

# GI JOBS:

## THE MACROECONOMIC EFFECTS OF DEFENSE EMPLOYMENT

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# OVERVIEW

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**US Armed Forces:** Largest domestic US employer

- 2.1 million enlisted and civilians
- Walmart: 1.6 mil (largest private-sector)
- Federal gov ex-DoD: 1.3 mil

Army provides **high-skilled jobs**

- Particularly **similar to manufacturing jobs**

**This study:** GE effects of mil. employment on US labor market

**End of Cold War:** US military sheds >700K jobs

- Shock to US manufacturing workers on top of trade and automation

# MAIN FINDINGS

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**Empirical:** End of Cold War led to >5% income decline for civilian workers in “hard hat” jobs similar to military

- Event study design
- The **Cold War Demobilization** shock

**Theory:** GE model of occupational choice and skill accumulation.

- Qualitatively replicates empirical findings (quantitative in progress)
- Defense spending stimulates GDP through **learning externality**

## RELATED LITERATURE

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### **Individual effects of military service**

Angrist 1990 (draft); vs. Angrist 1998; Greenberg et al. 2022 (voluntary)

### **Local labor market effects of public employment**

Faggio & Overman 2014, [Zou 2018](#), Becker, Heblich & Sturm 2021

### **Effects of fiscal policy: Aggregate and Procurement**

Blanchard & Perotti 2002, Ramey 2011a, 2011b, 2016, 2019, Ilzetzki, Mendoza & Vegh 2013, Nakamura & Steinsson 2014, Ramey & Zubairy 2018, Auerbach, Gorodnichenko & Murphy 2020

### **GE effects of public wages in frictional labor markets**

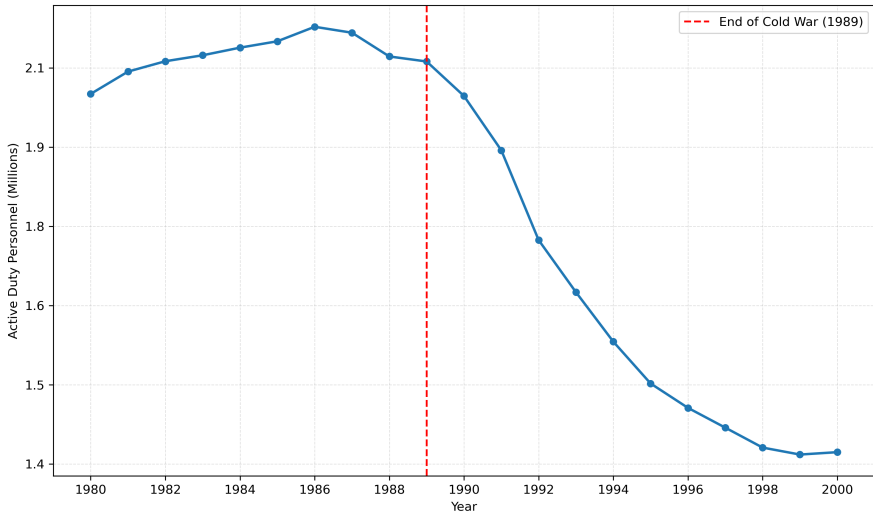
Michaillat 2014, Gomes 2015, Afonso & Gomes 2014, Chassamboulli & Gomes 2023

### **Occupational choice, tasks, and skill formation**

Autor, Levy & Murnane 2003, Acemoglu & Autor 2011, Deming 2017, Althoff & Reichardt 2026

# **MOTIVATING FACTS**

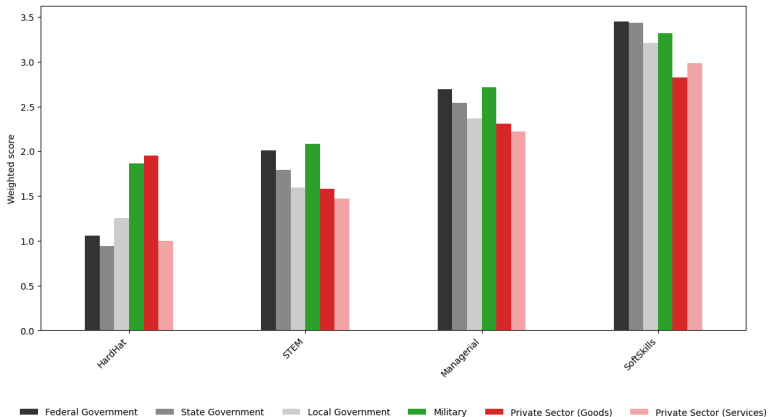
# ENLISTED SOLDIERS, 1980–2000



Sources: US Department of Defense and the authors

# SKILL REQUIREMENTS IN EMPLOYMENT SECTORS

## Average O\*NET score, 1-7 scale



Sources: American Community Survey, O\*NET, and the authors

[34 skills](#)

[Air force](#)

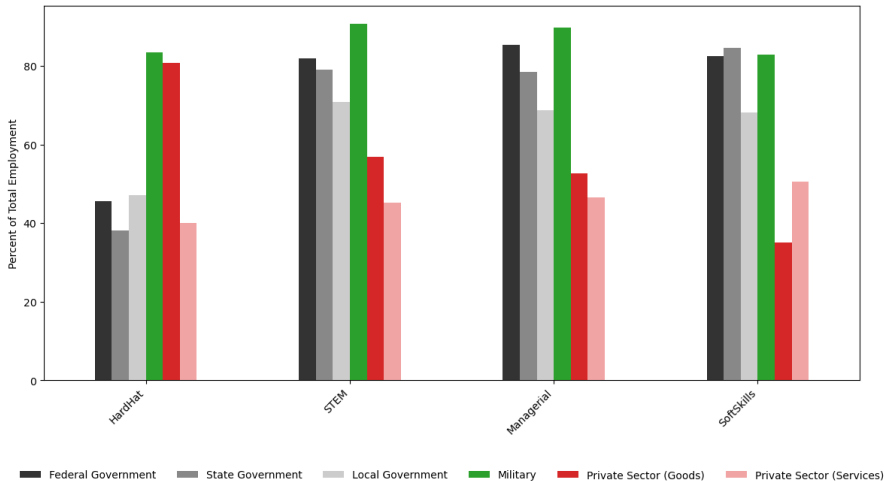
[34 skills \(Air force\)](#)

[Veterans](#)

[Occupation List](#)

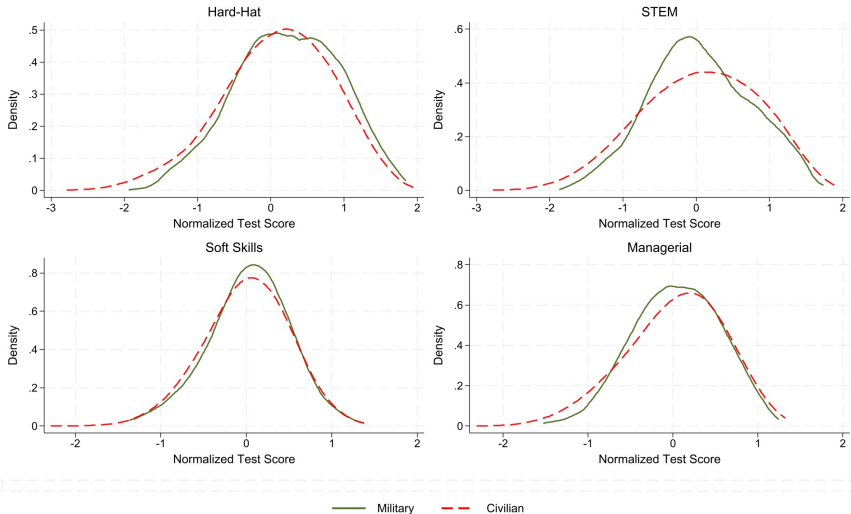
# SKILL REQUIREMENTS IN EMPLOYMENT SECTORS

