

Motivation
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Empirical Strategy
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G.I. Bill Effects
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Robustness
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Returns to Trade School
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Discussion
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The G.I. Bill & Vocational Training

Patrick Molligo (UCLA)

Practice Job Market Presentation

October 21, 2025

Vocational school is in vogue

The popularity of **vocational school** (trade school) is surging

- Enrollment ↑ 5% 2020–2023; 16% 2022–2023 [Clearinghouse \(2025\)](#)
- April 2025 workforce survey: 33% suggest trade school to H.S. graduates (vs. 28% for college)

Policymakers continue to invest millions & researchers are compiling new data (e.g., 2022 National Training, Education, and Workforce Survey (NTEWS) Pilot)

State and federal investment in trade school



Fri, Sep 15 2017

Why California is investing over \$200 million in vocational education



Release Number: 2024-98

Date: November 22, 2024

California Awards \$24.7 Million to Supercharge Apprenticeship Growth in New Industries

**U.S. DEPARTMENT OF LABOR****News Release**

US DEPARTMENT OF LABOR AWARDS \$86 MILLION TO 14 STATES FOR INVESTMENT IN SKILLS TRAINING PROGRAMS FOR CRITICAL IN-DEMAND, EMERGING INDUSTRIES

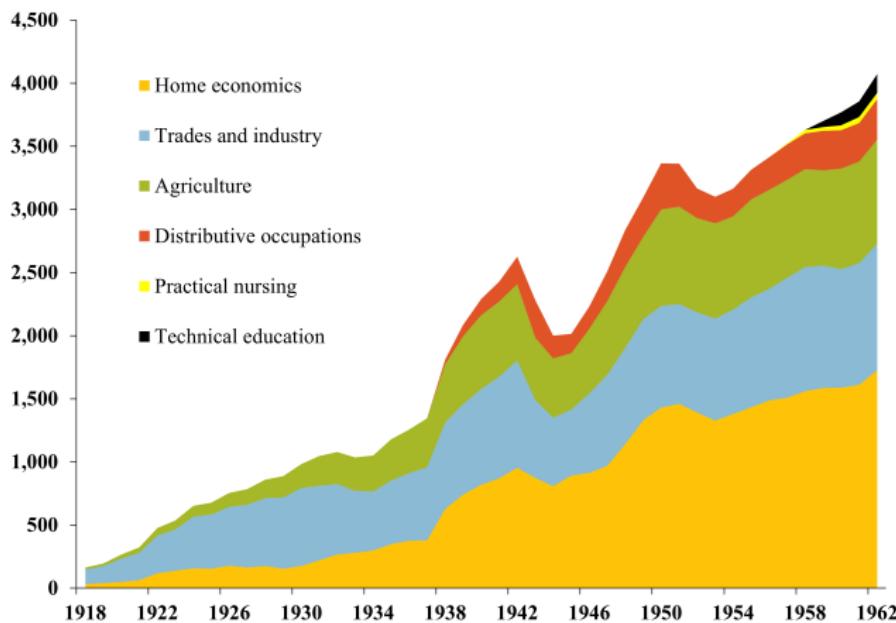
-September 30, 2025

Trade school lessons from history

This paper: **To what extent did the G.I. bill send workers to vocational school after WWII and the Korean War, and was there an effect on employment and earnings?**

- G.I. Bill – subsidies for veterans; started 1944, continues today
 - ▶ We know: ↑ in all types of education/training
 - ▶ Don't know: but-for benefits, expect a similar increase?
- Historical study of trade school → long-run outcomes

Vocational school enrollment, 1918-1962



*Units: thousands of students

Source: Digest of annual reports of state boards for vocational education to the Office of Education, Division of Vocational Education, 1918-1962.

Overview of this paper

① Measure trade school take-up in response to subsidies

- ▶ WWII & Korean War G.I. Bills → training stipends
- ▶ Exogenous variation in eligibility
- ▶ Trade school completion ↑ 4–9% (WWII), 3–7% (Korea)

② Estimate returns to trade school completion

- ▶ G.I. Bill instrument predicts training
- ▶ Modest effects on wages, employment, and occupation choice

Contributions

① G.I. Bill effects

- ▶ **New causal evidence on the G.I. Bill's impact on trade school enrollment vis-à-vis other choices**
- ▶ So far, evidence of increased college and high school attainment ([Bound and Turner \(2002\)](#); [Thomas \(2017\)](#), home ownership rates ([Fetter \(2013\)](#)), and marital sorting ([Larsen et al. \(2015\)](#))
- ▶ Innovation: [Abramitzky and Cristelli \(2025\)](#)

② Returns to trade school

- ▶ **New U.S. estimates, novel use of nationwide policy setting, long-run effects**
- ▶ Most studies are outside U.S. ([Aguirre \(2021\)](#), [Bertrand et al. \(2021\)](#), [Carruthers and Jepsen \(2021\)](#), [Zilic \(2018\)](#), [Hanushek et al. \(2017\)](#)) or measure short-term effects ([LaForest \(2023\)](#), [Meer \(2007\)](#))

The Mid-20th Century G.I. Bills

"An Act to provide Federal Government aid for the readjustment in civilian life of returning WWII veterans"

– (June 22, 1944, Public Law 346) Statement to Congress

"An Act to provide vocational readjustment and to restore lost educational opportunities to certain persons who served in the Armed Forces [...]"

– (July 16, 1952, Public Law 550)

	WWII	Korean War
Benefits (monthly)	Tuition + \$50-120 stipend	\$110-160 lump sum
Service period	Sep. 1940-Jul. 1947	Jun. 1950-Jan. 1955
Duration of Benefits	up to 4 years	up to 3 years
Expiration	1956	1965

Demand exceeded expectations

- High take-up + not only college [Definition](#)
 - ▶ Total utilization: 51% (WWII) and 44% (Korea)
 - ▶ Non-college shares: 71% (WWII) and 49% (Korea)

G.I. Bill Education Benefits Utilization

Conflict	Eligible	Received	Level of training received			
			College	Less than college	On-the-Job	Farm
World War II	15,440,000	7,800,000	2,230,000	3,480,000	1,400,000	690,000
Korean War	5,509,000	2,391,000	1,213,000	860,000	223,000	95,000

Source: [Bound and Turner \(2002\)](#), Appendix B2.

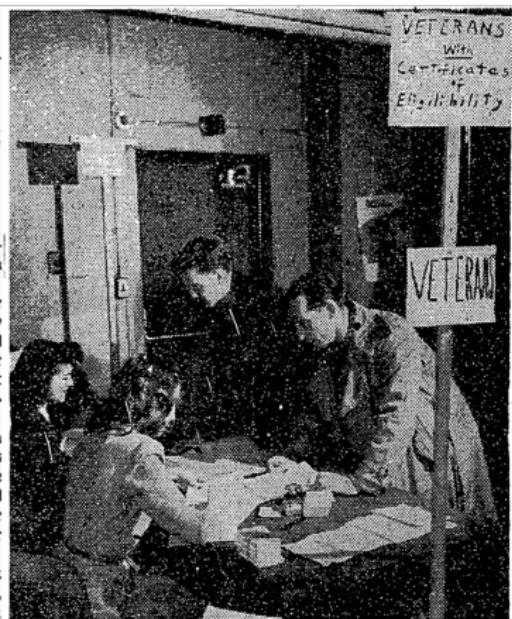
New York Times - 1956

G. I. SCHOOL LAW ENDS WEDNESDAY

7,800,000 Veterans Trained
in World War II Plan —
Korean Benefits Go On

Indeed, officials at the highest government levels predicted that a total of 500,000 veterans might take advantage of the bill. It was not long, though, before they revised their estimates and guessed perhaps 1,000,000.

