G.I. Bill subsidies and vocational training after WWII

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This project

1. Did tuition subsidies after WWII and Korean War increase enrollment in vocational training?

   - 1944: Servicemen's Readjustment Act (G.I. Bill) + Korean War extension

   - Widescale draft of most men → source of randomization

2. Did local access to education shift veterans into vocational training vis-à-vis college?

   - Black veterans faced segregation

   - Historically Black Colleges and Universities (HBCUs)

Empirical strategy – big picture

Goal: measure G.I. Bill effect on education/training

Challenges:

(i) Selection into military

(ii) Don't observe benefit utilization

Solution: Birth cohort ≈ benefit eligibility

WWII military service → benefit eligibility → college education

Bound and Turner (2002), Larsen et al. (2015), Thomas (2017)
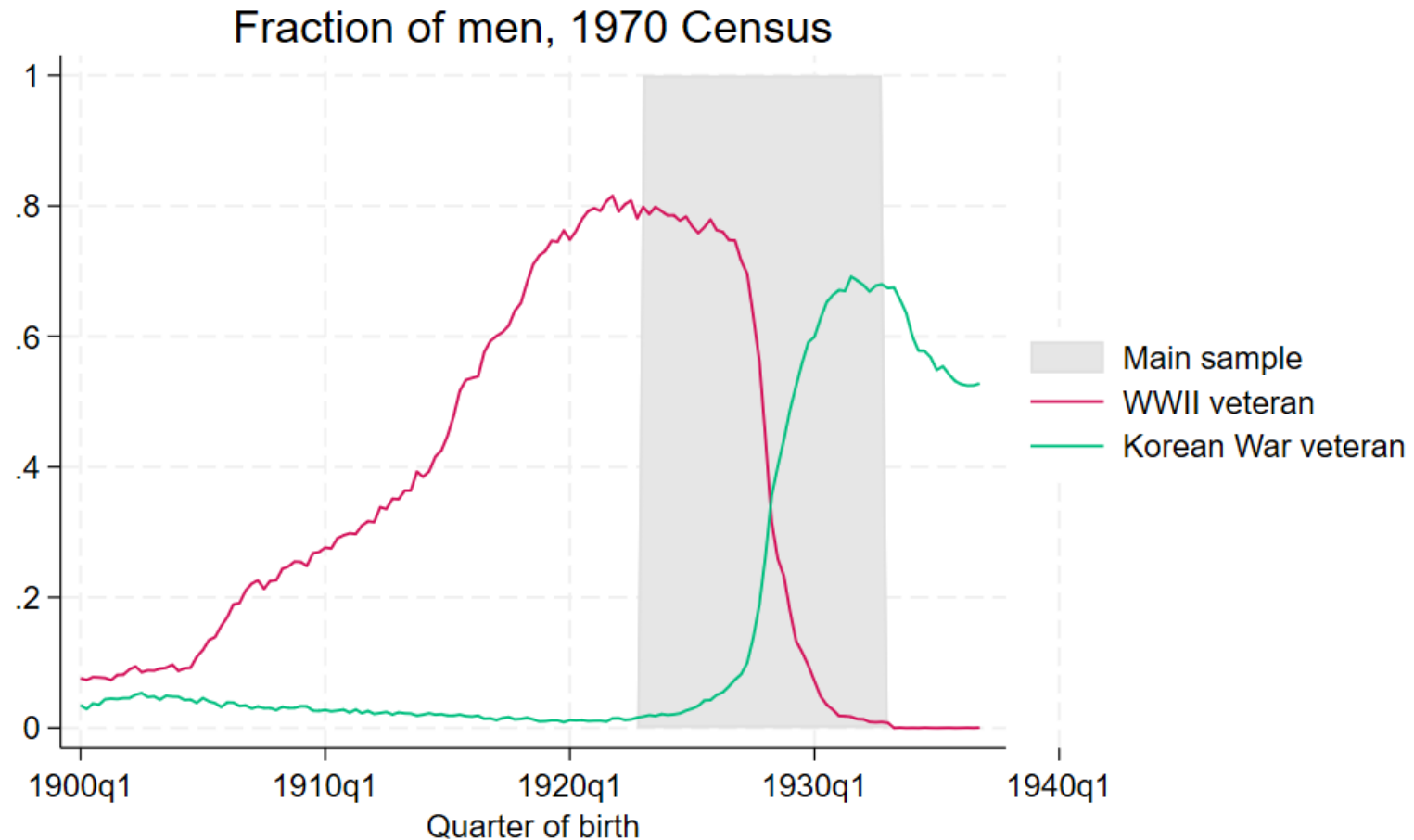
Difference from previous studies