## % workers in jobs with O\*NET score in top quartile



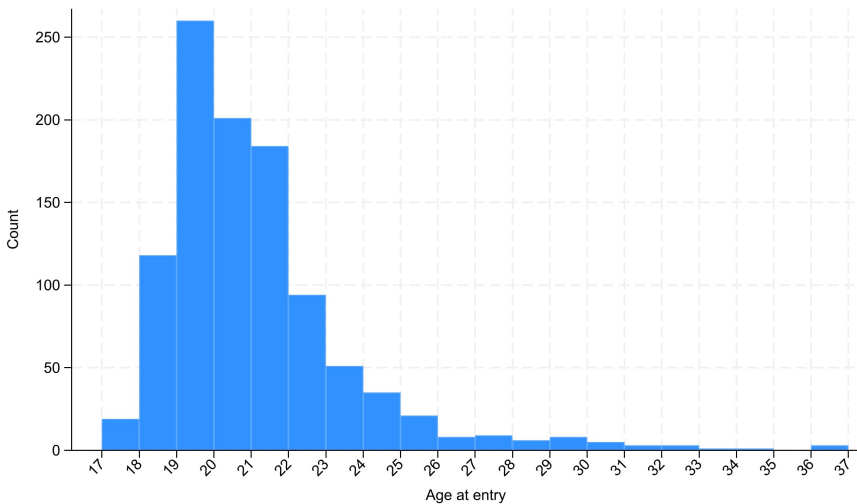
Sources: American Community Survey, O\*NET, and the authors

# TEST SCORES OF MILITARY AND CIVILIAN PERSONNEL

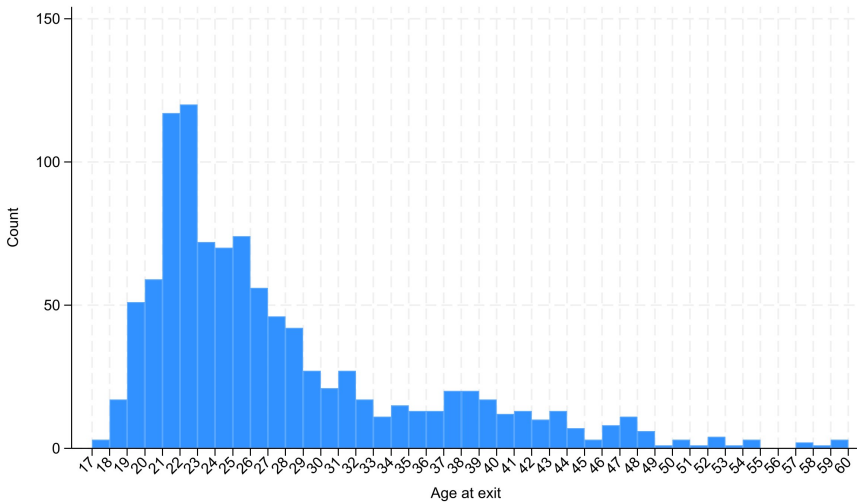


Sources: National Longitudinal Surveys of Youth and the authors

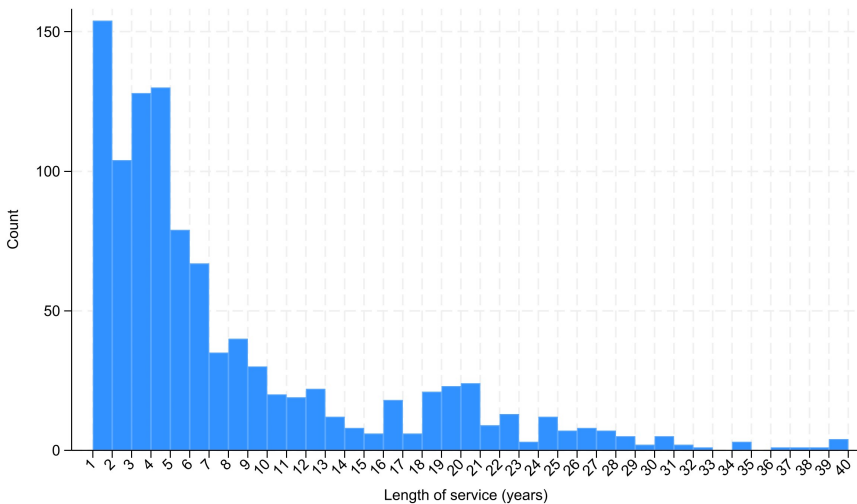
# AGE AT ENTRY INTO MILITARY SERVICE



# AGE AT EXIT FROM MILITARY SERVICE



# LENGTH OF MILITARY SERVICE



**EVENT STUDY:  
COLD WAR DEMOBILIZATION SHOCK**

## DATA SOURCES

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- O\*NET:** Department of Labor classification of skill requirements in jobs
- Only civilian jobs, but cross-walks available to translate military jobs into civilian counterparts.

**American Community Survey:** Includes occupation for a representative sample of enlisted soldiers

**Air Force Statistical Digest:** More granular administrative data on occupations in the Airforce

**Current Population Survey:** Repeated cross-section of earnings and demographic information on workers.

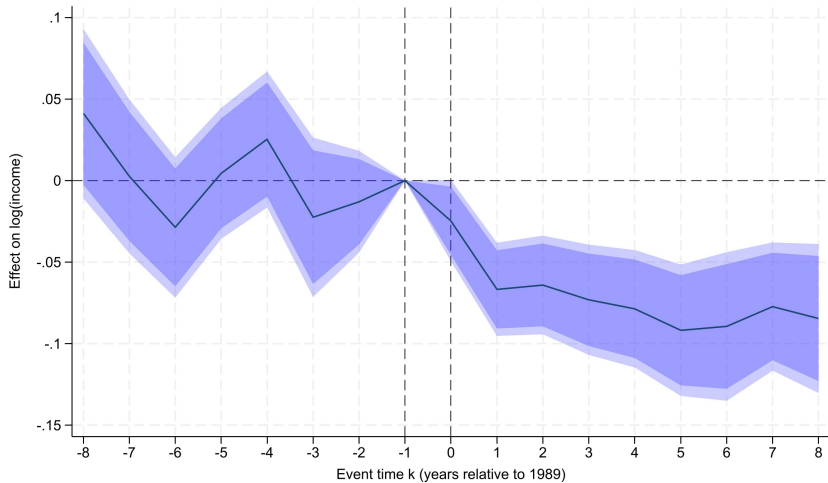
# EVENT STUDY: SPECIFICATION

## Two-way fixed effects (TWFE) regression:

$$\ln(\text{WageIncome}_{i ot}) = \sum_{\substack{k=-8 \\ k \neq -1}}^8 \beta_k (\mathbf{1}\{\text{event}_t = k\} \times \text{Treated}_o) + \alpha_o + \lambda_t + \varepsilon_{i ot} \quad (1)$$

- $i$  = individuals,  $o$  = occupations,  $t$  = calendar years,  $k$  = event time
- $k = -1$  (year 1989) is the omitted reference period
- $\alpha_o$  = occupation fixed effects,  $\lambda_t$  = year fixed effects
- $\text{Treated}_o$ : occupations in top decile of skill similarity to manual labor military jobs [Most similar jobs](#)

