Winners and Losers: Competition, Creative Destruction, and Labor Income Risk

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Census Acknowledgment

The Census Bureau has reviewed this data product to ensure appropriate access, use, and disclosure avoidance protection of the confidential source data used to produce this product (Data Management System (DMS) number: P-7503840, Disclosure Review Board (DRB) approval numbers: CBDRB-FY23-SEHSD003-046, CBDRB-FY23-SEHSD003-073, CBDRB-FY25-0100.

Introduction

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1. Labor market has frictions.

   and

2. Markets are incomplete.

Preview of Results

1. Workers share asymmetrically in innovation gains and losses.
   - Profit passthrough: 0.14 (own firm) vs. 0.29 (competitors).
   - Higher-paid workers are most exposed.

2. A model with job-specific human capital explains this asymmetry.
   - Incumbents bear displacement losses but capture only part of the upside.

3. The type of innovation matters for worker welfare.
   - Internal innovation broadly benefits workers.
   - Faster creative destruction can hurt high earners, despite gains ex ante.

Related Literature

Growth and creative destruction

Aghion and Howitt (1992); Peters (2020)

- Worker earnings risk and welfare with labor market frictions.

Firm shocks and worker earnings

Guiso et al. (2005); Kline et al. (2019); Lamadon et al. (2022)

- Asymmetric exposure to own-firm and competitor innovation.

Earnings dynamics and displacement

Krebs (2007); Guvenen et al. (2021)

- Creative destruction generates downside risk, especially at the top.

Roadmap

1. A motivating model
2. Creative destruction and worker earnings
3. The quantitative model
4. Worker welfare and declining business dynamism

A Motivating Model

A Minimal Model

- Aggregate output produced by a continuum of different industries j

$$Y(t) = \exp \int_0^1 \log Y_{j,t} \, dj$$

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$$l^s(w) = w^{\frac{1}{\varepsilon}}$$

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  which leads to monopsony power.

Labor Demand and Wages

- Labor Demand (incorporates markup/markdown friction)

$$l_j(v,t) = \bar{A}^{1-\sigma} \left(\frac{Q_j(v,t)}{\bar{Q}_j(t)} \right)^{\sigma-1} \left[\frac{\sigma}{\sigma-1} w_j(v,t)(1+\varepsilon) \right]^{-\sigma}$$

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- Firm Profits:

$$\Delta \log \hat{\Pi}_j(v,t) = \left(1 + \frac{1}{\varepsilon}\right) \frac{\sigma-1}{\sigma+\frac{1}{\varepsilon}} \left(\underbrace{\Delta \log Q_j(v,t)}_{\text{Firm Innovation}} - \underbrace{\Delta \log \bar{Q}_j(t)}_{\text{Competitor Innovation}} \right).$$

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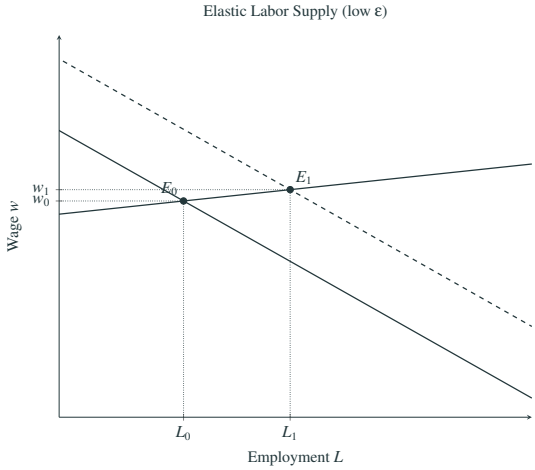
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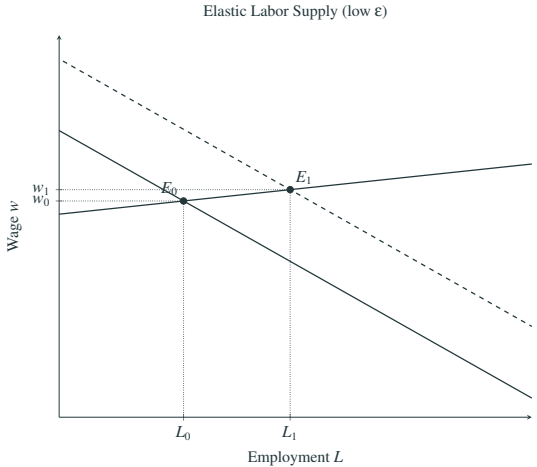
- Passthrough of Firm Profits to Worker Earnings:

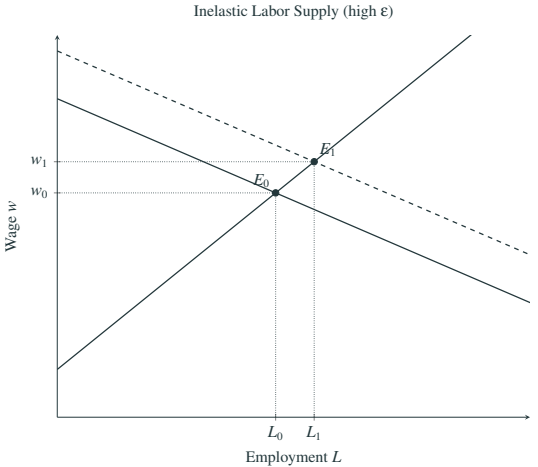
$$\frac{\partial\log w_f(v,t)}{\partial\log\hat{\Pi}_f(v,t)} = \left(1+\frac{1}{\varepsilon}\right)^{-1}$$

Degree of passthrough depends on labor supply elasticity



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Creative Destruction and Worker Earnings

Worker Earnings Data

Current Population Survey (CPS) $\leftrightarrow$ Employer-Employee Matched Earnings (SSA's DER).

- Period: 1980–2020.
- Sample: Aged 25 to 55; drop self-employed & individuals w/ earnings below a min threshold
- Match the CPS/DER sample to Compustat firms using Employer Identification Numbers (EIN).
- Final Sample:
  - Firm Panel: 12,500 firms and 132,000 firm years
  - Worker Panel: 9,700 firms, 780,000 people, and 5.6 million person years.

Summary Stats

Worker Earnings Data

- Construct age-adjusted earnings between periods t and $t+k$

$$w^i_{t,t+k} \equiv \log\left(\frac{\sum_{j=0}^{k} \text{W2 wage}_{i,t+j}}{\sum_{j=0}^{k} D(\text{age}_{i,t+j})}\right)$$

- Main outcome variable: growth in (cumulative) log earnings

$$Y_{i,t:t+h} \equiv w^i_{t+1,t+h} - w^i_{t-2,t}$$

Our specification emphasizes permanent income changes

Details

Creative Destruction and Firm vs Worker Outcomes

Measure degree of technological innovation using patents & their economic value:

- Kogan, Papanikolaou, Seru, and Stoffman (QJE, 2017)

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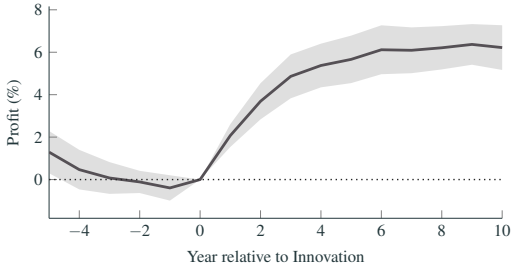
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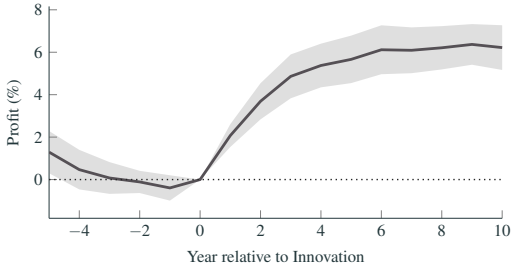
$$\text{Competitor Innovation:} \qquad A_{I\setminus f,t} = \frac{\sum_{f' \in I\setminus f} \left(\sum_{j \in P_{f',t}} \text{Value of Patent}_j \right)}{\sum_{f' \in I\setminus f} K_{f't}}$$