Actually, even this highest estimate, which was met with skepticism in 1945, soon proved too conservative.



Empirical strategy – big picture

Military service → benefit eligibility → vocational school take-up

- Challenges:
 - ▶ Selection into military
 - ▶ Don't observe benefit utilization
- Key facts:
 - ▶ Min. enlistment age of 18
 - ▶ Born after 1929 (WWII) or 1935 (Korea) – too young to have served

Solution: Birth cohort ≈ benefit eligibility

Data sources

U.S. Census ([Ruggles et al. \(2024\)](#))

- 1970, 1% samples [Details](#)
 - ▶ Vocational training: completion + field of training [Survey form](#)
 - ▶ Veteran status (WWII, Korea)
 - ▶ Race, birth state/country, birth quarter
- 1940, 1% sample
 - ▶ State industry shares (manufacturing, agriculture, construction)
 - ▶ State urban/rural shares

Biennial Survey of Education, 1939 ([Lleras-Muney \(2002\)](#))

- Pre-WWII state characteristics
 - ▶ Population, education expenditures, manufacturing employment/wages

Digest of State Boards for Voc. Ed., 1940

- U.S. Office of Education, Vocational Division; digitized records
 - ▶ Vocational school enrollment by state

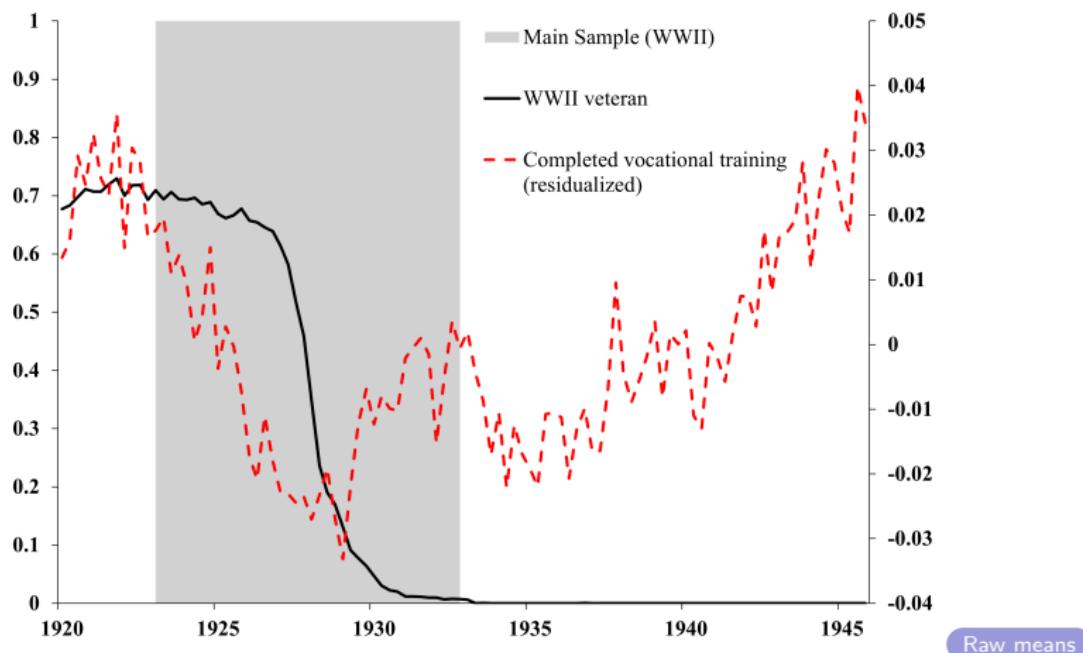
Sample construction

Sample restrictions:

- Drop allocated responses
- Black and white men only
- Exclude vets who served both conflicts
- Birth year ranges for each G.I. Bill analysis
 - ▶ WWII: 1923–1932 → 304,607 obs.
 - ▶ Korea: 1929–1939 → 321,460 obs.

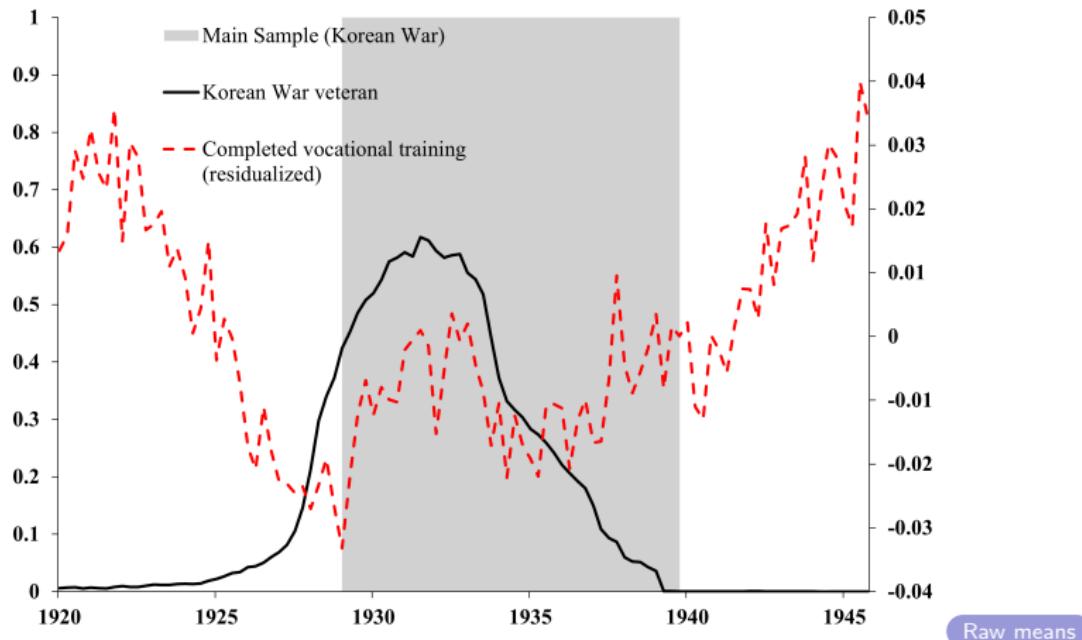
Identification - WWII sample

Share of WWII veterans & vocational school completion by cohort



Identification - Korean War sample

Share of Korean War veterans & vocational school completion by cohort



Linear Probability Model

$$Y_{ics} = \beta_1 \text{WWII}_c + \beta_2 \text{Korea}_c + \mathbf{Z}'_{ics} \delta + e_{ics}$$