# EVENT STUDY RESPONSES



Raw Data

Quartile

Quantiles

Controls

Robustness

Employment

# ADDRESSING IDENTIFICATION CONCERNS

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## ***Confounding miseries of manufacturing sector / working class***

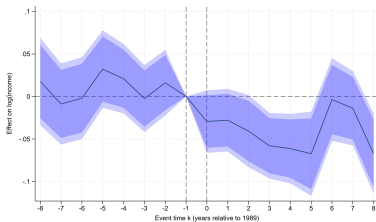
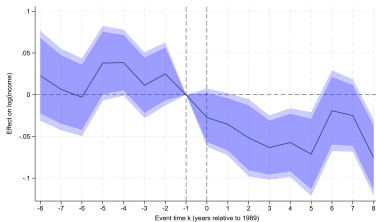
1. **Timing:** Sharp + persistent drop in incomes in 1990
  - 3 years before NAFTA
  - Decade before China  $\iff$  WTO
  - Automation: secular decline in manufacturing since late 1970s, sharper drop in early 2000s
2. **Control variables:**
  - NAFTA shock, China shock, automation
  - Manual labor / “hard hat” skills occupational scores

$\Rightarrow$  **Occupations similar to military:**

**Income drops *within* levels of “hard hat” skills**

# EVENT STUDY

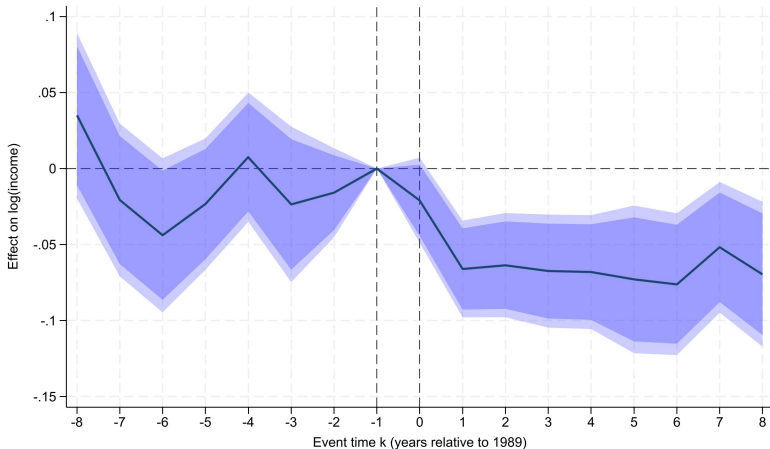
## Controlling for China Shock



Sources: ACS; O\*NET; Acemoglu, Autor, Dorn, Hanson, & Price (2016); and the authors

# EVENT STUDY

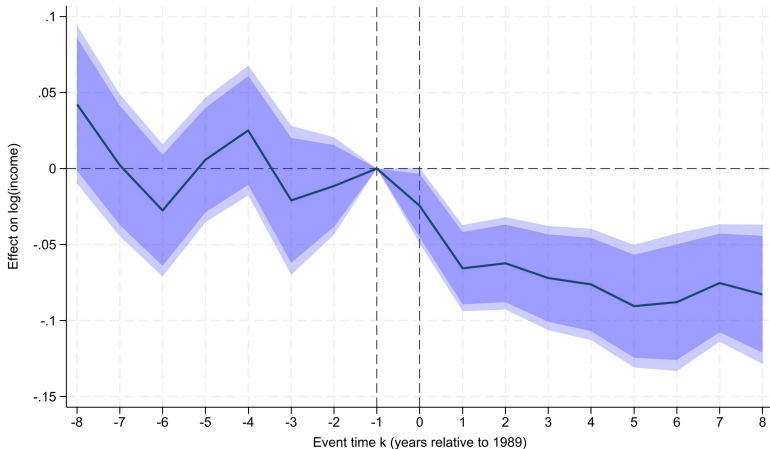
## Controlling for Automation



Sources: ACS; O\*NET; Autor & Dorn(2013); and the authors

# EVENT STUDY

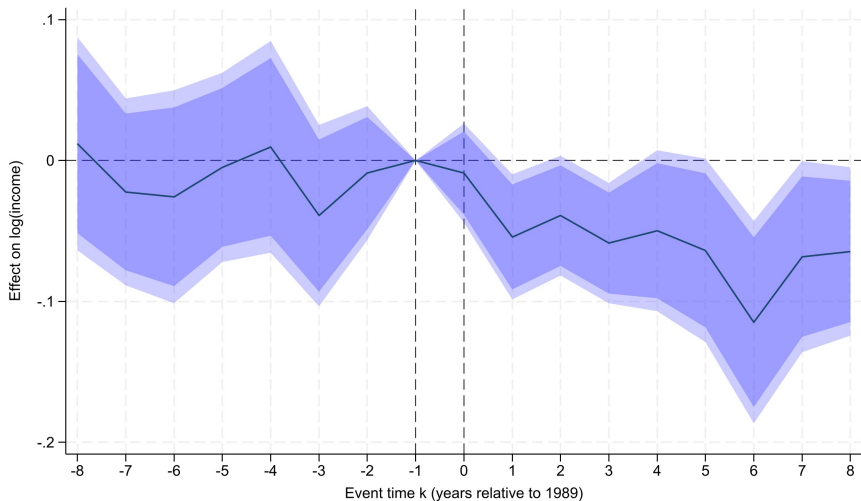
## Controlling for NAFTA shock



Sources: ACS; O\*NET; Hakobyan & McLaren (2016); and the authors

# EVENT STUDY

## Controlling for Hard Hat score fixed effects



# UNDERSTANDING HARD HAT FIXED EFFECTS

Regressions compare occupations similar to blue collar military *within* bins of “hard hat” score.

This not about the general misery of the working class.

Jobs similar to the military are **higher skill** and **higher pay**.

Bin	Title	Most similar occupation				Least similar occupation				
		HH	STEM	Avg	Salary	Title	HH	STEM	Avg	Salary
[0, 1]	Buyers & Purchasing Agents, Farm Products	0.97	1.94	2.28	\$75,650	Crossing Guards	0.16	0.38	0.97	\$37,700
(1, 2]	Diagnostic Related Technologists & Technicians	1.93	2.10	2.42	\$77,660	Pressers, Textile, Garment & Related Materials	1.47	0.56	1.19	\$33,880
(2, 3]	Broadcast & Sound Engineering Technicians	2.70	1.99	2.55	\$53,920	Cleaners of Vehicles and Equipment	2.10	0.58	1.39	\$35,270
(3, 4]	Radio & Telecom Equipment Installers & Repairers	3.31	2.12	2.64	\$64,190	Maintenance Workers, Machinery	3.25	1.40	2.25	\$60,500

**MODEL**

# MODEL: KEY INGREDIENTS

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**Worker heterogeneity:** age  $a \in [0, A]$ , skill vector  $\mathbf{h}$ , learning ability  $\psi$

**Occupations:** skill req's affect **comparative advantage** and **learning**

**Workers:** choose occupations to **maximize lifetime utility**

**Two sectors:**

- Occupations  $j \in [1, J^C]$ : consumer goods sector
- Occupations  $j \in [J^C + 1, J^C + J^G = J]$ : government / military sector