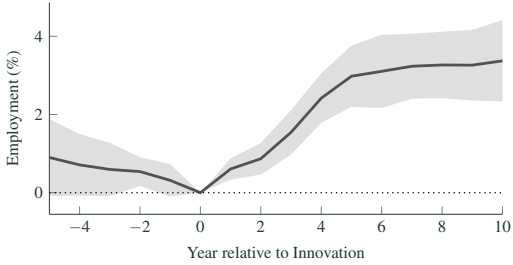
where I denotes firm f's SIC3 industry

Response to Own Firm Innovation: Firm Outcomes

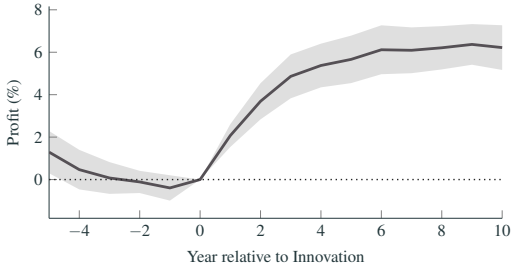


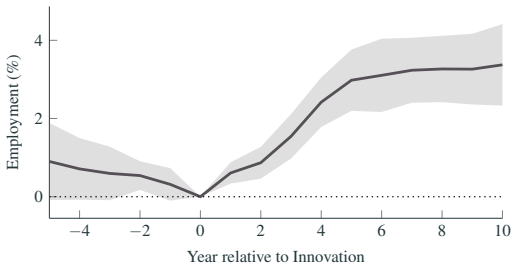
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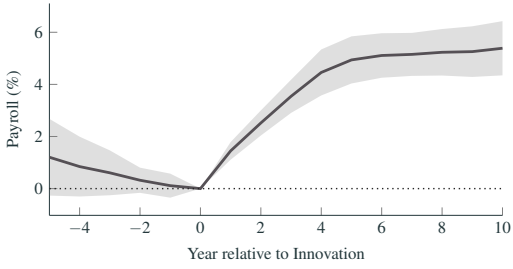




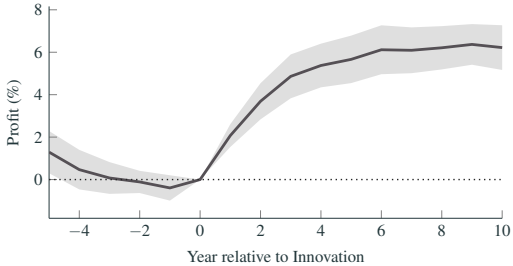
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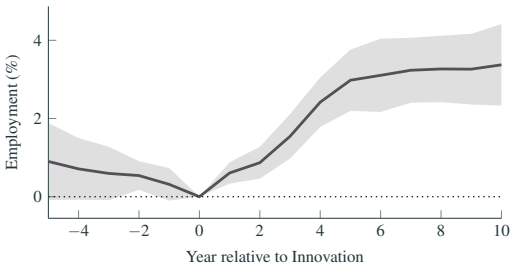


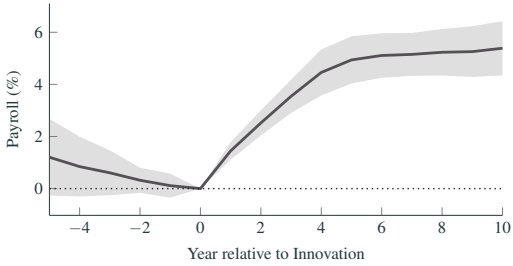


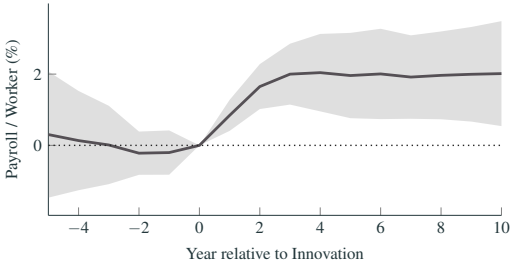


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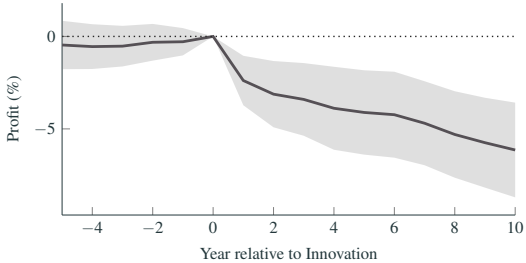




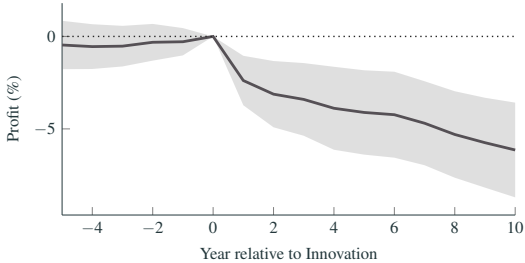


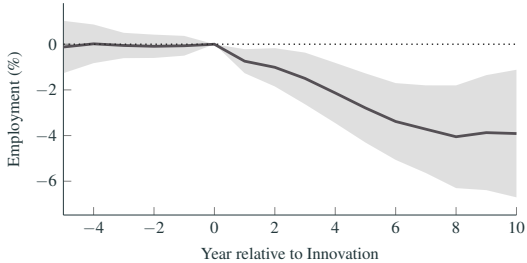


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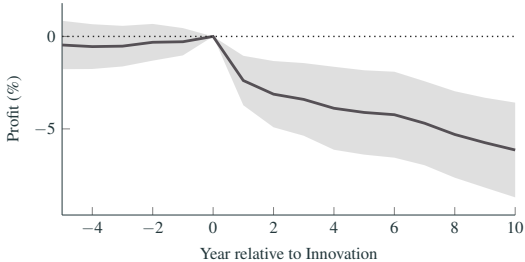


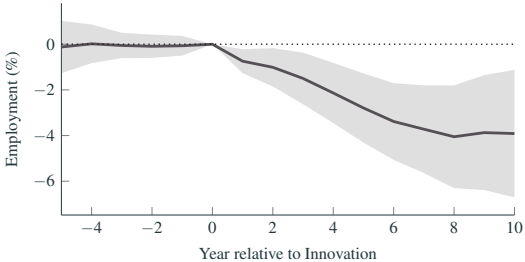
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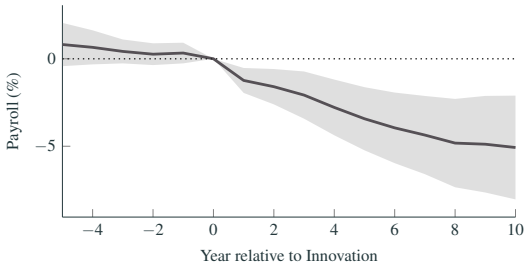




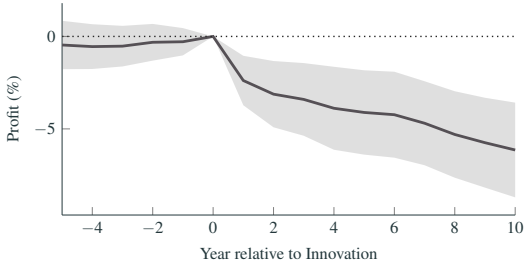
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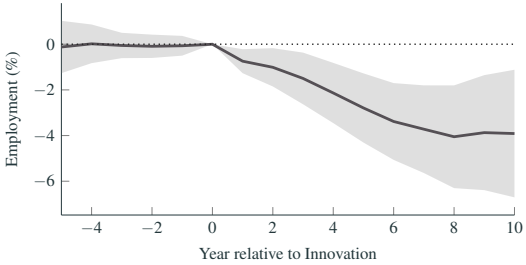


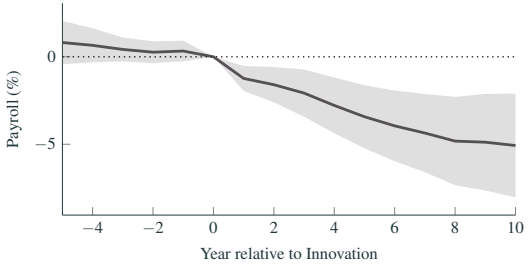


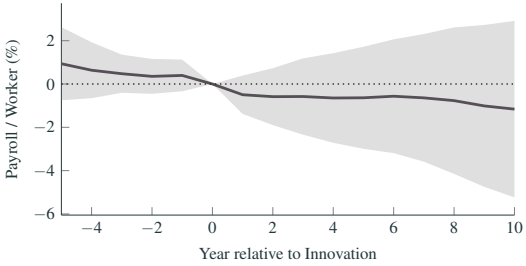


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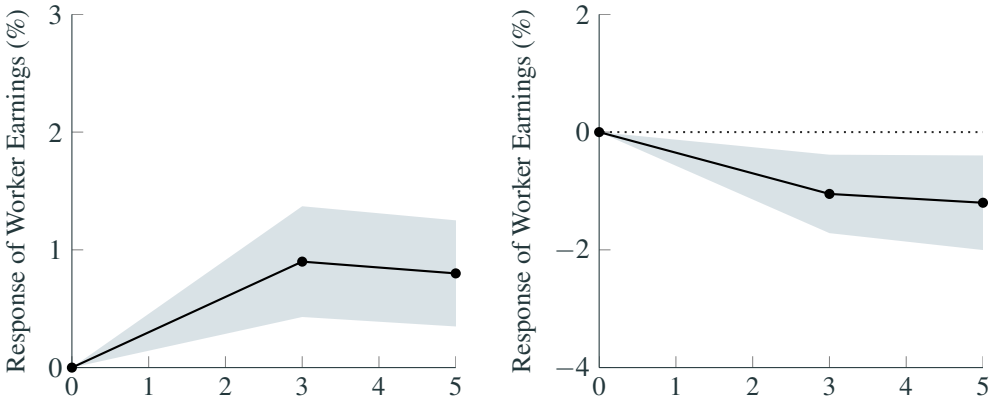