- Strong evidence of increased:
  - College education (white)
  - High school attainment
  - Marital sorting
  - Home ownership
  - *Bound and Turner (2002), Stanley (2003), Thomas (2017), Larsen et al. (2015)*

Today: look at vocational (job) training as alternative use of G.I. benefits
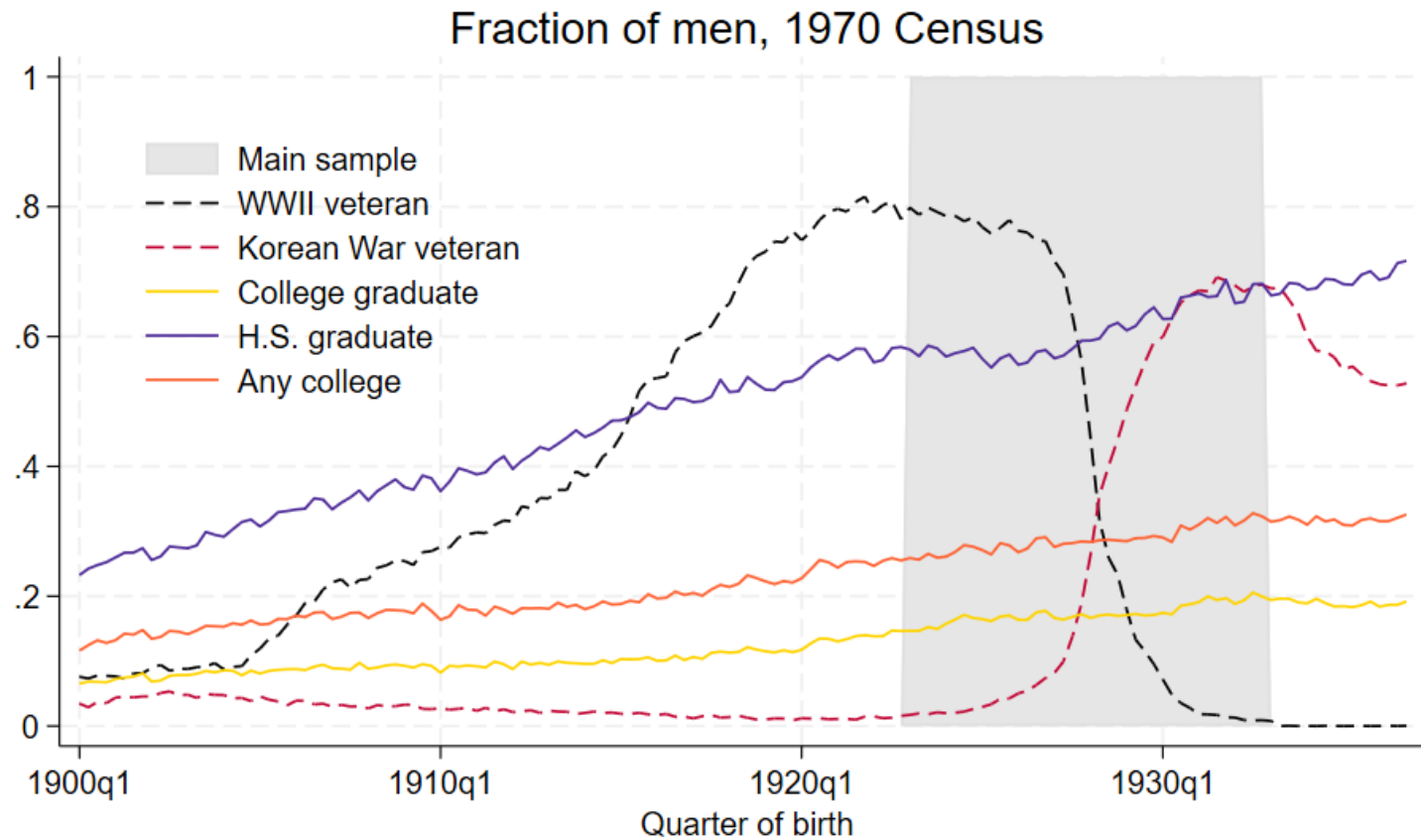
New empirical approaches to setting