- Y_{ics} : Vocational school completion
- WWII_c : cohort fraction of WWII veterans
- Korea_c : cohort fraction of Korean War veterans
 - ▶ s : state of birth
 - ▶ c : quarter of birth
- Controls \mathbf{Z} include:
 - ▶ Race
 - ▶ State of birth fixed effects; state characteristics
 - ▶ Linear & quadratic trend: birth year – 1929 + birth quarter/4

Important considerations for identification

- Key coefficients: β_1 and β_2
 - ▶ Effects of 100-pp ↑ in WWII/Korean War service share on prob. of completing trade school
 - ▶ Indirect effect of subsidies on training take-up
- G.I. Bill is a “bundled treatment”:
 - ▶ Tuition assistance, home loan guarantee, disability rehabilitation
 - ▶ Experience/training in armed forces
 - Can't isolate subsidy effect

Vocational training rates

Vocational Training completion rates

	Born 1923-32			Born 1929-39		
	All	White	Black	All	White	Black
No vocational training	68.45%	67.70%	76.65%	69.18%	68.39%	77.28%
Any vocational training	31.55%	32.30%	23.35%	30.82%	31.61%	22.72%
N	304,607	279,100	25,507	321,460	292,940	28,520

Vocational training fields

Vocational Training completion rates by field of study

	Born 1923-32			Born 1929-39		
	All	White	Black	All	White	Black
Trades & Crafts	56.31%	56.23%	57.45%	54.77%	54.92%	52.67%
Business	13.25%	13.43%	10.54%	13.68%	13.77%	12.42%
Engineering & Drafting	12.93%	13.35%	6.62%	14.02%	14.41%	8.50%
Agriculture & Home Econ.	3.51%	3.51%	3.53%	2.67%	2.66%	2.81%
Nursing & Health	2.48%	2.40%	3.58%	2.71%	2.57%	4.72%
Other	5.36%	5.29%	6.43%	5.98%	5.94%	6.48%
Not reported	6.17%	5.79%	11.85%	6.17%	5.73%	12.39%
N	96,110	90,154	5,956	99,079	92,599	6,480

Vocational training and years of school

Vocational Training completion rates by years of education

Panel A: Born 1923-32

	≤ 12 years	12 years	13-15 years	16 years
Trades & Crafts	69.66%	62.21%	41.51%	26.83%
Business	6.02%	12.97%	22.00%	19.15%
Engineering & Drafting	5.05%	10.43%	22.42%	26.30%
Agriculture & Home Economics	4.51%	3.63%	2.19%	2.61%
Nursing & Health	1.38%	1.67%	2.59%	7.24%
Other	4.95%	4.49%	5.14%	9.26%
Not reported	8.43%	4.60%	4.16%	8.60%
N	27,780	39,950	15,643	12,737

Panel B: Korea

G.I. Bill effects on vocational school completion

Effect of G.I. Bill on vocational school, 1923-1932 birth cohorts

	Voc. Training	Voc. Training, ≤ 14	Voc. Training, ≤ 12
Fraction WWII	0.086*** (0.021)	0.035* (0.015)	0.031 (0.017)
Fraction Korea	0.142*** (0.024)	0.070*** (0.019)	0.058* (0.024)
Black	-0.095* (0.046)	-0.117* (0.043)	-0.082 (0.041)
Black x Fraction WWII	0.052 (0.068)	0.114 (0.065)	0.079 (0.062)
Black x Fraction Korea	0.040 (0.082)	0.119 (0.075)	0.076 (0.071)
N	302,166	302,166	302,166
Mean dep. variable	0.315	0.265	0.222

Sample includes black and white men born between 1923 and 1932. Regressions include linear and quadratic time trends, defined as birth year - 1929 + birth quarter/4. Standard errors are clustered by quarter of birth. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

G.I. Bill effects on vocational school, Korean War

Effect of G.I. Bill on vocational school, 1929-1939 birth cohorts

	Voc. Training	Voc. Training, ≤ 14	Voc. Training, ≤ 12
Fraction Korea	0.069*** (0.017)	0.034 (0.018)	0.017 (0.022)
Fraction WWII	-0.140 (0.076)	-0.116 (0.098)	-0.115 (0.099)
Black	-0.052*** (0.004)	-0.035*** (0.004)	-0.026*** (0.004)
Black \times Fraction Korea	-0.015 (0.012)	-0.002 (0.010)	-0.007 (0.010)
Black \times Fraction WWII	-0.173** (0.062)	-0.191** (0.059)	-0.145* (0.071)
N	318,834	318,834	318,834
Fixed Effects	No	No	Yes
Mean dependent variable	0.308	0.258	0.211

Sample includes black and white men born between 1929 and 1939. Regressions include linear and quadratic time trends, defined as birth year - 1929 + birth quarter/4. Standard errors are clustered by quarter of birth. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

G.I. Bill effects on all education

Effect of G.I. Bill years of school and college

	Any Training	≤ 14	Years of School	Years of College	College Grad
Fraction WWII	0.086*** (0.021)	0.035* (0.015)	0.831** (0.286)	0.427*** (0.110)	0.100*** (0.025)
Fraction Korea	0.142*** (0.024)	0.070*** (0.019)	1.120** (0.391)	0.441** (0.142)	0.100** (0.034)
Black	-0.095* (0.046)	-0.117* (0.043)	-2.089*** (0.423)	-0.417* (0.171)	-0.064 (0.039)
Black x Fraction WWII	0.0520 (0.068)	0.1140 (0.065)	0.2360 (0.617)	-0.1430 (0.248)	-0.0500 (0.056)
Black x Fraction Korea	0.0400 (0.082)	0.1190 (0.075)	1.0940 (0.747)	-0.2870 (0.299)	-0.0910 (0.067)
N	302,166	302,166	302,166	302,166	302,166
Mean dep. Variable	0.315	0.265	11.552	0.990	0.174

Sample includes black and white men born between 1923 and 1932. Regressions include linear and quadratic time trends, defined as birth year - 1929 + birth quarter/4. Standard errors are clustered by quarter of birth. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Differences by geography, WWII

Effect of G.I. Bill on vocational school, southern states

	Voc. Training	Voc. Training, ≤ 14	Voc. Training, ≤ 12
Fraction WWII	0.105* (0.045)	0.079 (0.046)	0.070 (0.041)
Fraction Korea	0.153* (0.059)	0.108 (0.059)	0.096 (0.055)
Black	-0.089 (0.052)	-0.158** (0.053)	-0.140** (0.048)
Black \times Fraction WWII	0.010 (0.078)	0.133 (0.080)	0.130 (0.074)
Black \times Fraction Korea	-0.016 (0.092)	0.143 (0.092)	0.137 (0.083)
N	87,121	87,121	87,121
Fixed Effects	No	No	Yes
Mean dependent variable	0.282	0.238	0.202

Sample includes black and white men born between 1923 and 1932. Regressions include linear and quadratic time trends, defined as birth year - 1929 + birth quarter/4. Standard errors are clustered by quarter of birth. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Differences by geography, Korean War