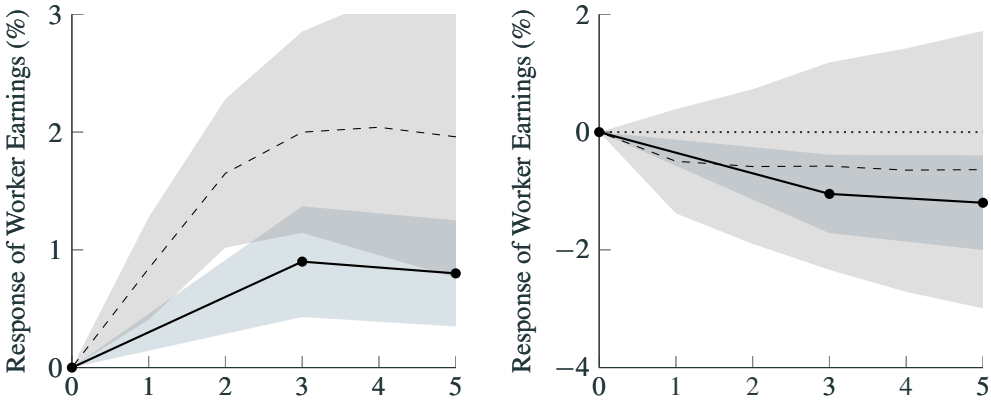


Worker Outcomes



Solid: (Incumbent) Worker Outcomes

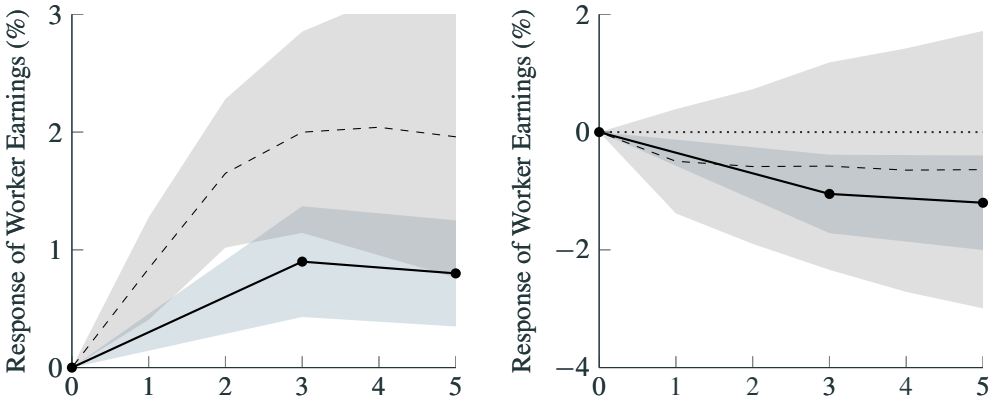
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Placebo tests: future innovation and current earnings growth

Firm Profitability, Worker Earnings, and Innovation

	Individual Worker Wage Growth	Firm Outcomes				
		Profits	Total Payroll		Employment	Pay/worker
			(all workers)	(incumbents)		
	(1)	(2)	(3)	(4)	(5)	(6)
Own Firm Innovation	0.80	6.12	5.11	3.00	3.10	2.01
	(0.23)	(0.59)	(0.44)	(0.46)	(0.48)	(0.65)
Competitor Innovation	-1.20	-4.23	-3.95	-2.35	-3.38	-0.57
	(0.41)	(1.19)	(1.03)	(0.85)	(0.86)	(1.33)

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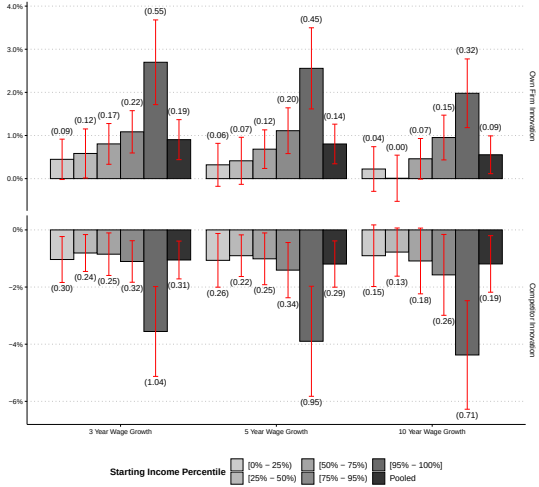
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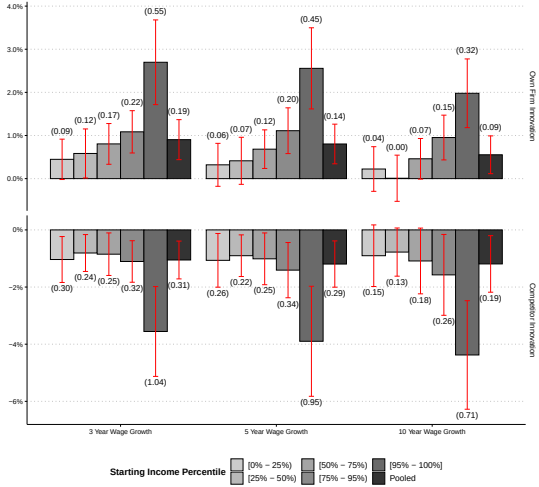
How does passthrough vary across workers?

Heterogeneous Average Wage Response by Income Group



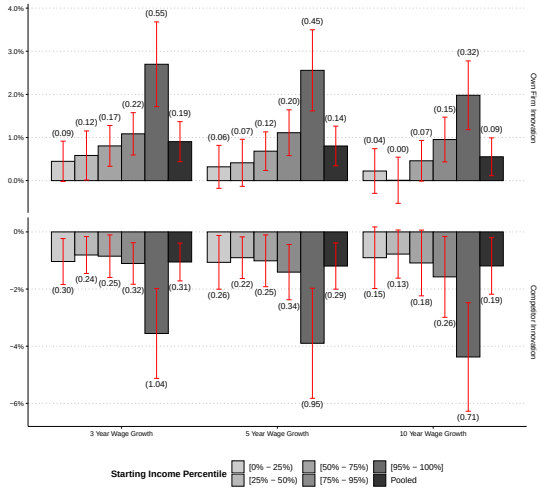
1. Passthrough is higher for higher-paid workers.

Heterogeneous Average Wage Response by Income Group



1. Passthrough is higher for higher-paid workers.
   - ► Labor supply for higher-skilled workers is more inelastic than for low-skill workers.

Heterogeneous Average Wage Response by Income Group



1. Passthrough is higher for higher-paid workers.
   - ► Labor supply for higher-skilled workers is more inelastic than for low-skill workers.
2. Passthrough is higher for competitor vs firm innovation for all worker types.

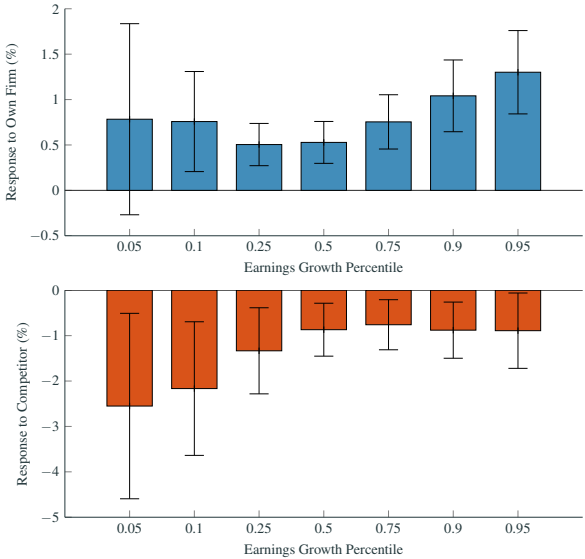
Drivers of Earnings Dynamics

Previous estimates correspond to earnings growth for the ‘average’ incumbent worker.

Next: how are these earnings changes distributed across workers ex-post?