  - Completed training & predicted training (occupation-industry cells)

  - Interaction with HBCUs

  - Multinomial logit

Variation in veteran status

Education + veteran status

Fraction of men, 1970 Census

Legend:
- Main sample (shaded region)
- WWII veteran (black dashed)
- Korean War veteran (red dashed)
- College graduate (yellow)
- H.S. graduate (purple)
- Any college (orange)

x-axis: Quarter of birth (1900q1, 1910q1, 1920q1, 1930q1)
y-axis: 0 to 1

Years educ

Years college

Vocational training + veteran status

Fraction of men, 1970 Census

Legend:
- Main sample
- WWII veteran
- Korean War veteran
- Completed vocational training
- Any college

x-axis: Quarter of birth (1900q1, 1910q1, 1920q1, 1930q1)
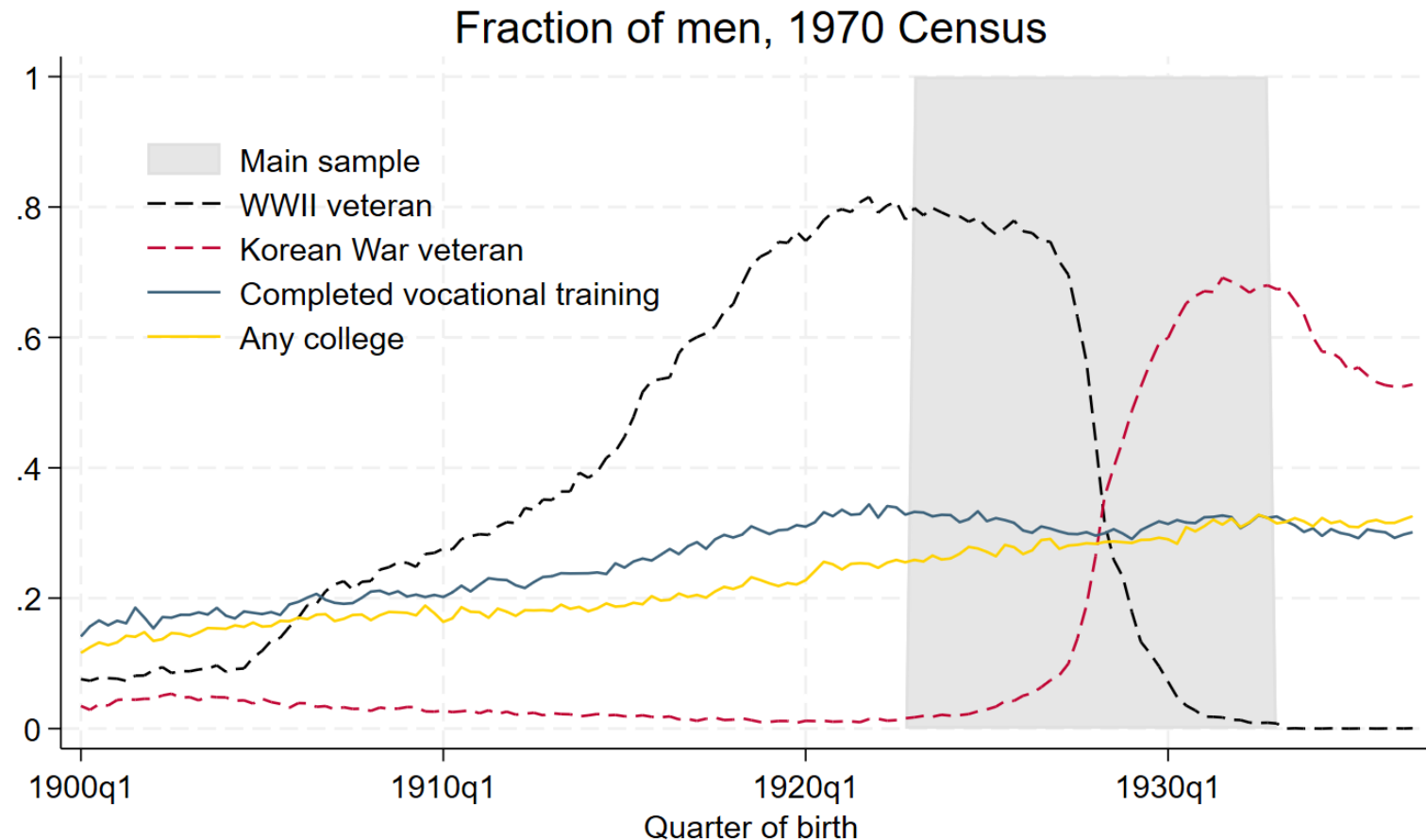
Breakdown