**Government:** raises labor tax  $\tau$  to produce public/defense good  $G$

**Workers:** supply one unit of labor inelastically; consume after-tax income

Technology and wages

Firm's problem

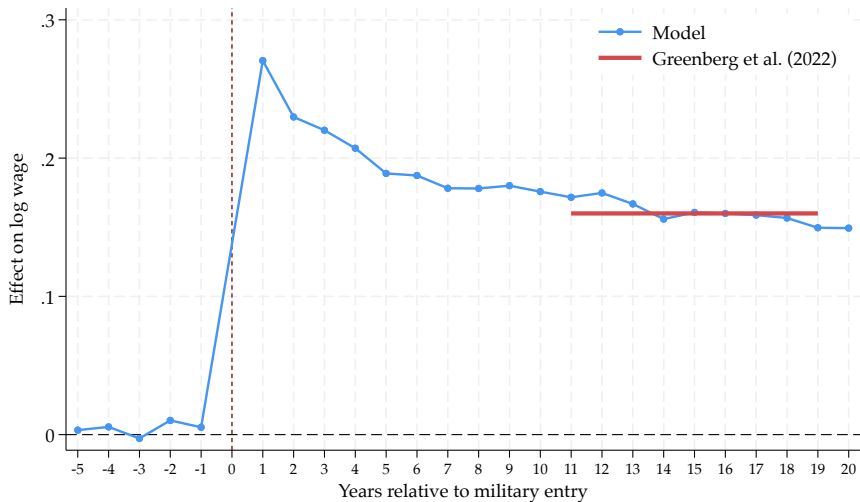
Occupational choice: problem

Occupational choice: solution

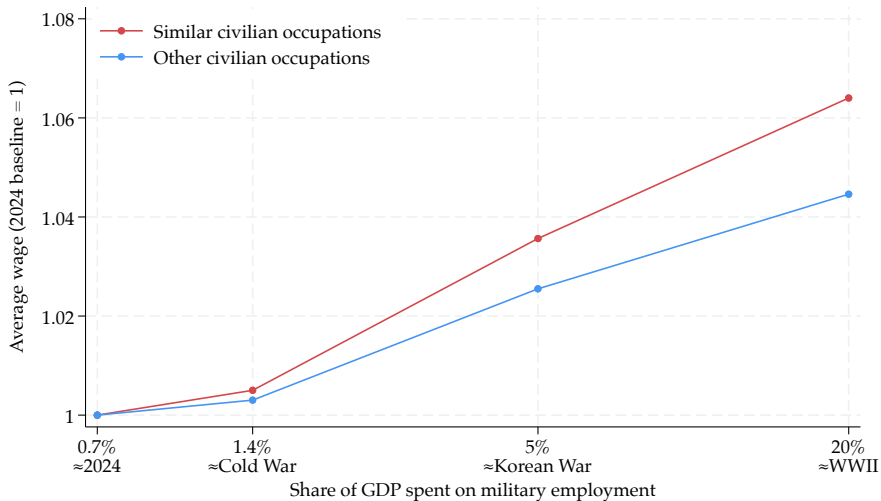
Equilibrium conditions

# MODEL SIMULATIONS

# MODEL: CAUSAL EFFECT OF MILITARY SERVICE



# MODEL: GE EFFECTS OF MOBILIZATION



## KEY TAKEAWAYS

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- Military employment creates **good jobs**
- Can increase private sector wages through
  - Demand for skills (relative effect)
  - Human capital accumulation (lifts all boats)
- **Cold War Demobilization** post-1989 hurt incomes
  - Compounded trade, automation shocks
- Military/public employment has important equilibrium effects
  - Positive side effects of re-mobilization?

# **ADDITIONAL MATERIALS**

# TOP OCCUPATIONS: US ARMED SERVICES

Rank	Occupation	Emp %
1	Military Enlisted Tactical Operations and Air/Weapons Specialists and Crew Members	23.38%
2	Military Officer Special and Tactical Operations Leaders	8.18%
3	First-Line Enlisted Military Supervisors	6.70%
4	Aircraft Mechanics and Service Technicians	5.49%
5	Aircraft Pilots and Flight Engineers	4.21%
6	Human Resources Workers	3.22%
7	Police Officers	2.76%
8	Logisticians	2.11%
9	Maintenance and Repair Workers, General	2.11%
10	Avionics Technicians	1.38%

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# TOP OCCUPATIONS: US AIR FORCE

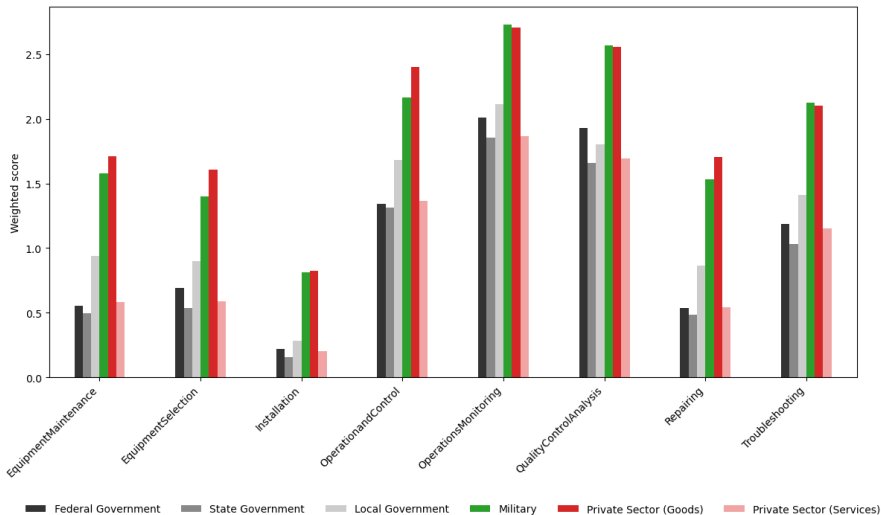
Rank	Occupation	Emp %
1	Aerospace Maintenance - Enlisted	17.28%
2	Security Forces - Enlisted	8.42%
3	Cyberspace Support - Enlisted	8.40%
4	Civil Engineering - Enlisted	5.34%
5	Munitions & Weapons - Enlisted	4.37%
6	Pilot - Officer	4.30%
7	Intelligence - Enlisted	4.19%
8	Transportation And Vehicle Management - Enlisted	3.84%
9	Command Control Systems Operations - Enlisted	3.77%
10	Aircrew Operations - Enlisted	2.85%