Model how the entire conditional distribution of earnings shifts following innovation shocks using quantile regressions (Schmidt and Zhu, 2016)

Response of Distribution of Earnings Growth Rates: Pooled Estimates



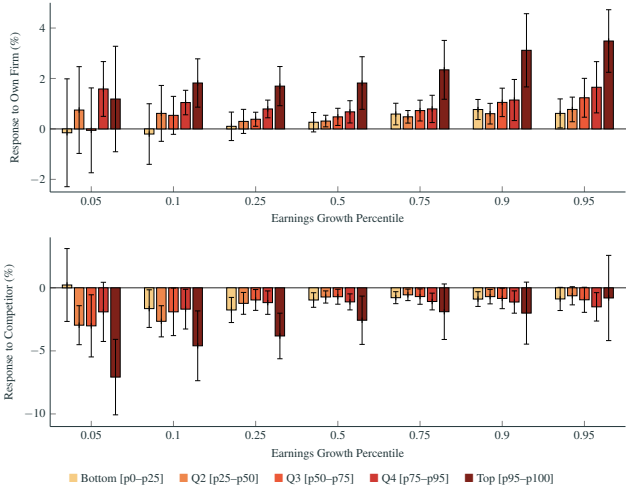
Firm Innovation:

- Incumbent earnings growth becomes more right-skewed

Competitor Innovation:

- Incumbent earnings growth becomes more left-skewed

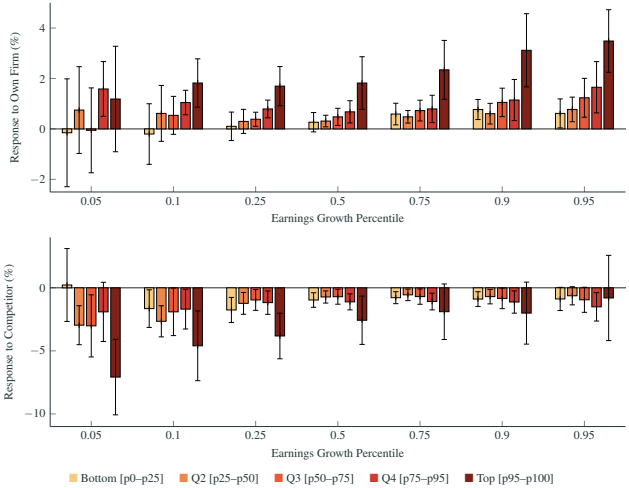
Response of Distribution of Earnings Growth Rates: Conditional on Worker Income



Higher-paid workers:

- Distribution of earnings growth more sensitive to both firm and competitor innovation.

Response of Distribution of Earnings Growth Rates: Conditional on Worker Income

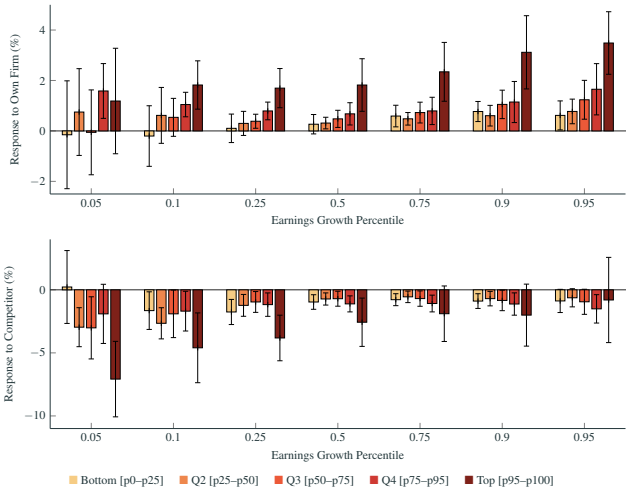


Higher-paid workers:

- Distribution of earnings growth more sensitive to both firm and competitor innovation.

Likelihood of Job Loss?

Response of Distribution of Earnings Growth Rates: Conditional on Worker Income



Higher-paid workers:

- Distribution of earnings growth more sensitive to both firm and competitor innovation.

Likelihood of Job Loss?

Worker Earnings	Own Firm	Competitor
0–p25	-0.17	0.70
	[0.14]	[0.32]
p25–p50	-0.22	0.74
	[0.18]	[0.33]
p50–p75	-0.31	0.75
	[0.12]	[0.33]
p75–p95	-0.42	0.89
	[0.09]	[0.30]
p95–p100	-0.79	1.87
	[0.22]	[0.41]

Passthrough smaller for Radical vs Incremental Innovation

	A. Firm Outcomes			B. Worker Wage Growth					
	Profit	Total Payroll	Employment	Pooled	[0%, 25%)	[25%, 50%)	[50%, 75%)	[75%, 95%)	[95%, 100%]
Own Firm, Radical (novel)	9.25	7.70	5.59	1.09	1.29	0.12	0.96	1.50	2.31
	(0.99)	(0.65)	(0.71)	(0.52)	(0.74)	(0.56)	(0.68)	(0.77)	(1.17)
				[11.8]	[14.0]	[1.3]	[10.4]	[16.2]	[25.0]
Own Firm, Incremental (non-novel)	3.88	3.36	1.21	0.66	-0.26	0.73	0.56	0.81	2.82
	(1.01)	(0.48)	(0.54)	(0.32)	(0.50)	(0.46)	(0.46)	(0.39)	(0.66)
				[17.1]	[-6.72]	[18.8]	[14.4]	[21.0]	[72.6]
Competitor	-4.24	-3.98	-3.42	-1.20	-1.07	-0.89	-1.01	-1.42	-3.91
	(1.20)	(1.04)	(0.87)	(0.41)	(0.48)	(0.37)	(0.46)	(0.49)	(1.00)
				[28.2]	[25.1]	[21.1]	[23.8]	[33.5]	[92.1]

Note: Novel patents are measured based on textual similarity to prior patents. This table compares firm and worker outcomes on a 5 year horizon for novel and non-novel patents. Estimates and standard errors are multiplied by 100. Standard errors are in parentheses, and the implied passthrough from profits to wages is in brackets. Passthrough (wage growth relative to firm profit responses) is substantially higher for non-novel innovation, especially for higher income individuals, since wage growth is larger but profit responses are smaller for non-novel patents relative to novel ones.

Thus far...

Consistent with the model:

1. Innovation by the firm, or its competitors, affects both firm profits and worker earnings.
2. Higher passthrough for higher-paid workers consistent with more inelastic labor supply.

Thus far...

Consistent with the model:

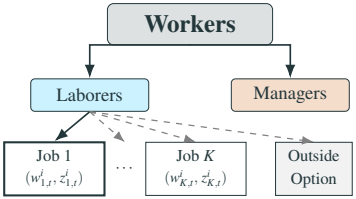
1. Innovation by the firm, or its competitors, affects both firm profits and worker earnings.
2. Higher passthrough for higher-paid workers consistent with more inelastic labor supply.

Outside the model:

1. Passthrough is higher for competitor than firm innovation.
2. Innovation affects skewness of earnings growth.
   - ► Benefits and costs are concentrated to subset of workers.
3. Firm Innovation: Wage growth of incumbent workers smaller than average growth at firm
   - ► Wage of new hires increase relative to incumbents.
4. Firm Innovation: Passthrough smaller for radical than incremental innovation
4. Competitor Innovation: Increased probability of exit.

The Model

Quantitative Model: One Slide Summary



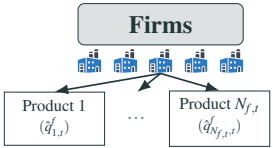
Worker choices

- Choose job with highest $w \cdot z$
- Choose effort e; supply ze eff. units
- Earnings: $(w \cdot z)^{1+1/\varphi}$

Skill Dynamics

$\hookleftarrow$ $z_{i,t}$ mean-reverts over time

$\rightsquigarrow$ Displacement $\Rightarrow$ new draw of z (as in Jones & Kim, 2018)



Production and choices (per product line)

- Higher productivity $\Rightarrow$ more managers per laborer
- Post laborer wage w, manager salary s
- Internal innovation intensity I
- External innovation intensity x

Potential Outcomes

$\hookrightarrow$ No industry burst: relative prod. $\hat{q}$ unchanged

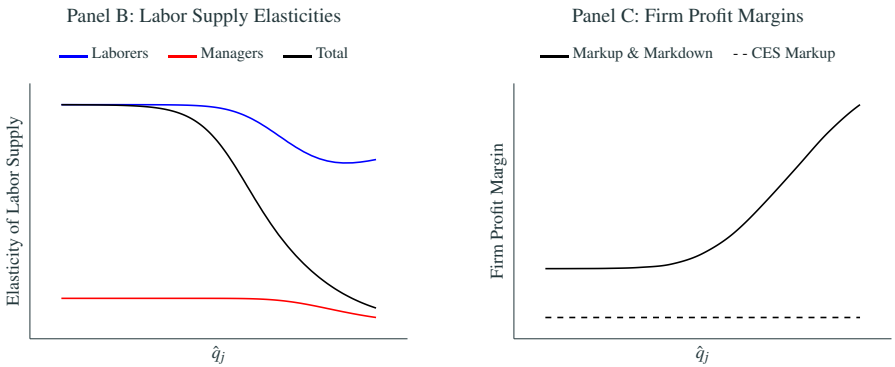
$\hookrightarrow$ Successful internal: $\log Q \uparrow$ by $\log \lambda$

$\hookrightarrow$ Successful external: add product line

$\hookrightarrow$ Unsuccessful: Industry prod. $\bar{Q} \uparrow$, relative prod. $\hat{q} \downarrow$