G.I. Bill overview

An Act to provide Federal Government aid for the readjustment in civilian life of returning World War II veterans. [...] This Act may be cited as the "Servicemen's Readjustment Act of 1944".

– June 22, 1944, Public Law 346

- Direct cash benefits to individual veterans
  - $500 for tuition/books + $50-$120 monthly stipend
  - Served between Sept. 1940 and July 1947; at least 90 days
  - Min. 1 year training/eduction → up to 4 years depending on service

- Similar Bill for Korean War (served 1950-1955)

G.I. Bill take up

## Utilization of Veterans' Education Benefits

G.I. Bill	Number Eligible	Number of Veterans Enrolled				Program Cost (Billions of Dollars)
		College	Other Schools	On-the-Job Training	Farm Training	
World War II	15,440,000*	2,230,000	3,480,000	1,400,000	690,000	14.5
Korea	5,509,000	1,213,000	860,000	223,000	95,000	4.5
Vietnam	8,200,000	5,100,000	2,500,000	591,000	56,000	42

SOURCE.—U.S. Department of Veterans' Affairs (1999).
* Total veteran population.

Source: Bound & Turner (2002), Appendix B2

Vocation training vs. vet status by state
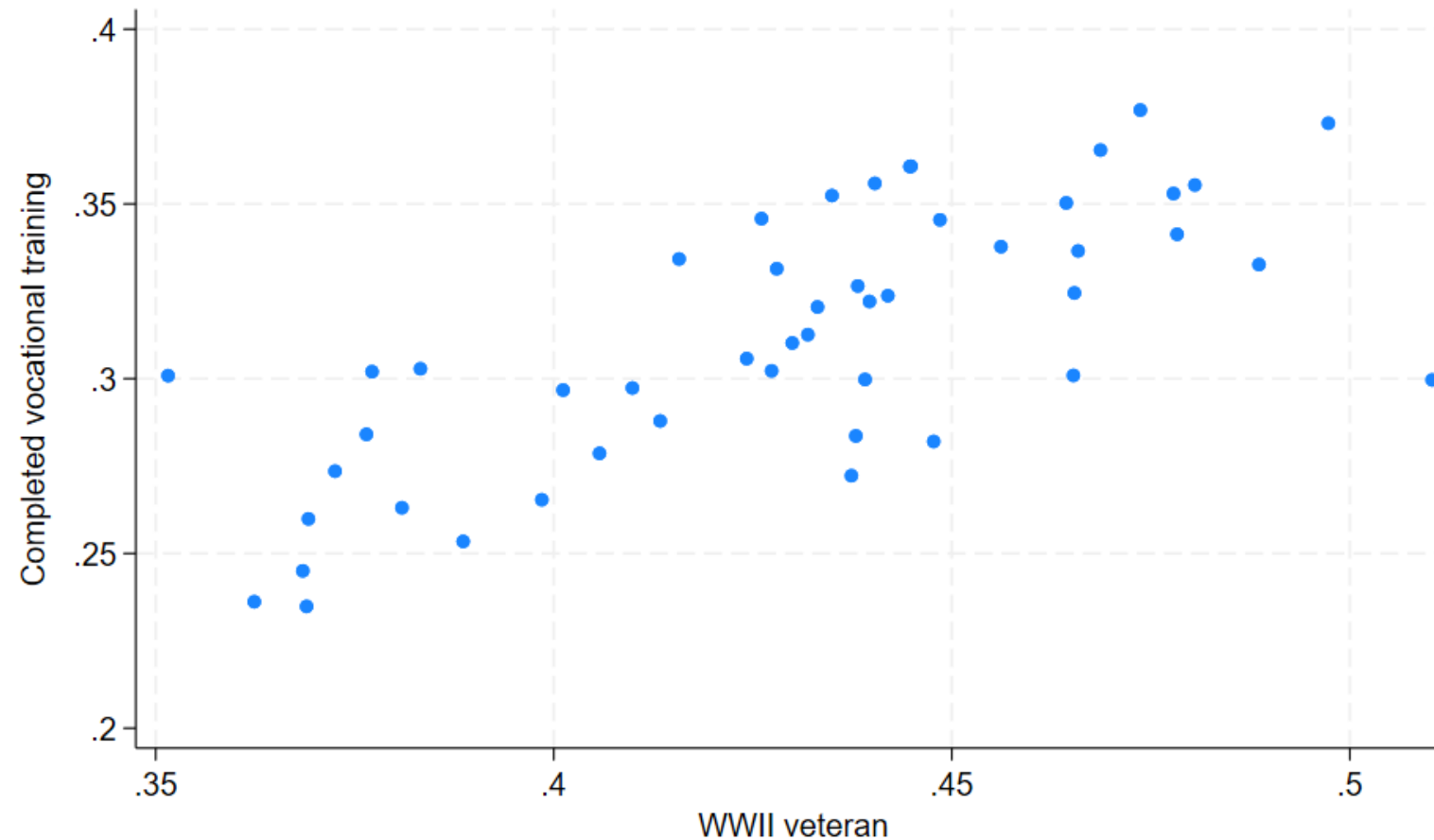
Empirical model #1