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# TOP CIVILIAN OCCUPATIONS: SIMILARITY TO MILITARY

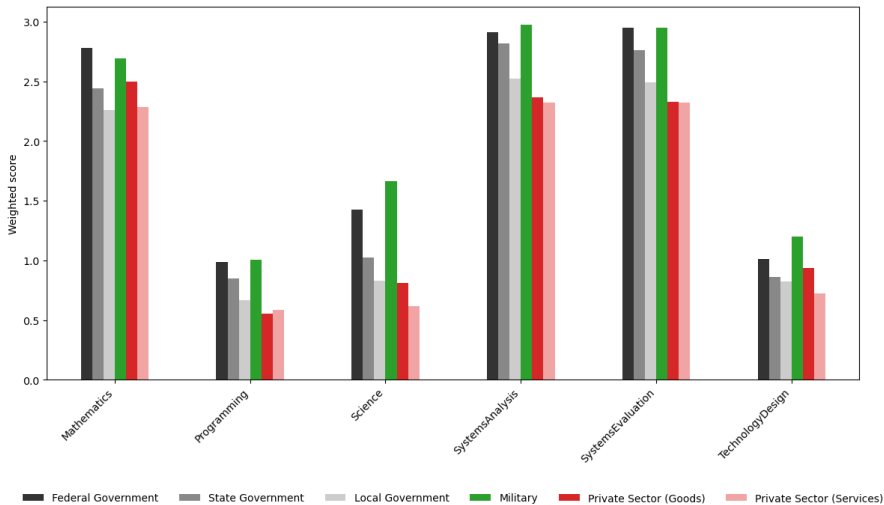
Rank	Military	Airforce	Military (High HardHat)	Airforce (Hard Hat)
1	Chief Executives	Veterinary Technologists and Technicians	Electrical and Electronic Engineering Technologists and Technicians	Electrical and Electronic Engineering Technologists and Technicians
2	Fallers	First-Line Supervisors of Firefighting and Prevention Workers	Electrical and Electronics Repairers, Powerhouse, Substation, and Relay	Broadcast Technicians
3	Logging Equipment Operators	Forest Fire Inspectors and Prevention Specialists	Broadcast Technicians	Medical Appliance Technicians
4	Log Graders and Scalers	Fish and Game Wardens	Medical Appliance Technicians	Electrical and Electronics Repairers, Powerhouse, Substation, and Relay
5	First-Line Supervisors of Construction Trades and Extraction Workers	Nuclear Power Reactor Operators	Commercial Divers	Computer Network Support Specialists
6	Boilermakers	Forest and Conservation Technicians	Chemical Plant and System Operators	Chemical Plant and System Operators
7	Brickmasons and Blockmasons	Surveyors	Computer Network Support Specialists	Captains, Mates, and Pilots of Water Vessels
8	Stonemasons	First-Line Supervisors of Landscaping, Lawn Service, and Groundskeeping Workers	Aircraft Structure, Surfaces, Rigging, and Systems Assemblers	Nuclear Technicians
9	Carpenters	Power Distributors and Dispatchers	Audiovisual Equipment Installers and Repairers	Petroleum Pump System Operators, Refinery Operators, and Gaugers
10	Carpet Installers	Aircraft Cargo Handling Supervisors	Gas Plant Operators	Manufactured Building and Mobile Home Installers

# HARD HAT SKILL REQUIREMENTS



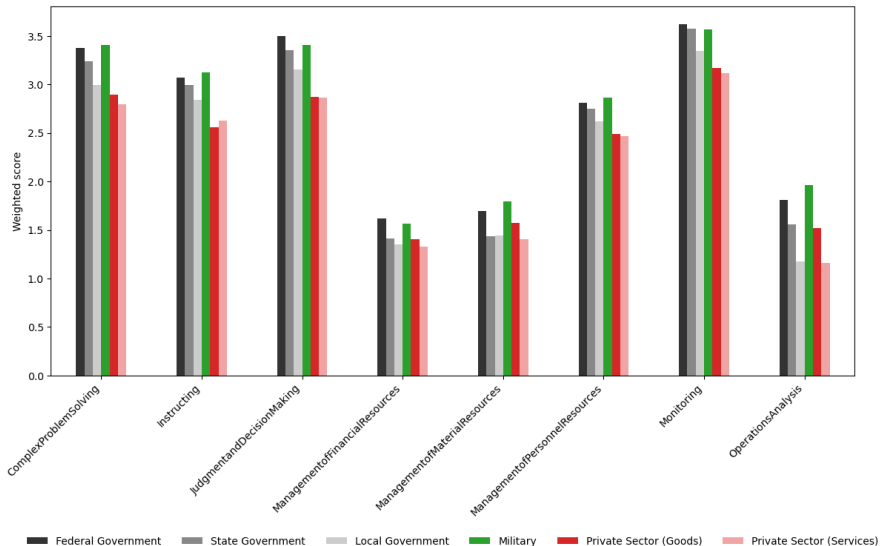
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# STEM SKILL REQUIREMENTS

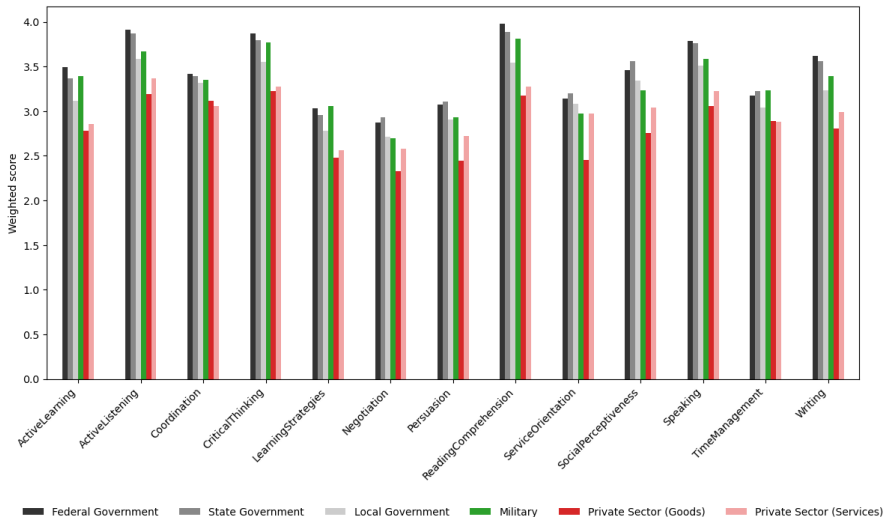


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# MANAGEMENT SKILL REQUIREMENTS



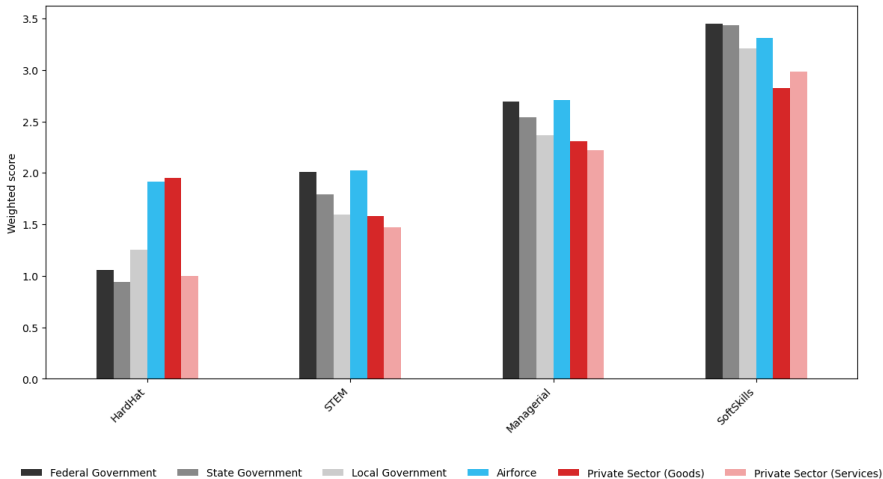
# SOFT/SOCIAL SKILL REQUIREMENTS



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# SKILL REQUIREMENTS IN AIR FORCE