Effect of G.I. Bill on vocational school, 1929-1939 birth cohorts, south

	Voc. Training	Voc. Training, ≤ 14	Voc. Training, ≤ 12
Fraction Korea	0.092** (0.033)	0.048 (0.031)	0.018 (0.031)
Fraction WWII	-0.071 (0.158)	-0.090 (0.175)	-0.153 (0.155)
Black	-0.095*** (0.006)	-0.080*** (0.006)	-0.057*** (0.006)
Black x Fraction Korea	-0.001 (0.015)	0.018 (0.014)	0.002 (0.014)
Black x Fraction WWII	-0.160* (0.064)	-0.187* (0.073)	-0.124 (0.087)
N	94,517	94,517	94,517
Fixed Effects	No	No	Yes
Mean dependent variable	0.267	0.225	0.187

Sample includes black and white men born between 1929 and 1939. Regressions include linear and quadratic time trends, defined as birth year - 1929 + birth quarter/4. Standard errors are clustered by quarter of birth. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Effect on field of training - WWII

Effect of G.I. Bill on training fields, 1923-1932 birth cohorts

	Any Training	Trades	Agri.	Engin.	Business	Health
Fraction WWII	0.086*** (0.021)	0.046* (0.018)	0.016** (0.005)	0.031* (0.015)	-0.0150 (0.011)	0.0010 (0.005)
Fraction Korea	0.142*** (0.024)	0.073** (0.023)	0.012 (0.006)	0.048* (0.019)	-0.006 (0.014)	0.004 (0.006)
Black	-0.095* (0.046)	-0.026 (0.040)	-0.022** (0.007)	0.005 (0.013)	-0.056** (0.019)	0.005 (0.009)
Black x Fraction WWII	0.0520 (0.068)	-0.0020 (0.059)	0.025* (0.011)	-0.0350 (0.019)	0.0540 (0.027)	-0.0060 (0.014)
Black x Fraction Korea	0.0400 (0.082)	-0.0260 (0.069)	0.033** (0.012)	-0.048* (0.022)	0.071* (0.034)	-0.0020 (0.016)
N	302,166	302,166	302,166	302,166	302,166	302,166
Mean dep. Variable	0.315	0.178	0.011	0.041	0.042	0.008

Sample includes black and white men born between 1923 and 1932. Regressions include linear and quadratic time trends, defined as birth year - 1929 + birth quarter/4. Standard errors are clustered by quarter of birth. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Effect on field of training - Korea

Effect of G.I. Bill on training fields, 1929-1939 birth cohorts

	Any Training	Trades	Agri.	Engin.	Business	Health
Fraction WWII	-0.1400 (0.076)	-0.0240 (0.063)	-0.0210 (0.015)	-0.083** (0.030)	-0.0140 (0.027)	0.0060 (0.011)
Fraction Korea	0.069*** (0.017)	0.036** (0.013)	0.004 (0.003)	0.005 (0.007)	0.009 (0.008)	0.004 (0.003)
Black	-0.052*** (0.004)	-0.038*** (0.003)	-0.001 (0.001)	-0.015*** (0.002)	-0.012*** (0.002)	0.006*** (0.001)
Black x Fraction WWII	-0.173** (0.062)	-0.062* (0.025)	0.0090 (0.017)	0.0160 (0.027)	-0.109* (0.043)	0.0110 (0.024)
Black x Fraction Korea	-0.0150 (0.012)	0.0030 (0.007)	-0.0030 (0.002)	-0.012* (0.004)	0.0010 (0.007)	-0.0050 (0.003)
N	318,834	318,834	318,834	318,834	318,834	318,834
Mean dep. Variable	0.308	0.169	0.008	0.043	0.042	0.008

Sample includes black and white men born between 1929 and 1939. Regressions include linear and quadratic time trends, defined as birth year - 1929 + birth quarter/4. Standard errors are clustered by quarter of birth. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Summary of LPM results

- Joint effect of G.I. Bill + military service ↑ training take-up
 - ▶ WWII: 9%
 - ▶ Korea: 7%
- Effect on trades/crafts programs positive but smaller
 - ▶ WWII: 5%
 - ▶ Korea: 3.5%
- Effect in South is stronger
 - ▶ WWII: 10.5%
 - ▶ Korea: 9%
- Evidence of positive offsetting effect for black workers post-WWII
 - ▶ WWII: $-9.5\% + 5.2\% = -4.3\%$

Robustness - expanding sample window forward

Effect of G.I. Bill on vocational school, alternate sample ranges

	1923-28	1923-29	1923-30	1923-31	1923-32	1923-33	1923-34	1923-35	1923-36
Fraction WWII	-0.0030 (0.042)	0.092* (0.037)	0.095** (0.030)	0.083** (0.026)	0.086*** (0.021)	0.089*** (0.018)	0.071*** (0.015)	0.073*** (0.015)	0.075*** (0.015)
Fraction Korea	0.090 (0.061)	0.180** (0.063)	0.165* (0.061)	0.134** (0.042)	0.142*** (0.024)	0.143*** (0.016)	0.119*** (0.012)	0.122*** (0.012)	0.125*** (0.012)
N	185,234	215,068	245,138	273,350	302,166	329,925	357,972	386,428	414,767
Mean dependent variable	0.314	0.313	0.314	0.315	0.315	0.315	0.314	0.313	0.312

Robustness - expanding sample window backward

Effect of G.I. Bill on vocational school, alternate sample ranges

	1919-32	1920-32	1921-32	1922-32	1923-32
Fraction WWII	0.250*** (0.030)	0.202*** (0.031)	0.140*** (0.024)	0.114*** (0.025)	0.086*** (0.021)
Fraction Korea	0.349*** (0.042)	0.282*** (0.042)	0.201*** (0.030)	0.171*** (0.030)	0.142*** (0.024)
Mean dep. var.	423,299	395,019	364,566	333,339	302,166
Mean dependent variable	0.318	0.319	0.318	0.317	0.315

Placebo check - WWI military service

G.I. Bill started in 1944 → don't expect effects after WWI

- U.S. involvement – mid-1917 through 1918
- Born after 1900 = low chance of draft Birth cohort shares
- Apply WWII and Korea War design to this setting

Placebo check - WWI military service

Effect of WWI service on training

	Any Training	Years of College	Years of School
Fraction WWI	-0.0070 (0.041)	-0.1760 (0.131)	-0.6150 (0.576)
Black	-0.071*** (0.004)	-0.291*** (0.014)	-2.746*** (0.067)
Black x Fraction WWI	-0.005 (0.021)	0.198** (0.061)	0.483 (0.283)
Mean dep. var.	110,275	110,275	110,275
Mean dependent variable	0.173	0.079	8.655