$$Y_{ics} = \beta_0 + \boldsymbol{\beta_1 * WWII_{cs}} + \boldsymbol{\beta_2 * Korea_{cs}} + \beta_3 * State + \beta_4 * Black_i + \beta_5 * Trend + \beta_6 * Trend^2 + e_{ics}$$

Y_{ics}: Education/training attainment

$WWII_{cs}$: fraction served in WWII (birth cohort-state)

$Korea_{cs}$: fraction served in Korean War (birth cohort-state)

State: State of birth dummy

Trend: birth year – 1929 + birth quarter/4

Empirical model #2

Possible complication: G.I. Bill allows college, high school, or job training

Solution: multinomial logit model - relative odds of choosing vocational training

$$\Pr(Y_i = k) = \frac{\exp(Z_{ik})}{1 + \sum_{j=2}^{K} \exp(Z_{ij})}$$

$$Z_{ik} = \beta_{0k} + \boldsymbol{\beta_{1k} * WWII_{cs}} + \boldsymbol{\beta_{2k} * Korea_{cs}} + \beta_{3k} * State + \beta_{4k} * Black_i + \beta_{5k} * Trend + \beta_{6k} * Trend^2$$

- *K* alternatives
  - Less than H.S.
  - H.S. (or equivalent) but no vocational training
  - Vocational school
  - College

Public data sources

U.S. Census - 1970 1% samples (IPUMS)

Key variables:

- Vocational training *(SCHLVOC)*
  - Ever completed a vocational training program + main field of training.
  - Special high school programs, apprenticeships, business, nursing, and trade schools, technical institutes, and armed forces schools

- Military service *(VETWWII, VETKOREA)*

HBCU data

- Number of HBCUs by county, date founded, date closed

Did the GI Bill increase vocational training?

Table 1: Effect of WWII service on education (1923-1932 birth cohorts) - State and quarter of birth

	(1) Years ed.	(2) H.S. grad	(3) College	(4) Voc. training
Fraction WWII	0.679***	0.0159	0.0688***	0.0502*
	(0.125)	(0.0173)	(0.00964)	(0.0193)
Fraction Korea	0.741***	0.0949***	0.0594***	0.0886***
	(0.149)	(0.0230)	(0.0127)	(0.0210)
Fraction black	-1.567***	-0.200***	-0.116***	-0.0743***
	(0.147)	(0.0157)	(0.00796)	(0.00642)
Fraction black=1 × Fraction WWII	-0.498***	-0.0289***	0.0167***	0.0192*
	(0.0638)	(0.00693)	(0.00413)	(0.00869)
N	574,628	574,628	574,628	288,422
Mean dep. var.	11.605	0.606	0.173	0.315

Std. errors in parentheses, clustered by state-quarter of birth.

Quarter only

County

Acemoglu et al.