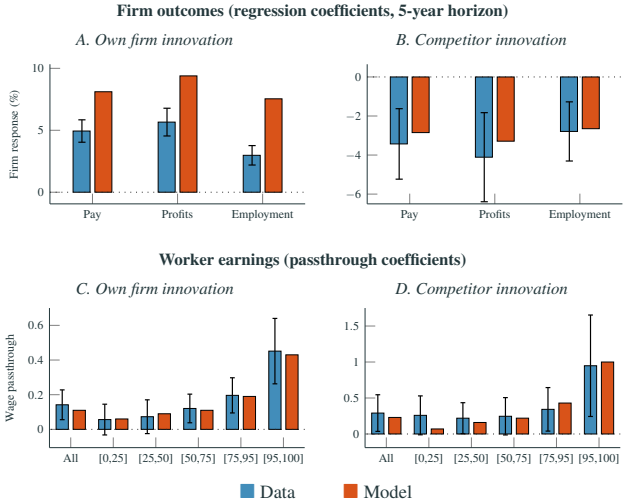
$\hookrightarrow$ Displacement: firm loses product line (at rate $x + e$)

Static Equilibrium: Monopsony Power, Productivity, and Firm Profits



- More productive firms post higher wages, face less elastic labor supply $\Rightarrow$ higher profit margins
- Like Peters (2020), profitability endogenous to innovation
  Channel different: monopsony power, like Gouin-Bonenfant (2022) and Seegmiller (2024)

Targeted Moments for Calibration



Key targeted moments (left)

Direct model analogues of KPSS surprises

Other targeted moments

- Earnings inequality (income-share distribution)
- Job separation rates by income
- 5-yr income growth volatility
- Labor-supply elasticities by productivity quartile from Seegmiller (2024)
- Share of KPSS value from textually novel patents

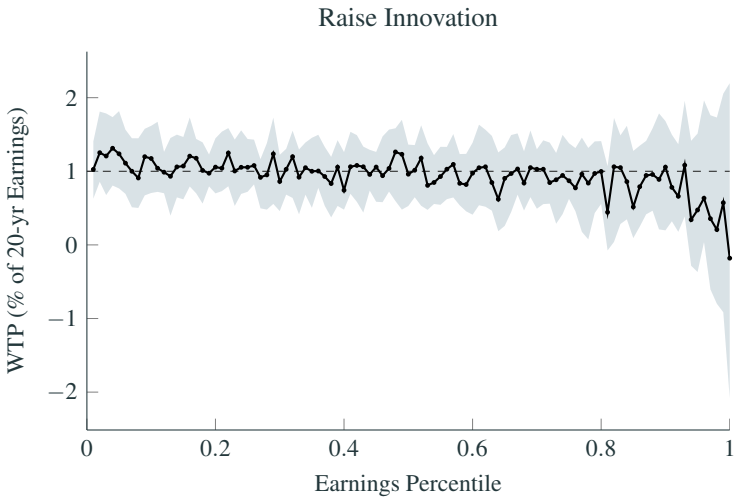
Sources of Income Risk in Model

- **Intensive margin:** as in simple model, changes in $\hat{q}$ change wages
  - Managers have more inelastic labor supply, hence larger passthrough
  - Workers can partially offset by switching jobs
- **Extensive margin**: Loss of product line has two effects
  - Displaced workers matched to a new firm.
  - Get a new draw of idiosyncratic productivity (often bad b.c. new draw replaces best option)
- **Background risk**: Top workers more exposed to innovation since:
  - Passthrough of own firm and competitor innovation is sharply increasing in gap between earnings in current job vs next best option Details
  - This gap is highly correlated with prior income

Model replicates other nontargeted features of the data

- Income risk moments from Guvenen, Karahan, Ozkan, & Song (2021):
  - ▶ Negatively skewed and highly leptokurtic distribution of income growth Details
  - ▶ Sharp increase in income risk at the top of the distribution Details
  - ▶ Skewness declines across most of the income distribution Details
- Sensitivity of job-loss probability to own & competitor innovation across income groups Details
- Negative relationship between labor share & productivity Details
- Profile of income growth coefficients across horizons Details

Willingness to Pay for Subsidies that increase growth 1% for 1 Year



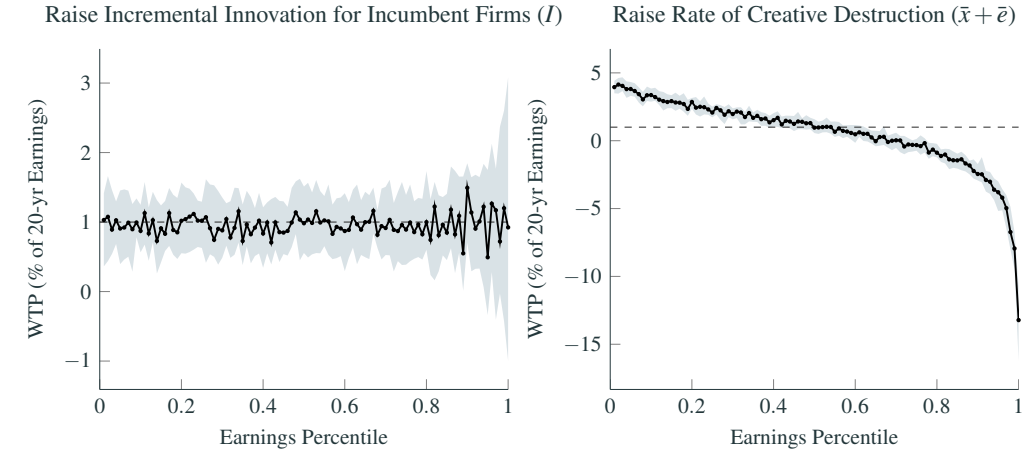
Use the model to compute HHs' willingness to pay for subsidy that increases growth by 1% for 1 year by increasing all innovation proportionally.

Assumptions: Workers have log utility and are hand-to-mouth.

Average WTP for subsidy (as % of 20-yr earnings):

- Overall: 0.96%
- Top 20%: 0.77%

WTP For Subsidies that increase growth 1% for 1 Year: Different types of innovation



- WTP for entrant subsidy: -5.3% for top-decile earners

Ex-ante vs Ex-post

Incomplete risk-sharing lowers the ex-post benefits of growth induced by innovation

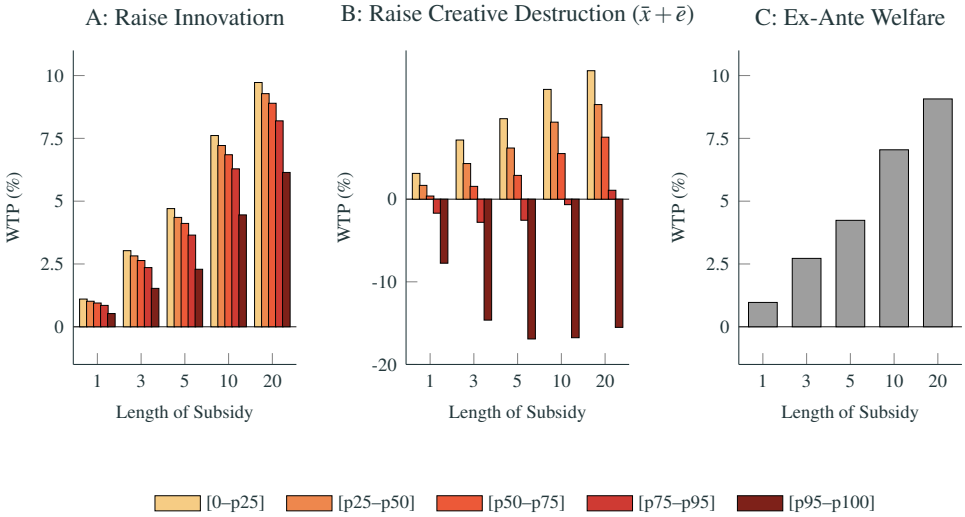
- especially when driven by creative destruction
- especially for those who currently have the best match to current technology

Fixing current productivity, faster growth is accompanied by greater risk: change is risky

That said, ex-ante welfare is increasing in the amount of innovation:

- More innovation adds a level shift: shifts the whole log earnings distribution
- More creative destruction $\Rightarrow$ worker productivity mean-reverts faster $\Rightarrow$ less dispersion in lifetime earnings

Willingness to pay for subsidies of different lengths



Declining Business Dynamism and Income Risk

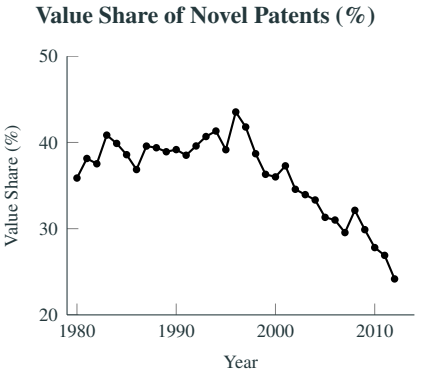
Declining dynamism is well documented (Haltiwanger, 2012; Akcigit and Ates, 2023), especially in firm entry rates