## Average O\*NET score, 1-7 scale

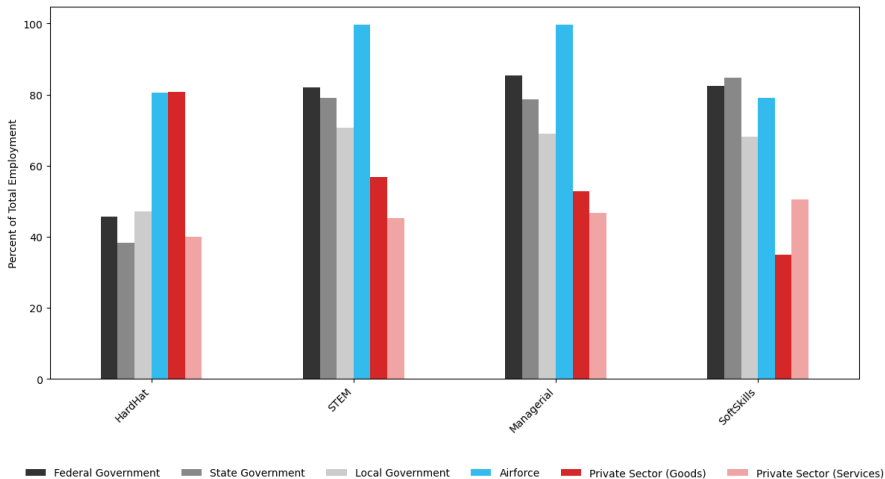


Sources: American Community Survey, O\*NET, and the authors

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# SKILL REQUIREMENTS IN AIR FORCE

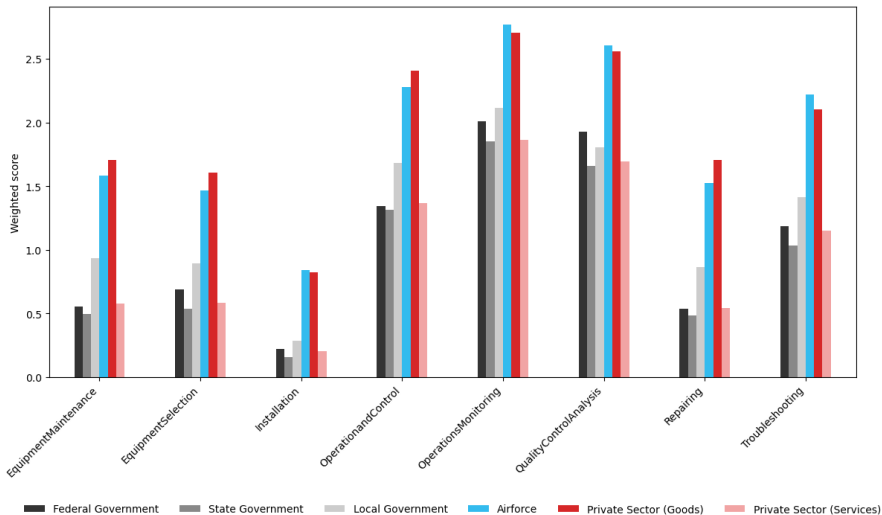
**% workers in jobs with O\*NET score in top quartile**



Sources: American Community Survey, O\*NET, and the authors

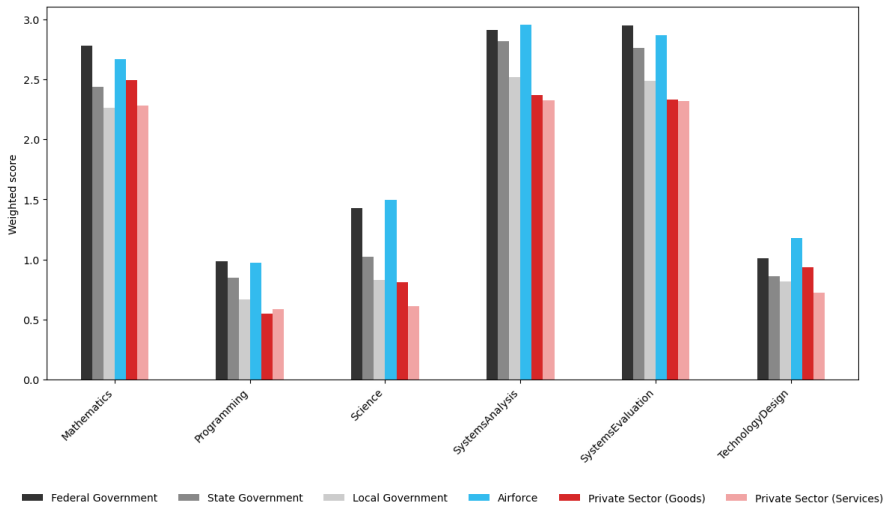
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# HARD HAT SKILL REQUIREMENTS (AIR FORCE)



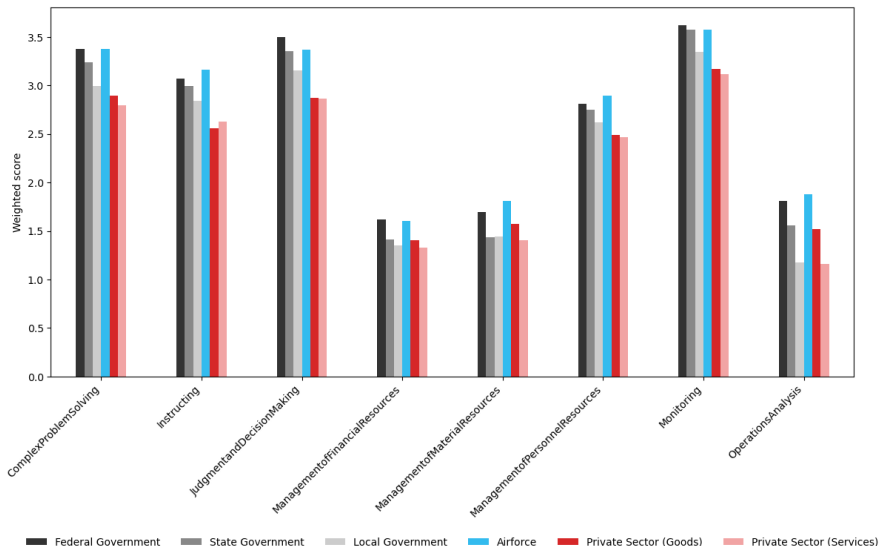
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# STEM SKILL REQUIREMENTS (AIR FORCE)

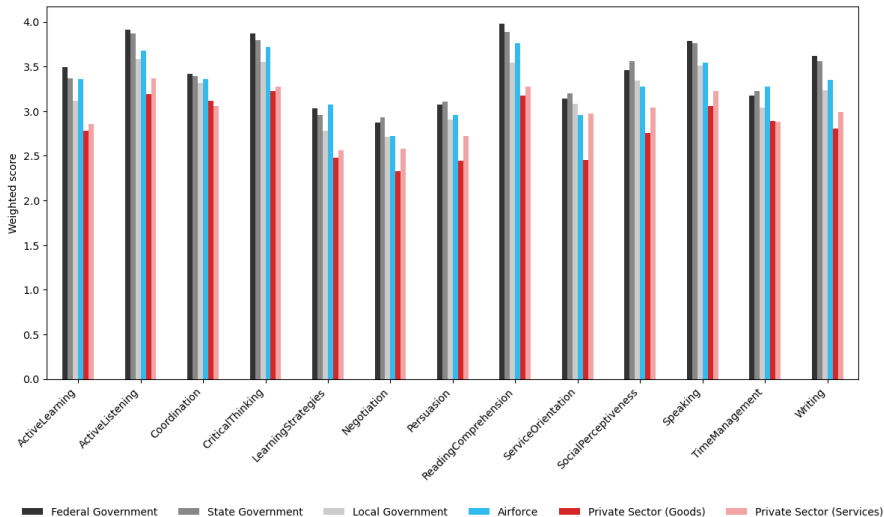


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# MANAGEMENT SKILL REQUIREMENTS (AIR FORCE)