Effects in the South

Table 5: Effect of WWII service on education in South

	(1) Years ed.	(2) H.S. grad	(3) College	(4) Voc. training
Fraction WWII	1.101*	0.0660	0.0744*	0.0728
	(0.422)	(0.0474)	(0.0285)	(0.0448)
Fraction Korea	1.218*	0.119	0.0660	0.108
	(0.593)	(0.0739)	(0.0375)	(0.0650)
Fraction black	-2.154***	-0.275***	-0.0995***	-0.101***
	(0.375)	(0.0326)	(0.00802)	(0.0168)
Fraction black=1 × Fraction WWII	-0.670***	-0.0247	-0.00159	0.0580
	(0.0802)	(0.0171)	(0.0106)	(0.0324)
N	86,980	86,980	86,980	43,685
Mean dep. var.	10.801	0.522	0.149	0.277

Std. errors in parentheses, clustered by birth cohort-state of birth.

Non-south

Effects by race

Table 7: Effect of WWII service on education – Black sample

	(1) Years ed.	(2) H.S. grad	(3) College	(4) Voc. training
Fraction WWII	0.959***	0.0579**	0.0227	0.0372
	(0.125)	(0.0196)	(0.0117)	(0.0286)
Fraction Korea	0.960***	0.128***	0.0321*	0.0208
	(0.156)	(0.0274)	(0.0141)	(0.0256)
N	49,405	49,405	49,405	24,598
Mean dep. var.	9.389	0.336	0.052	0.231

Std. errors in parentheses, clustered by birth cohort-state of birth.

South

Effect of HBCUs in birth state

Table 9: Effect of WWII service on education - Black sample + HBCUS

	(1) Years ed.	(2) H.S. grad	(3) College	(4) Voc. training
Fraction WWII	1.035***	0.0539*	0.0269	0.0665
	(0.233)	(0.0262)	(0.0211)	(0.0478)
Fraction Korea	1.014***	0.0891*	0.0325	0.0430
	(0.246)	(0.0329)	(0.0242)	(0.0400)
Num. HBCUs in birth state	-0.135***	-0.00707***	-0.000686	-0.00598***
	(0.0129)	(0.00161)	(0.000824)	(0.00147)
N	20,094	20,094	20,094	10,103
Mean dep. var.	8.989	0.291	0.050	0.217

Std. errors in parentheses, clustered by birth cohort-state of birth.

Binary

Multinomial logit – base = no training

Table 11: Effect of WWII service on education decisions

	(1) H.S.	Vocational_training	College
Fraction WWII	0.707***	1.341***	1.603***
	(0.0666)	(0.110)	(0.115)
Fraction Korea	0.862	1.607***	1.520***
	(0.102)	(0.166)	(0.136)
N	574,628		

Odds ratios reported. Std. errors in parentheses.

Alternate ordering

What kind of training?

Table 13: Type of vocational training - Men

	Vocational training	H.S.	Some coll	4 years coll
Business, office work	13.18	12.92	21.80	19.34
Nursing, health fields	2.41	1.70	2.61	6.76
Trades and crafts	56.67	62.30	42.11	27.77
Engineering, drafting, science technician	12.68	10.34	22.05	25.44
Agriculture, home economics	3.59	3.69	2.13	2.77
Other vocational field	5.34	4.45	5.13	9.39
Field not reported	6.14	4.61	4.18	8.53
N	90,750	38,402	14,688	11,747

Birth years 1923-1932. Question from 1970 census on type of vocational program completed.

Alternative measure of vocational school

- Data limitation of 1970 vocational school measure

  - Few observations; not linked to veteran questionnaire; broad measure; single Census year

Construct a more detailed measure

1. Group by occupation-industry-education attainment
2. Compute fraction with vocational training
3. Classify high/low intensity of voc. school

Variation within occupations

Occupation	Industry	Years of school	Fraction vocational training
Carpenters	Fabricated steel products	12	0.51
Carpenters	Fabricated steel products	13	0.76
Carpenters	Fabricated steel products	14	0.82