Among incumbents, the value share of textually novel patents has fallen from 1990s to 2010s

- Consistent w/ lower external innovation x in model

Counterfactual exercise: fixing other parameters

- recalibrate model's rate of creative destruction to match decade's novel innovation share
- compute variance of 5-year earnings growth



Share of total patent value from textually novel patents: patents w/ low similarity to prior patents from the same firm following Kelly, Papanikolaou, Seru, & Taddy (2018)

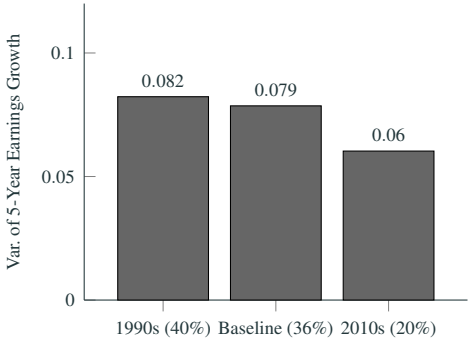
Model: Declining Creative Destruction Reduces Earnings Risk

Earnings-growth variance falls by around 20% from 1990s to 2010s

- Silver lining of declining dynamism: less displacement risk
- Consistent with the "Great Micro Moderation" (Sabelhaus and Song, 2010; Salgado, Bloom, Guvenen, Pistaferri, and Sabelhaus, 2023)

Caveat: only a local comparative static

- Many other changes over same period
- We have completely ignored labor-saving innovations; AI may reverse this trend!



Conclusion

Standard models: creative destruction raises growth $\Rightarrow$ raises welfare

This paper: workers share in the gains and losses from creative destruction

- (ex-post) welfare impact of creative destruction is ambiguous under incomplete markets
- points to a role for policy to address redistribution induced by creative destruction

Conclusion

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- points to a role for policy to address redistribution induced by creative destruction

Asset Pricing:

Relevant for asset prices: exposure particularly relevant among high earners

- Helps rationalize a value premium (Kogan, Papanikolaou, Stoffman, 2020)

Conclusion

Standard models: creative destruction raises growth ⇒ raises welfare

This paper: workers share in the gains and losses from creative destruction

- (ex-post) welfare impact of creative destruction is ambiguous under incomplete markets
- points to a role for policy to address redistribution induced by creative destruction

Political Economy: Political opposition to innovation, ↑ demand for populist policies.

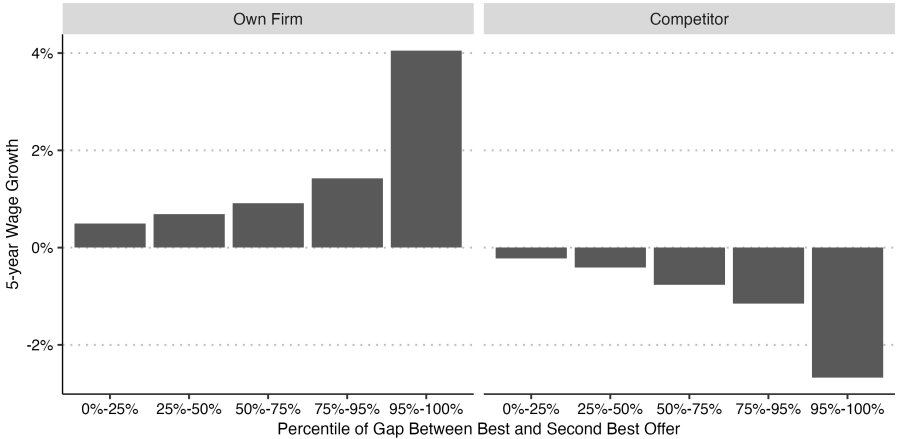
► Especially when most negatively impacted group has largest share of current output.





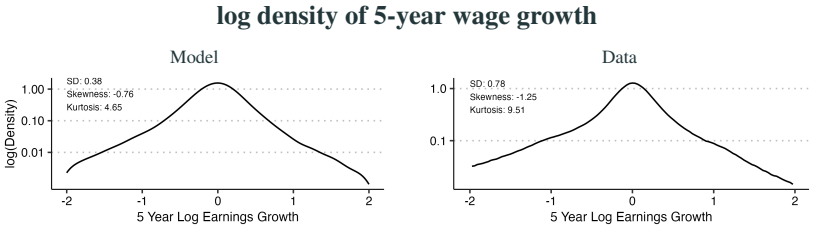
Appendix

The passthrough of innovation to wage growth is highly related to gap between current earnings and potential earnings in next best option



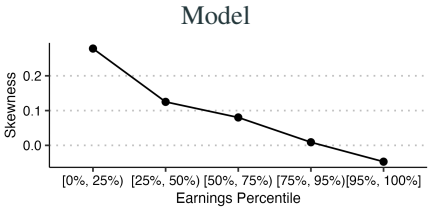
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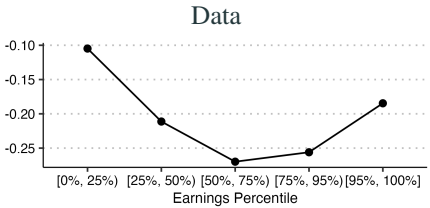
Details: Worker Earnings are Leptokurtotic



Back

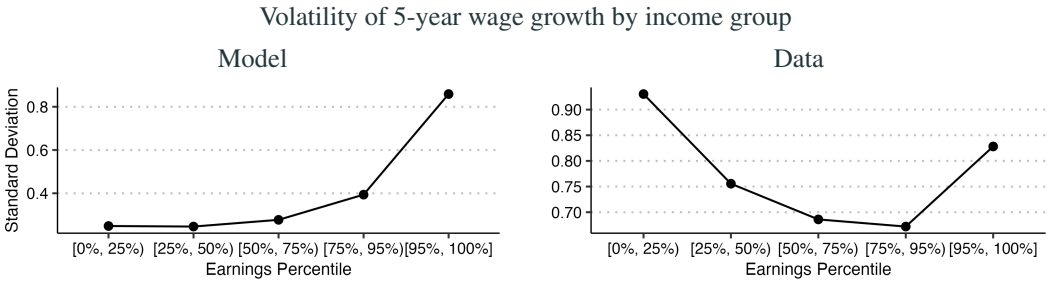
Details: Skewness of Income Growth Declines with Starting Earnings





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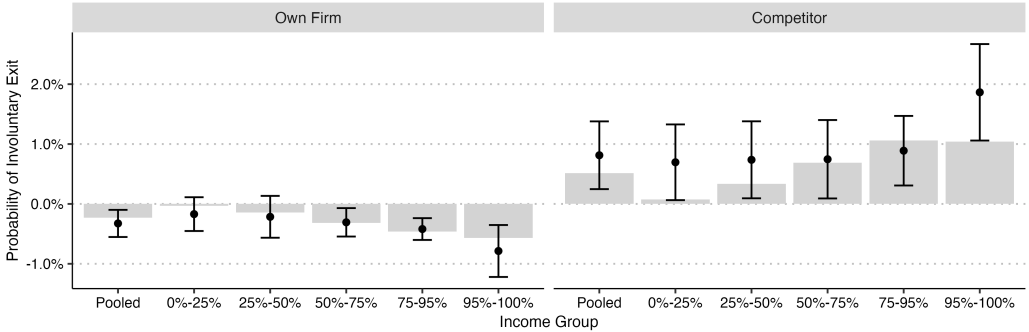
Details: Income Risk Rises at the Top by Starting Earnings



Note: Meeuwis, Papanikolaou, and Schmidt (2026) develop a search model with a complementary mechanism that explains elevated volatility for lower-income workers.