Robustness - Female sample

Effect of G.I. Bill on women's training

	Any Training	Voc. Training, ≤ 14	Trades	Business	College Grad	Years of School
Fraction WWII	0.0300 (0.046)	-0.004 (0.047)	0.009 (0.018)	0.031 (0.033)	-0.005 (0.031)	0.366 (0.280)
Fraction Korea	0.060 (0.056)	0.010 (0.059)	0.012 (0.022)	0.048 (0.040)	0.017 (0.040)	0.601 (0.365)
Black	0.102** (0.037)	0.084* (0.036)	0.030 (0.024)	0.029 (0.025)	-0.048 (0.024)	-0.973** (0.321)
Married	-0.044 (0.033)	-0.040 (0.035)	0.024 (0.014)	-0.005 (0.023)	-0.023 (0.022)	0.330 (0.202)
Married x Fraction WWII	0.024 (0.048)	0.028 (0.050)	-0.033 (0.021)	-0.017 (0.034)	0.006 (0.032)	-0.080 (0.298)
Married x Fraction Korea	0.007 (0.056)	0.021 (0.060)	-0.043 (0.025)	-0.026 (0.040)	-0.008 (0.038)	-0.089 (0.362)
N	318,100	318,100	318,100	318,100	318,100	318,100
Mean dependent variable	0.201	0.179	0.029	0.098	0.084	11.276

Training rates

Robustness - WWII mobilization

Effect of G.I. Bill on training w. state characteristics I

	Any Training	Trades	Any Training	Trades
Fraction WWII	0.083*** (0.016)	0.046** (0.013)	-0.0120 (0.028)	0.0190 (0.022)
Fraction Korea	0.134*** (0.018)	0.072*** (0.014)	0.0220 (0.033)	0.0410 (0.027)
Mobilization	0.251*** (0.050)	0.197*** (0.045)	0.250*** (0.051)	0.190*** (0.045)
N	284,583	284,583	284,583	284,583
Mean dependent variable	0.314	0.178	0.314	0.178
Voc. enrollment	No	No	Yes	Yes

Robustness - 1940 state controls

Effect of G.I. Bill on training w. state characteristics II

	Any Training	Trades	Any Training	Trades
Manuf. share (1940)	0.398*** (0.052)	0.290*** (0.048)	0.391*** (0.052)	0.295*** (0.048)
Agri. share (1940)	0.070* (0.027)	0.0130 (0.021)	0.098** (0.030)	0.0270 (0.023)
Construction share (1940)	0.3570 (0.180)	0.315* (0.132)	0.464* (0.194)	0.361* (0.137)
Education spending (1940)	-0.003* (0.0020)	-0.004** (0.0010)	-0.0030 (0.0020)	-0.004** (0.0010)

Korea

Robustness - Vocational school enrollment

Effect of G.I. Bill on training w. state characteristics III

	Any Training	Trades	Any Training	Trades
Fraction WWII	0.103*** (0.021)	0.052** (0.016)	0.111** (0.036)	0.125*** (0.029)
Fraction Korea	0.163*** (0.026)	0.082*** (0.021)	0.189*** (0.046)	0.178*** (0.036)
Voc/H.S. ratio			0.007 (0.063)	0.127** (0.040)
Voc/H.S. x Fraction WWII			0.227*** 0.057	0.058 (0.044)
Voc/H.S. x Fraction Korea			0.256*** (0.070)	0.0640 (0.051)

Korea

Expand the training choice set

- Subsidies used for a variety of programs
- Use multinomial logit framework to study more complex decision

$$Pr(Y_{ics} = k) = \frac{\exp(Z_{icsk})}{1 + \sum_{j=2}^K \exp(Z_{icsj})}$$

- ▶ Z_{icsk} measures log-odds ratio of alternative k relative to base case
- ▶ Same identification as LPM

Classifying workers by training type

Training alternatives used in multinomial logit model

	Definition	Share of workers	
		Born 1923-32	Born 1929-39
Less than high school	< 12 years ed.; No voc. training	30.80%	25.88%
High school	Exactly 12 years ed.; No voc. training	18.21%	21.18%
Vocational training	Completed vocational training; ≤ 14 years	26.55%	25.84%
College	> 12 years ed.; No voc. training	24.44%	27.10%
N		304,607	321,460

Multinomial logit estimates, base = no training, WWII

Effect of G.I. Bill on relative odds of choices, 1923-1932 birth cohorts

	H.S.	Vocational Training	College
Fraction WWII	0.917 (0.170)	1.694** (0.273)	1.430 (0.262)
Fraction Korea	1.748* (0.436)	2.696*** (0.586)	1.6170 (0.398)
N	302,166		
Base alternative	No training		
IIA test statistic	123.32	-79.17	1.69

Base = college

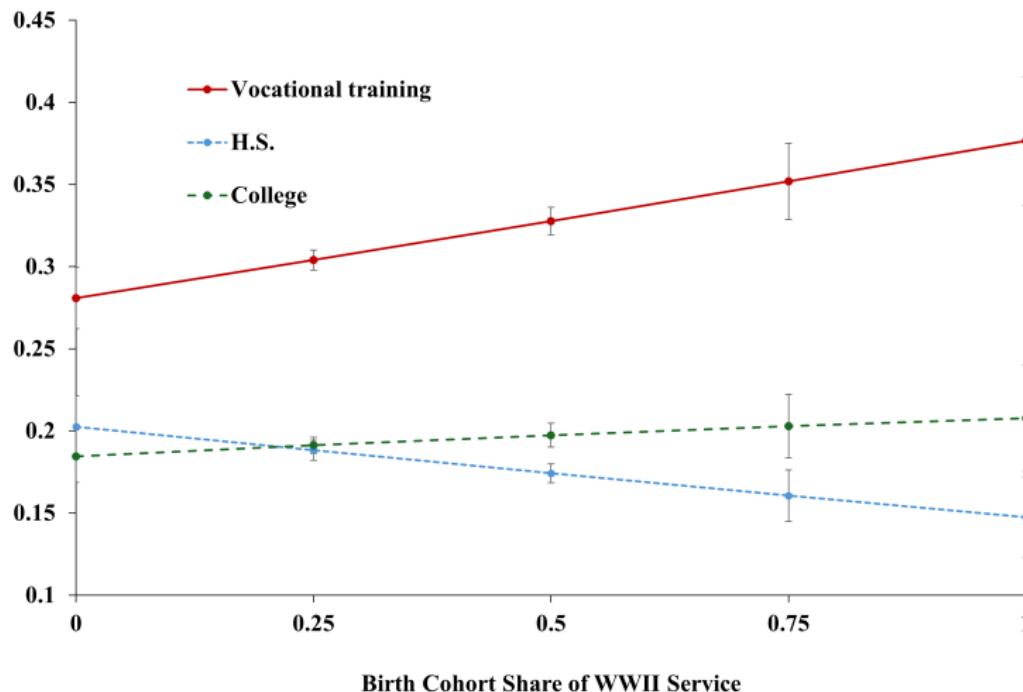
Multinomial logit estimates, base = no training, Korea

