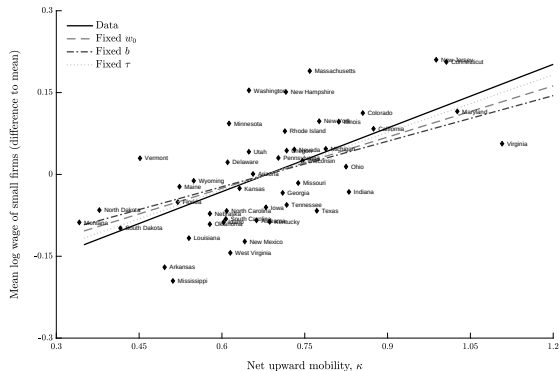


(b) Offered wages

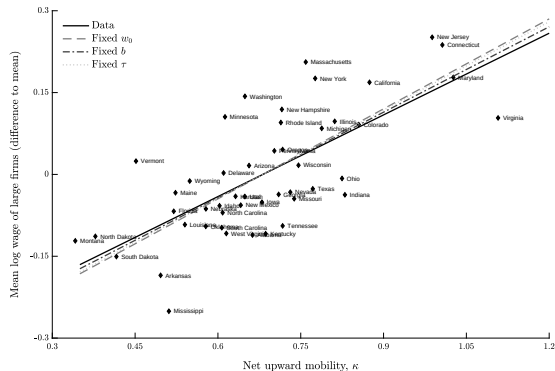
The Impact of Lower Efficiency of On-the-Job Search across Space

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High-productivity, high-paying, large firms in particular pay more in high- κ states



(a) Small firms (less than 500)



(b) Large firms (500 or more)