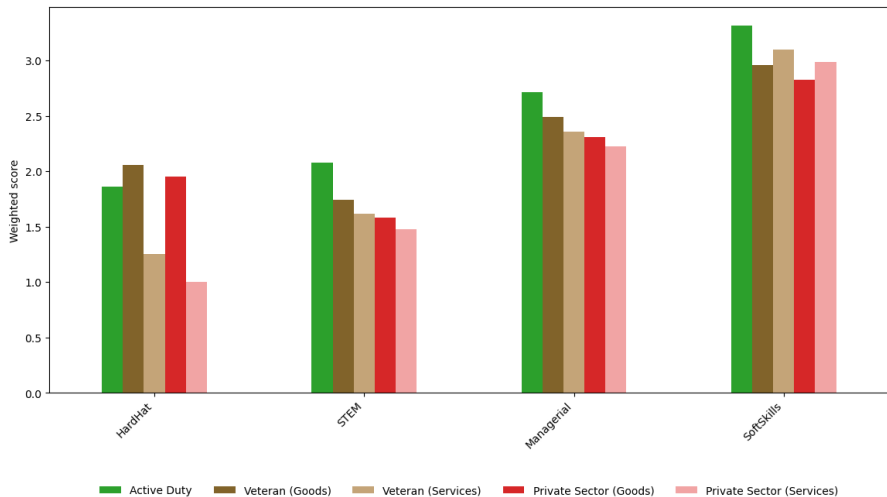


# SOFT/SOCIAL SKILL REQUIREMENTS (AIR FORCE)



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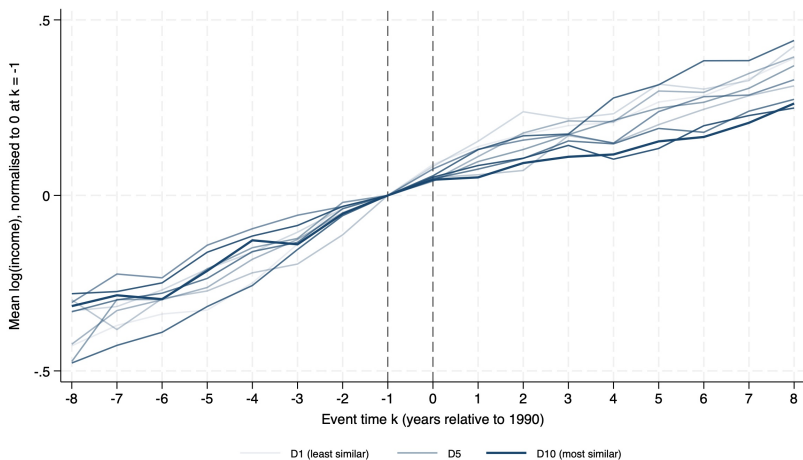
# SKILL REQUIREMENTS IN JOBS HELD BY VETERANS



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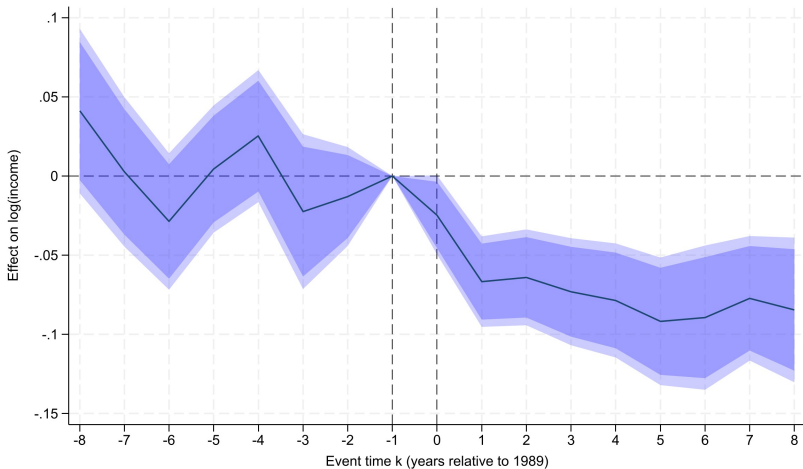
# EVENT STUDY: RAW TIME SERIES