Effect of G.I. Bill on relative odds of choices, 1929-1939 birth cohorts

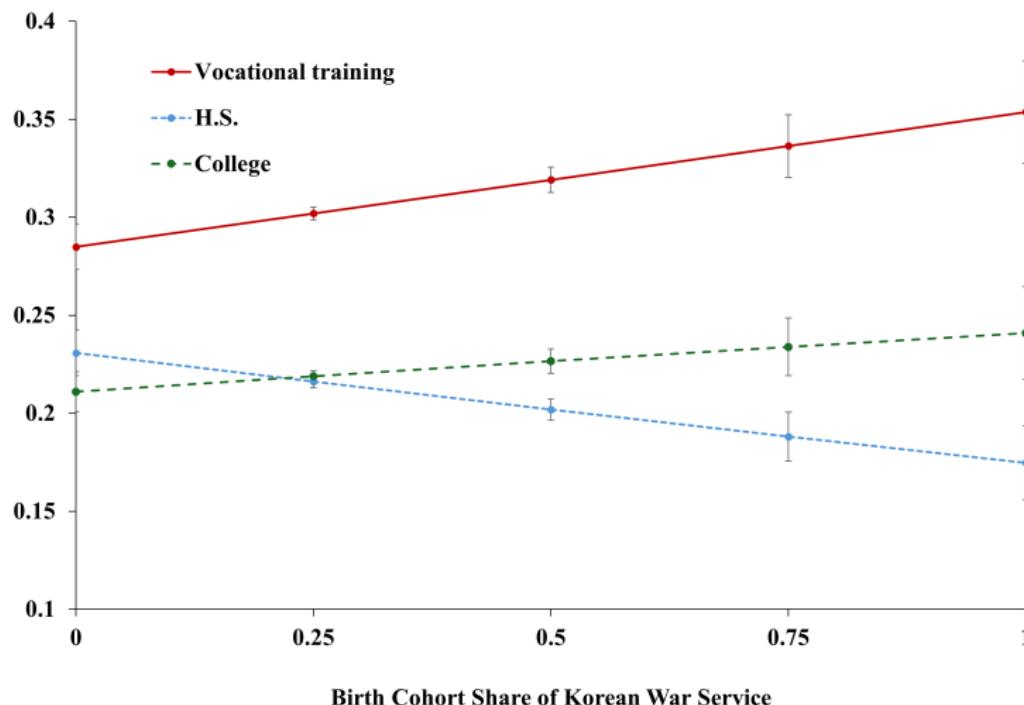
	H.S.	Vocational Training	College
Fraction WWII	0.369 (0.537)	0.109 (0.141)	1.201 (1.741)
Fraction Korea	50.695*** (52.958)	18.744** (17.341)	29.400** (30.489)
N	116,932		
Base alternative	No training		
IIA test statistic	12.66	-39.06	-7.25

Base = college

Multinomial logit - marginal effects - WWII



Multinomial logit - marginal effects - Korean War



Measuring returns to trade school

If vocational training is endogenous, labor market effects biased

Take-up regressions suggest G.I. Bills shifted workers into training

⇒ 2SLS identifies LATE:

$$\text{Training}_{ics} = \alpha_1 * \text{WWII}_c + \alpha_2 * \text{Korea}_c + \mathbf{Z}'_{ics} * \gamma + \nu_{ics}$$

$$Y_{ics} = \beta_1 \widehat{\text{Training}}_{ics} + \mathbf{Z}'_{ics} * \delta + e_{ics}$$

- Y_{ics} : log hourly wages; employed (0/1); below poverty (0/1); employed in manufacturing/construction (0/1)
- Controls and predictors as defined in LPM

Estimated returns to trade school, WWII sample

Labor market effects of vocational training, 1923-1932 birth cohorts

	OLS			2SLS		
	Log Wage	Poverty	Employed	Log Wage	Poverty	Employed
Voc. Train.	0.060*** (0.003)	-0.024*** (0.001)	0.020*** (0.001)	0.1930 (0.343)	0.317* (0.156)	0.2280 (0.150)
Black	-0.330*** (0.006)	0.126*** (0.002)	-0.082*** (0.002)	-0.289** (0.106)	0.229*** (0.047)	-0.0190 (0.045)
N	242,434	297,950	302,166	242,434	297,950	302,166
Mean dep. variable	1.403	0.062	0.932	1.403	0.062	0.932
First stage F-stat.	-	-	-	2913.27	3675.70	3819.83

Effects on occupational choice, WWII sample

Occupational choice effects of vocational training, 1923-1932 birth cohorts

	OLS		2SLS	
	Construction	Manufacturing	Construction	Manufacturing
Vocational training	0.015*** (0.001)	0.013*** (0.002)	-0.387* (0.196)	0.2530 (0.262)
Black	0.0000 (0.002)	0.014*** (0.004)	-0.122* (0.059)	0.0870 (0.079)
N	302,166	302,166	302,166	302,166
Mean dependent variable	0.100	0.301	0.100	0.301
First stage F-stat.	-	-	3819.83	3819.83

Alternative approach - 2SRI

G.I. Bill shifts workers in/out of college/trade school

Might not be a valid policy instrument to measure returns

⇒ Use 2-stage residual inclusion (2SRI) ([Terza et al. \(2008\)](#)):

- ① Estimate training probabilities with multinomial logit for k choices
- ② Compute residuals: $r_k = 1[k = 1] - \hat{P}(k, X)$
- ③ Include r_k in wage regression

$$Y_{ics} = \beta_{1k} \text{Training}_{ik} + \mathbf{X}'_{ics} * \delta + \sum \gamma_k r_k + e_{ics}$$

2SRI estimates - returns to training

Estimated returns to training choices, 1923-1933 cohorts

	Log Hourly Wage
Vocational Training	0.874***
College	1.59***
H.S.	0.43
N	242,434
Mean dependent variable	1.403

Concluding discussion

- New evidence on causal effects of G.I. Bill on vocational training
 - ▶ Access to benefits increased trade school enrollment
 - Reduction in direct & opportunity costs of training
 - ▶ Strong outcomes in South
 - ▶ Heterogeneous effects by field
 - ▶ Positive effects on wages
- Future research:
 - ▶ Use results as historical benchmark
 - ▶ Marginal worker deciding on college

Thank you for your attention!

Contact: pmolligo@gmail.com

Definitions

Vocational Education: Educational programs directly related to preparation of individuals for employment in occupations requiring less than a baccalaureate or advanced degree (1990 Perkins Act).

[Back](#)

G.I. Bill: "All public or private elementary, secondary, and other schools furnishing education for adults, business schools and colleges, scientific and technical institutions, colleges, **vocational schools**, junior colleges, teachers colleges, normal schools, professional schools, universities, and other educational institutions, and [...] other establishments providing apprentice or other training on the job [...]"
– 1944 Servicemen's Readjustment Act, Chapter 4, Education of Veterans

[Back](#)

G.I. Bill origins

FDR statement to Congress, November 23, 1943:

"What our servicemen and women want, more than anything else, is the assurance of satisfactory employment upon their return to civil life... The goal after the war should be the maximum utilization of our human and material resources."