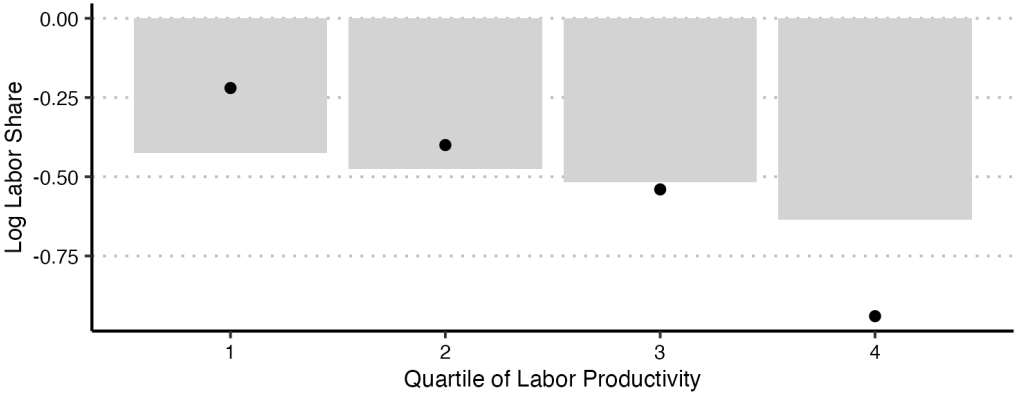
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Details: Job-Loss Sensitivity to Own and Competitor Innovation



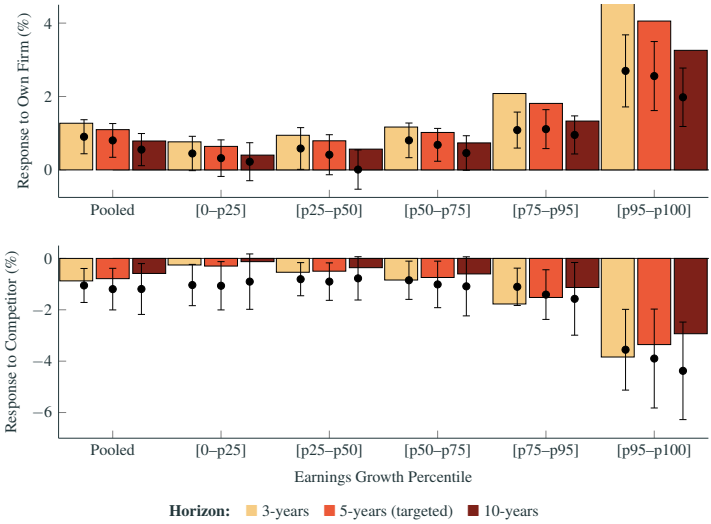
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Details: Labor Share Declines with Productivity



Back

Details: Income Growth Responses Across 3-, 5-, and 10-Year Horizons

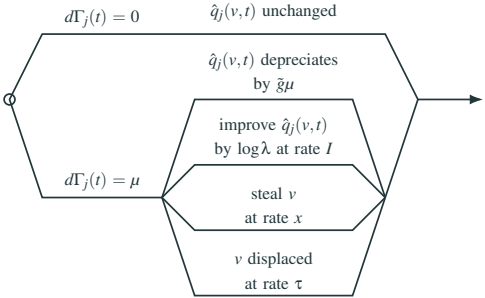


How Innovation Events Cluster in Time

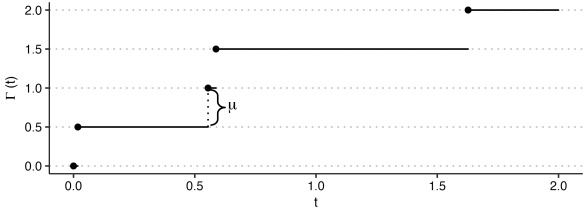
Innovation occurs in *bursts*:

$$d\Gamma_j(t) = \mu\, dN_j(t), \quad N_j \sim \text{Pois}\left(\frac{\Delta}{\mu}\right)$$

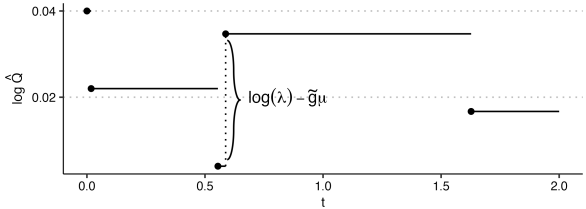
$$E[d\Gamma_j(t)] = dt, \quad \text{Larger } \mu \Rightarrow \text{more clustering}$$



Panel A: Jump Process for $\Gamma_j(t)$



Panel C: Sample Path for $\hat{q}$ Over t



Back

Production and Static Equilibrium

Leading producer in variety v, industry j operates CES technology combining laborers l and managers m:

$$Y_j(v,t) = \left((1-B) \left[Q_j(v,t)\, l_j(v,t) \right]^{\frac{\psi-1}{\psi}} + B \left[\bar{Q}_j(t)^{\alpha} Q_j(v,t)^{1-\alpha} m_j(v,t) \right]^{\frac{\psi-1}{\psi}} \right)^{\frac{\psi}{\psi-1}}$$

- $\psi < 1$: laborers and managers are complements
- $\alpha > 0$: more productive firms use higher ratio of managers to laborers (tech is skill-biased, improves productivity of laborers more than managers)
- Product market competition: constant markup $\frac{\sigma}{\sigma-1}$ over marginal cost (as in motivating model)
- Monopsony power generalizes: firms still set markup $\times$ markdown, but the effective labor supply elasticity now differs by worker type and *varies with firm productivity* $\hat{Q}_j(v,t) \equiv \frac{Q_j(v,t)}{\bar{Q}_j(t)}$

Pricing Equation Back

The Dynamic Firm Problem

Value of a firm = sum of product-line values $V(\hat{q})$, where $\hat{q} \equiv \log Q_j(v,t)/\bar{Q}_j(t)$

Each product line's value reflects:

- Current flow profits $\pi(\hat{q})$ from the static problem
- Two endogenous innovation choices:
  1. *Internal* rate I: improve own product quality by $\log \lambda$ per step
  2. *External* rate x: steal a competitor's product line
- Creative destruction risk: product line lost at rate $\bar{x} + \bar{e}$
- Optimality: invest up to the point where marginal cost = marginal benefit

$$c_I'(\bar{I};\hat{q}) = \mathcal{G}_I V \qquad \text{and} \qquad c_x'(\bar{x}) = \mathcal{G}_x V$$

Cost function chosen so equilibrium innovation rates I and x are *constant* across firms and over time

Compute a direct model analogue of the KPSS surprises from empirics: Competitor KPSS $\propto d\Gamma_j(t)$

HJB Equation Back

Summary Statistics for Firm and Worker Sample

	Mean	5%	25%	Median	75%	95%
A. Pooled Worker Sample Summary Stats						
Age	39.41	27	33	39	46	53
Wage	71,790	16,770	35,630	56,170	84,350	160,600
5 Year Wage Growth (log points)	-9.47%	-99.98%	-17.59%	-0.49%	13.85%	50.13%
B. 75-95% Percentile Earners Sample Summary Stats						
Age	38.48	27	32	38	45	52
Wage	103,400	45,040	72,360	95,590	123,600	188,400
5 Year Wage Growth (log points)	-7.08%	-70.31%	-15.10%	-1.06%	10.98%	37.65%
C. Top 5% of Earners Sample Summary Stats						
Age	40.87	27	35	41	47	53
Wage	263,400	80,470	127,800	177,100	268,400	636,700
5 Year Wage Growth (log points)	-4.44%	-81.68%	-18.17%	1.09%	19.17%	59.50%
D. Firm Sample Summary Stats						
Payroll, Thousands (Source: LBD)	282,600	641	6,002	26,880	132,100	1,173,000
Employment, Thousands (Source: LBD)	8.203	0.024	0.195	0.93	4.2	35.7
Profits, Millions (Source: Compustat)	532.2	1.264	10.55	45.25	214.7	1951

Back

Interpreting the dependent variable

Sum over multiple years for two reasons:

1. Mitigate problem with observations with zero income when using year-on-year growth rates
2. Smooths large changes in earnings that may be induced by large transitory shocks
   $\rightarrow$ more emphasis on persistent earnings

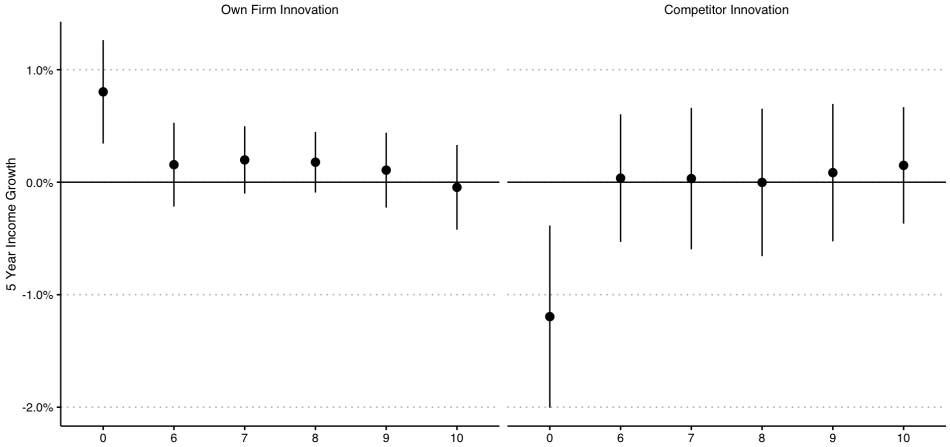
For example, suppose that annual log earnings (net of age effects) is sum of:

- permanent random walk component: $\xi_{i,t} = \xi_{i,t-1} + \eta_{i,t}$
- iid, mean zero, transitory component: $\varepsilon_{i,t}$