## Top Quartile of Similarity



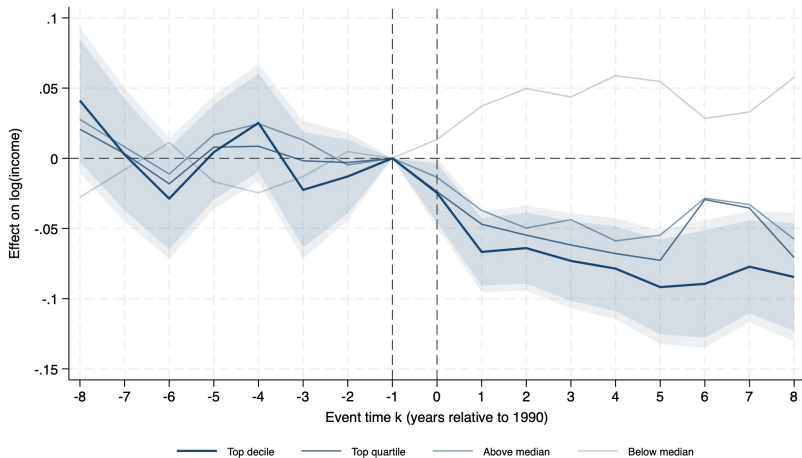
# EVENT STUDY

## Top Quartile of Similarity



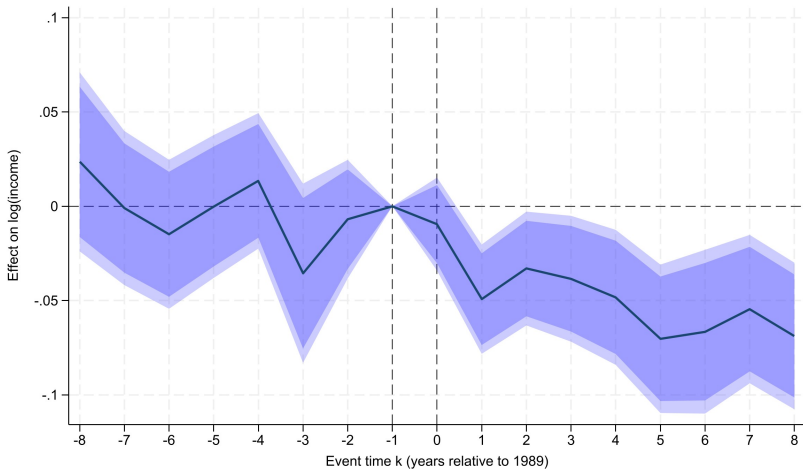
# EVENT STUDY

## Several Quantiles Compared



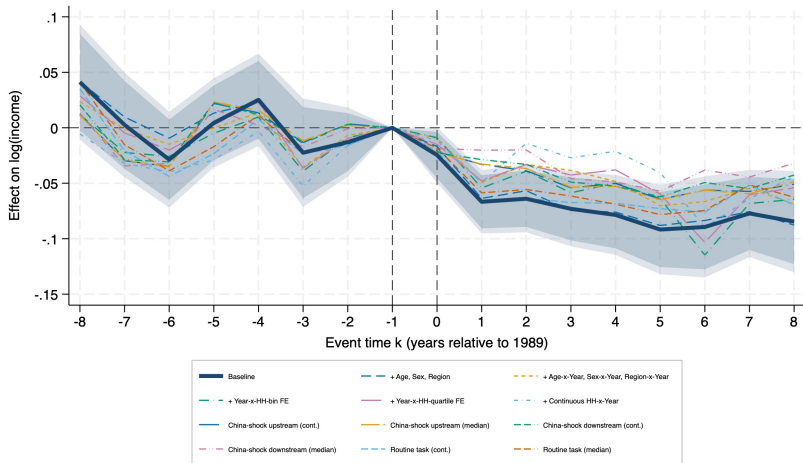
# EVENT STUDY

## Controlling for individual characteristics



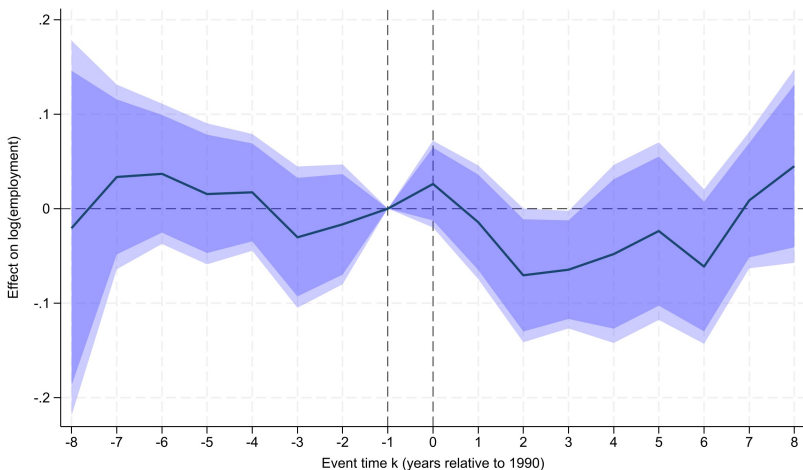
# EVENT STUDY

## Robustness Checks



# EVENT STUDY

## Employment Response



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# MODEL: PRODUCTION TECHNOLOGY AND WAGES

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**Production function** for occupation  $j$ :

$$y_j(\mathbf{h}) = \gamma_j f(\mathbf{h}, \mathbf{r}_j)$$

$\gamma_j$  = productivity of occupation  $j$ ,  $\mathbf{r}_j$  = skill requirements of occupation  $j$ ;  
 $f(\cdot)$  = match between worker skills and job requirements

**Competitive wage** equals marginal product:

$$w_j(\mathbf{h}) = p_j \gamma_j f(\mathbf{h}, \mathbf{r}_j)$$

**Skill accumulation** depends on occupation and learning ability  $\psi$ :

$$\mathbf{h}' = g_j(\mathbf{h}, \psi)$$

## MODEL: FIRM'S PROBLEM

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Each occupation  $j$  is produced by a representative firm:

$$\max_{n_j(\mathbf{h})} \int n_j(\mathbf{h}) (p_j y_j(\mathbf{h}) - w_j(\mathbf{h})) d\mathbf{h}$$

- $n_j(\mathbf{h})$ : labor employed with skill set  $\mathbf{h}$
- Firms in consumer goods and government sectors operate equivalently
- $p_j$ : price of occupation  $j$ 's output, determined in equilibrium

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## MODEL: OCCUPATIONAL CHOICE

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**Value function** for a worker of age  $a$ , skills  $\mathbf{h}$ , ability  $\psi$ , previous occupation  $k$ :

$$V_a(\mathbf{h}, \psi, k) = \mathbb{E} \left[ \max_j \log(w_j(\mathbf{h})(1 - \tau)) + \log \varepsilon_j + \mu_j - \kappa(k, j) + \beta V_{a+1}(\lambda_j(\mathbf{h}, \psi), \psi, j) \right]$$

- $\varepsilon_j \sim$  Gumbel: idiosyncratic match/productivity shock for occupation  $j$
- $\mu_j$ : amenity value of occupation  $j$
- $\kappa(k, j)$ : switching cost from occupation  $k$  to  $j$ ; set to  $\kappa \cdot \mathbf{1}[j \neq k]$
- $\lambda_j(\mathbf{h}, \psi)$ : next period's human capital when choosing  $j$
- Terminal condition:  $V_{A+1}(\cdot) = 0$

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# MODEL: LOGIT CHOICE PROBABILITIES

With Gumbel-distributed shocks, the **choice probability** has a closed form:

$$\mathbb{P}_a(j | \mathbf{h}, \psi, k) = \frac{\exp\left(\frac{1}{\zeta} (\log(w_j(\mathbf{h})(1 - \tau)) + \mu_j - \kappa(k, j) + \beta V_{a+1}(\lambda_j(\mathbf{h}, \psi), \psi, j))\right)}{\sum_{l=1}^J \exp\left(\frac{1}{\zeta} (\log(w_l(\mathbf{h})(1 - \tau)) + \mu_l - \kappa(k, l) + \beta V_{a+1}(\lambda_l(\mathbf{h}, \psi), \psi, l))\right)}$$

**Simplified value function:**

$$V_a(\mathbf{h}, \psi, k) = \zeta \log \sum_{j=1}^J \exp\left(\frac{1}{\zeta} (\log(w_j(\mathbf{h})(1 - \tau)) + \mu_j - \kappa(k, j) + \beta V_{a+1}(\lambda_j(\mathbf{h}, \psi), \psi, j))\right)$$

Solved via backward induction from age  $A$  to 1, with  $V_{A+1}(\cdot) = 0$

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## MODEL: PRIVATE AND PUBLIC DEMAND

**Consumer goods** – CES basket  $C = \left( \sum_{j=1}^{J^C} \alpha_j^\sigma c_j^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}}$ ; cost minimization yields:

$$\frac{p_j}{P_C} = \alpha_j^{\frac{1}{\sigma}} \left( \frac{c_j}{C} \right)^{-\frac{1}{\sigma}}, \quad P_C = \left( \sum_{j=1}^{J^C} \alpha_j p_j^{1-\sigma} \right)^{\frac{1}{1-\sigma}} = 1$$

**Government good** – CES aggregate  $G = \left( \sum_{j=J^C+1}^J \alpha_j^\sigma g_j^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}}$ ; cost minimization yields:

$$\frac{p_j}{P^G} = \alpha_j^{\frac{1}{\sigma}} \left( \frac{g_j}{G} \right)^{-\frac{1}{\sigma}}, \quad P^G = \left( \sum_{j=J^C+1}^J \alpha_j p_j^{1-\sigma} \right)^{\frac{1}{1-\sigma}}$$

**Government budget constraint:**  $P^G G = T$

# MODEL: EQUILIBRIUM CONDITIONS

**Law of motion** for the distribution of workers over states:

$$\Lambda_{a+1,t+1}(\mathbf{h}', \psi, j) = \sum_{k=1}^J \int_{\lambda_j(\mathbf{h}', \psi) \leq \mathbf{h}} \mathbb{P}_{a,t}(j | \mathbf{h}, \psi, k) d\Lambda_{a,t}(\mathbf{h}, \psi, k)$$

**Market clearing** for each occupation:

$$y_{j,t} \equiv \sum_{a=1}^A \sum_{k=1}^J \int y_j(\mathbf{h}) \mathbb{P}_{a,t}(j | \mathbf{h}, \psi, k) \mathbb{E}[\varepsilon_j | j, \mathbf{h}, \psi, k] d\Lambda_{a,t}(\mathbf{h}, \psi, k)$$

**Output market clearing:**  $c_j + g_j = y_j \quad \forall j$

**Labor market clearing:**  $n_{j,t}(\mathbf{h}) = G_{a,t}(\mathbf{h}, \psi, j) \quad \forall j, \mathbf{h}$

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