Back

Oldest student

MAJOR, OVER 60, TAKES G. I. COURSE

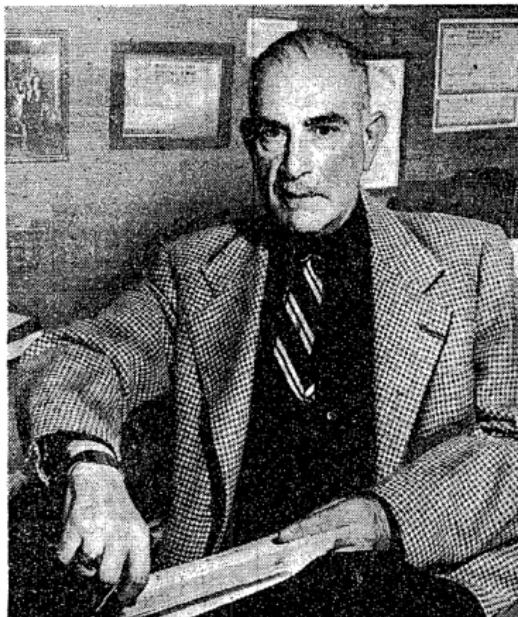
Peter Rodyenko, Philosopher and Soldier, Caps a World Career on Long Island

Four evenings out of every seven, Maj. Peter Rodyenko squeezes his six-foot frame into a midget British car and drives purposefully from his home at Plandome, L. I. Monday and Wednesday evenings he heads for Oyster Bay and Fridays for Hicksville, to attend Long Island University classes in philosophy and history. A fourth night he goes to Mitchell Air Force Base for Civil Air Patrol duties.

Often unorthodox and always positive about his ideas, the major sounds off in class about Spinoza or Kant or illustrates a point in a discussion of world affairs with an anecdote about his experiences with the Chinese Army from 1912 to 1919.

The major is the oldest student, so far as is known, attending college under the G. I. Bill of Rights. He smilingly admits to being "over 60." Records of his birth in Austria

OLDEST COLLEGE STUDENT UNDER G. I. BILL



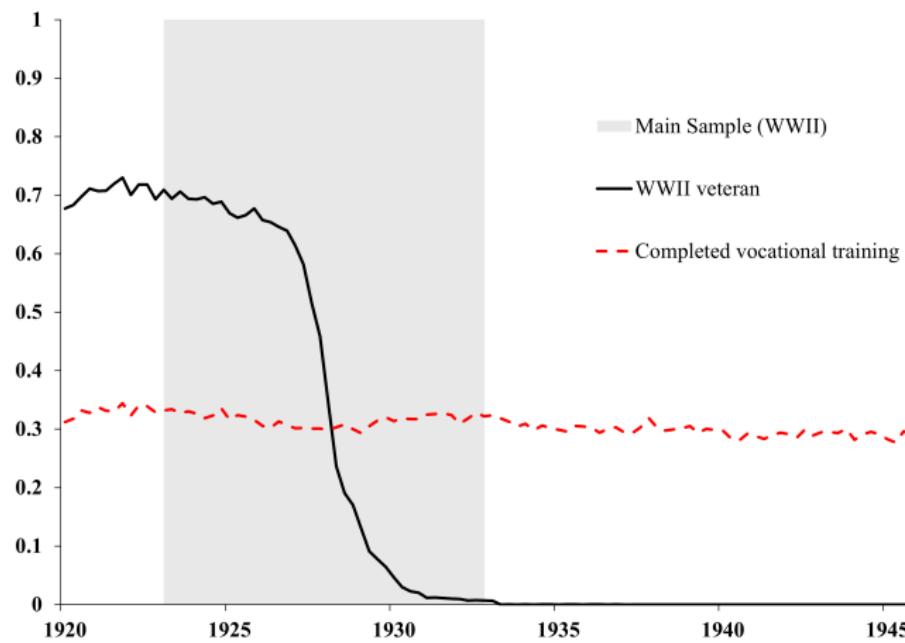
Maj. Peter Rodyenko at his home in Plandome, L. I.

The New York Times

Back

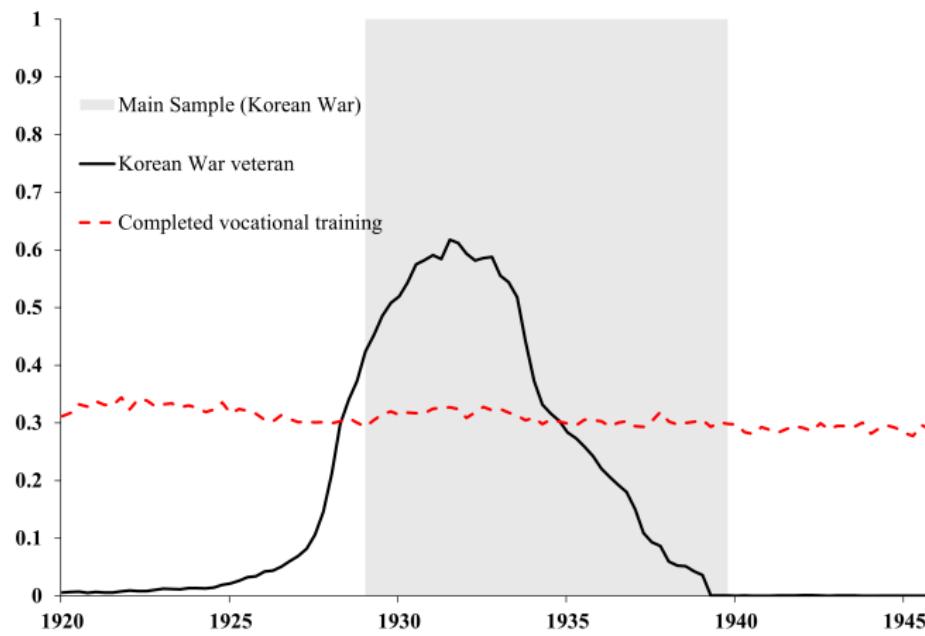
Identification - WWII sample, raw means

Share of WWII veterans & vocational school completion by cohort

[Back](#)

Identification - Korean War sample, raw mean

Share of Korean War veterans & vocational school completion by cohort



Back

1970 U.S. Census

Two different survey forms, not linked

- Form 1:
 - ▶ 3 samples, each 5% of population (state, metro area, neighborhood)
 - ▶ Vocational school completion
 - *SCHLVOC*: respondent ever completed a vocational training program
 - If yes, main field of training (Business, nursing/health, trades/crafts, engineering/drafting, agriculture/home economics)
- Form 2:
 - ▶ 3 samples, each 15% of population (state, metro area, neighborhood)
 - ▶ Veteran status by conflict (*VETWWII*, *VETKOREA*)

Back

Vocational school Census question

Question text on Census:

27(a). Has this person ever completed a vocational training program? For example, in high school; as apprentice; in school of business, nursing or trades; technical institute; or Armed Forces schools.*

- Yes
- No (skip to 28)

**Count only programs that he finished. Do not count courses which are not part of an organized program of study. Do not count training he got on-the-job, in company schools, in college after the second year, or by correspondence.*

27(b). What was his main field of vocational training? Fill one circle.