A log-linear approximation of $Y_{i,t:t+5}$ around zero is:

$$\begin{aligned} Y_{i,t:t+5} &\approx \frac{1}{5}\eta_{i,t+5} + \frac{2}{5}\eta_{i,t+4} + \frac{3}{5}\eta_{i,t+3} + \frac{4}{5}\eta_{i,t+2} + \eta_{i,t+1} + \frac{2}{3}\eta_{i,t} + \frac{1}{3}\eta_{i,t-1} \\ &+ \frac{1}{5}\left[\varepsilon_{i,t+5} + \varepsilon_{i,t+4} + \varepsilon_{i,t+3} + \varepsilon_{i,t+2} + \varepsilon_{i,t+1}\right] - \frac{1}{3}\left[\varepsilon_{i,t} + \varepsilon_{i,t-1} + \varepsilon_{i,t-2}\right]. \end{aligned}$$

Earning Growth vs Future Innovation



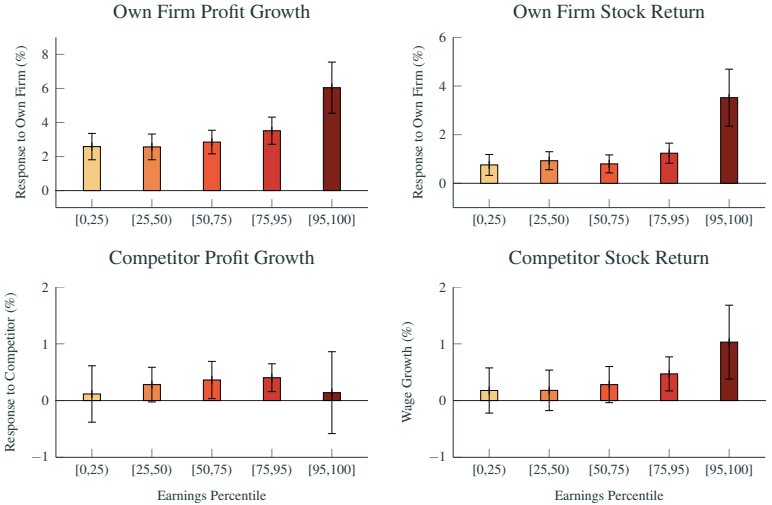
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Firm Outcomes and Wage Growth for Industry Subgroups

		5 Year Firm Outcomes			5 Year Wage Growth	
		Profit	Pay	Employment	[50 - 75)	[95 - 100]
Industry Income Inequality						
Own Firm	High	7.190	6.030	3.640	0.869	2.930
		(0.613)	(0.546)	(0.613)	(0.261)	(0.588)
	Low	3.800	2.240	1.670	0.043	0.271
		(0.797)	(0.580)	(0.625)	(0.140)	(0.230)
Competitor	High	-4.310	-4.000	-2.670	-1.030	-4.440
		(1.340)	(1.040)	(0.900)	(0.585)	(1.220)
	Low	0.380	-0.137	-0.265	-0.026	-0.062
		(0.520)	(0.628)	(0.641)	(0.230)	(0.344)
Average Industry Wage						
Own Firm	High	7.540	6.380	3.810	1.030	3.440
		(0.652)	(0.577)	(0.624)	(0.271)	(0.579)
	Low	2.980	1.760	1.750	0.269	-0.646
		(0.707)	(0.512)	(0.725)	(0.180)	(0.492)
Competitor	High	-4.240	-4.010	-2.700	-0.784	-4.810
		(1.410)	(1.070)	(0.942)	(0.527)	(1.040)
	Low	-0.656	-0.764	-0.711	0.448	-0.605
		(0.456)	(0.531)	(0.580)	(0.447)	(0.849)

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Wage Growth Response to Firm Profits and Stock Returns (OLS)



Pricing and Optimality in the Full Model

Profit maximization gives relative price:

$$\hat{p}(\hat{Q}) = \frac{\sigma}{\sigma-1}\frac{\bar{A}}{\hat{Q}_j(v,t)}\Bigg((1-B)^{\Psi}[w_j(v,t)(1+\varepsilon_j^w(v,t))]^{1-\Psi} + B^{\Psi}\hat{Q}_j(v,t)^{\alpha(1-\Psi)}[s_j(v,t)(1+\varepsilon_j^s(v,t))]^{1-\Psi}\Bigg)^{\frac{1}{1-\Psi}}$$

where $\varepsilon_j^w, \varepsilon_j^s$ are elasticities of inverse labor supply for laborers and managers.

- Generalizes the motivating model: price $= \underbrace{\frac{\sigma}{\sigma-1}}_{\text{markup}} \times$ marginal cost (which includes $\underbrace{(1+\varepsilon)}_{\text{markdown}}$)
- Key difference: ε_j^w and ε_j^s now vary across firms with $\hat{Q}_j(v,t)$
- More productive firms $\Rightarrow$ hire more $\Rightarrow$ face steeper supply $\Rightarrow$ higher profit margins

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Hamilton–Jacobi–Bellman Equation for Product-Line Value

$$(r-g)\,V(\hat{q}) = \max_{I,x}\Bigg\{ \underbrace{\pi(\hat{q})}_{\text{flow profits}} - \underbrace{c_I(I;\hat{q}) - c_x(x)}_{\text{innovation costs}} + \underbrace{x\,\mathcal{G}_x V}_{\substack{\text{business}\\ \text{stealing}}} + \frac{1}{\mu}\Bigg[\underbrace{e^{-(I+\bar{x}+\bar{e})\mu} \sum_{k=0}^{\infty} \frac{(I\mu)^k}{k!}\, V\Big(\hat{q} + k\log\lambda - \tilde{g}\mu\Big)}_{\text{evolution of relative productivity}} - V(\hat{q}) \Bigg] \Bigg\}$$

- Cost of internal innovation: $c_I(I;\hat{q}) = \frac{1}{\varphi_I}\Phi(\hat{q})\, I^{\zeta}$, with $\Phi(\hat{q})$ chosen so $\bar{I}$ is constant
- Cost of external innovation: $c_x(x) = \frac{1}{\varphi_x} x^{\zeta}$
- Free entry: $\mathcal{G}_e V \leq \frac{1}{\varphi_e}$, with equality if $\bar{e} > 0$

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Workers: Job Choice, Effort, and Labor Supply

Extensive margin (Roy model): each worker draws type $\tau(i) \in (L, M)$ at birth with probabilities $(\omega, 1-\omega)$, observes productivity in K jobs

Job-specific productivity $z \sim$ Fréchet$(T, \theta_{\tau(i)})$, with $\theta_l > \theta_m$

$\Rightarrow$ Manager labor supply less elastic than laborers on extensive margin

All workers pick job w/ highest wage per unit of effort

Intensive margin (effort): GHH preferences $\Rightarrow$ optimal effort $e_{i,t} = (w_{i,t} z_{i,t})^{1/\varphi}$

Earnings, with optimal effort: $(w_{i,t} z_{i,t})^{1+1/\varphi} Y_t$

Labor supply to each firm has three channels:

1. Intensive margin: incumbents work harder $(w^{1/\varphi})$
2. Job switching: workers switch from competitors
3. Non-employment: workers drawn in from home production

Worker dynamics: match quality follows a mean-reverting process; displacement resets the draw

Labor Supply Equations

Labor supply of **laborers** to a firm posting wage w:

$$l(w,t) = \omega K T_l^{[1+1/\varphi]/\theta_l} \underbrace{w^{1/\varphi}}_{\substack{\text{intensive} \\ \text{margin}}} \times \mathbb{E}_{\mathcal{W}_{i,t}} \Bigg[\underbrace{\left(\frac{w^{\theta_l}}{w^{\theta_l} + \mathcal{W}_i^{\theta_l}} \right)^{[1+1/\varphi]/\theta_l - 1}}_{\text{reallocation across employers}} \underbrace{\gamma\Big(1 - \tfrac{1+1/\varphi}{\theta_l}, -[T_l(w^{\theta_l} + \mathcal{W}_{i,t}^{\theta_l})]R^{-\theta_l}\Big)}_{\text{non-employment}} \Bigg]$$

Labor supply of **managers** to a firm posting wage s:

$$m(s,t) = (1-\omega) K T_m^{[1+1/\varphi]/\theta_m} s^{1/\varphi} \times \mathbb{E}_{\mathcal{S}_{i,t}} \left[\left(\frac{s^{\theta_m}}{s^{\theta_m} + \mathcal{S}_{i,t}^{\theta_m}} \right)^{[1+1/\varphi]/\theta_m - 1} \gamma\Big(1 - \tfrac{1+1/\varphi}{\theta_m}, -[T_m(s^{\theta_m} + \mathcal{S}_{i,t}^{\theta_m})]R^{-\theta_m}\Big) \right]$$

- $\mathcal{W}_{i,t}$, $\mathcal{S}_{i,t}$: sufficient statistics for wages posted by $K-1$ competing employers
- $\gamma(\cdot,\cdot)$: lower incomplete gamma function (from truncated Fréchet max)
- As $w \to \infty$: reallocation and non-employment channels saturate, elasticity $\to 1/\varphi$

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