- Business, office work
- Nursing, other health fields
- Trades and crafts (mechanic, electrician, beautician, etc.)
- Engineering or science technician; draftsman
- Agriculture or home economics
- Other field - Specify

Back

Vocational training and years of school

Vocational Training completion rates by years of education

Panel B: Born 1929-39

	\leq 12 years	12 years	13-15 years	16 years
Trades & Crafts	69.44%	62.36%	40.30%	24.17%
Business	5.96%	12.60%	20.60%	20.41%
Engineering & Drafting	5.17%	10.92%	24.44%	24.97%
Agriculture & Home Economics	2.41%	2.87%	1.98%	3.30%
Nursing & Health	1.58%	1.75%	2.94%	7.61%
Other	5.58%	4.92%	5.68%	10.78%
Not reported	9.85%	4.58%	4.05%	8.75%
N	21,167	46,685	18,021	13,206

Back

WWI veteran shares by birth cohort

[Back](#)

Vocational training rates - Women

Vocational training completion rates, women

	Born 1923-32			Born 1929-39		
	All	White	Black	All	White	Black
No vocational training	79.87%	79.64%	81.97%	79.54%	79.54%	79.58%
Any vocational training	20.13%	20.36%	18.03%	20.46%	20.46%	20.42%
N	322,042	290,385	31,657	337,291	301,176	36,115

[Back](#)

Vocational training fields - Women

Vocational training by field, women

	Born 1923-32			Born 1929-39		
	All	White	Black	All	White	Black
Business	48.86%	51.22%	24.42%	48.69%	50.92%	29.97%
Nursing & Health	22.48%	21.51%	32.44%	24.01%	22.96%	32.86%
Trades & Crafts	14.18%	13.52%	21.04%	12.61%	12.12%	16.67%
Not reported	7.69%	7.15%	13.35%	7.65%	7.15%	11.79%
Other	3.71%	3.69%	4.01%	4.05%	4.03%	4.19%
Agriculture & Home Economics	2.19%	2.00%	4.22%	2.25%	2.05%	3.88%
Engineering & Drafting	0.88%	0.91%	0.53%	0.75%	0.76%	0.64%
N	64,820	59,111	5,709	69,000	61,627	7,373

[Back](#)

Vocational training and years of school - Women

Vocational training by education, women

Born 1923-32

	≤ 12 years	12 years	13-15 years	16 years
Trades & Crafts	27.68%	13.41%	5.95%	3.45%
Business	31.68%	58.43%	49.19%	25.40%
Engineering & Drafting	0.74%	0.62%	1.31%	2.08%
Agriculture & Home Economics	3.11%	1.73%	1.21%	5.68%
Nursing & Health	18.66%	17.96%	34.19%	36.01%
Other	3.03%	2.43%	3.62%	15.47%
Not reported	15.10%	5.43%	4.53%	11.90%
N	13,186	34,694	12,278	4,662

Back

Multinomial logit estimates, base = college, WWII

Effect of G.I. Bill on choices, 1923-1932 birth cohorts, base case = college

	No Training	Vocational Training	H.S.
Fraction WWII	0.699 (0.128)	1.18 (0.211)	0.641* (0.129)
Fraction Korea	0.6180 (0.152)	1.668* (0.397)	1.0810 (0.289)
N	302,166		
Base alternative	College		
IIA test statistic	15.30	-79.17	123.32

Back

Multinomial logit estimates, base = college, Korea

Effect of G.I. Bill on choices, 1929-1939 birth cohorts, base case = college

	No Training	Vocational Training	H.S.
Fraction WWII	0.832 (1.206)	0.091 (0.127)	0.307 (0.476)
Fraction Korea	0.034** (0.035)	0.6380 (0.624)	1.7240 (1.885)
N	116,932		
Base alternative	College		
IIA test statistic	-5.21	-39.10	12.70

Back

Post-war costs of training

COLLEGE COST REDUCTION DUE TO THE WORLD WAR II AND KOREAN WAR GI BILLS

<i>Cost per academic year</i>	World War II (1948)		Korea (1956)	
	<i>Private university</i>	<i>Public university</i>	<i>Private university</i>	<i>Public university</i>
Tuition and fees (dollars)	402	102	626	148
Opportunity cost (dollars)	1390	1390	1890	1890
Total cost (dollars)	1792	1492	2516	2038
<i>GI bill subsidy per academic year, by family composition</i>		<i>Subsidy in dollars</i>		
No children	1077	777	990	990
1 child	1347	1047	1210	1210
≥2 children	1482	1182	1440	1440
<i>Subsidy as a percentage of total cost</i>				
No children	60	52	39	49
1 child	75	70	48	59
≥2 children	83	80	57	71

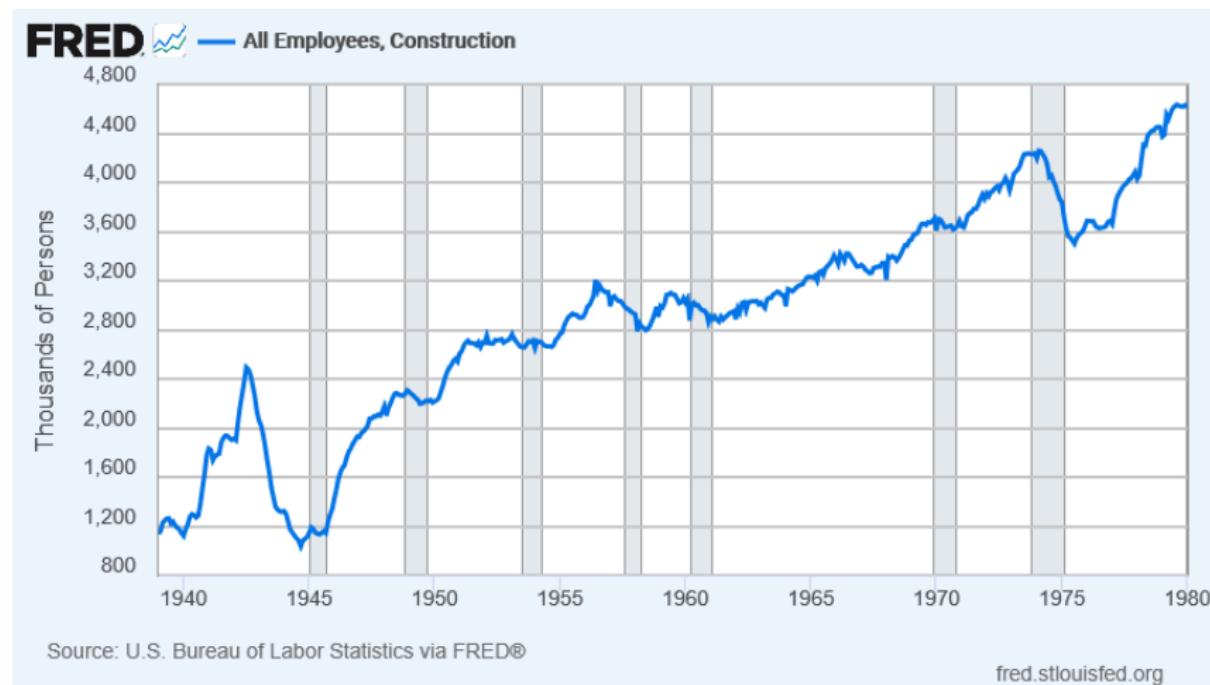
Stanley (2003)

U.S. Manufacturing employment, 1939-1980



Back

U.S. Construction employment, 1939-1980



Back

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