Variation across industries

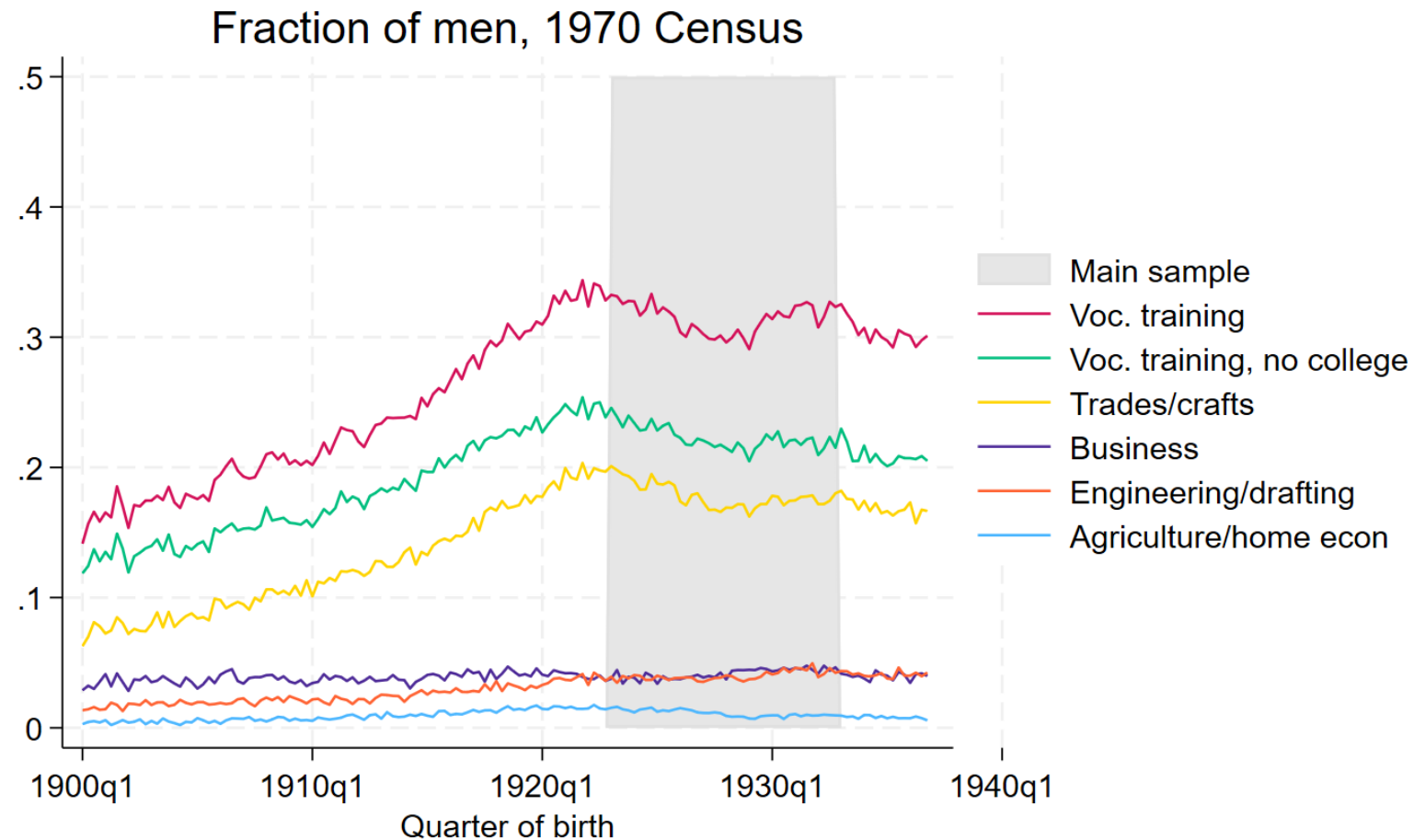| Occupation	Industry	Years of school	Fraction vocational training
Carpenters	Misc retail stores	12	0.26
Carpenters	Misc retail stores	13	0.50
Carpenters	Misc retail stores	14	0.20

New outcome variable

Table 14: Effect of WWII service on voc. school intensity (1923-1932 birth cohorts) - State and quarter of birth

	(1) High intesnity job	(2) High intesnity job (alt)
Fraction WWII	0.00128	0.00274
	(0.00433)	(0.00267)
Fraction Korea	0.00172	0.00388
	(0.00551)	(0.00344)
Fraction black	-0.00284*	-0.000964
	(0.00105)	(0.000822)
Fraction black=1 × Fraction WWII	0.00223	0.00190
	(0.00207)	(0.00173)
N	574,628	574,628
Mean dep. var.	0.016	0.010

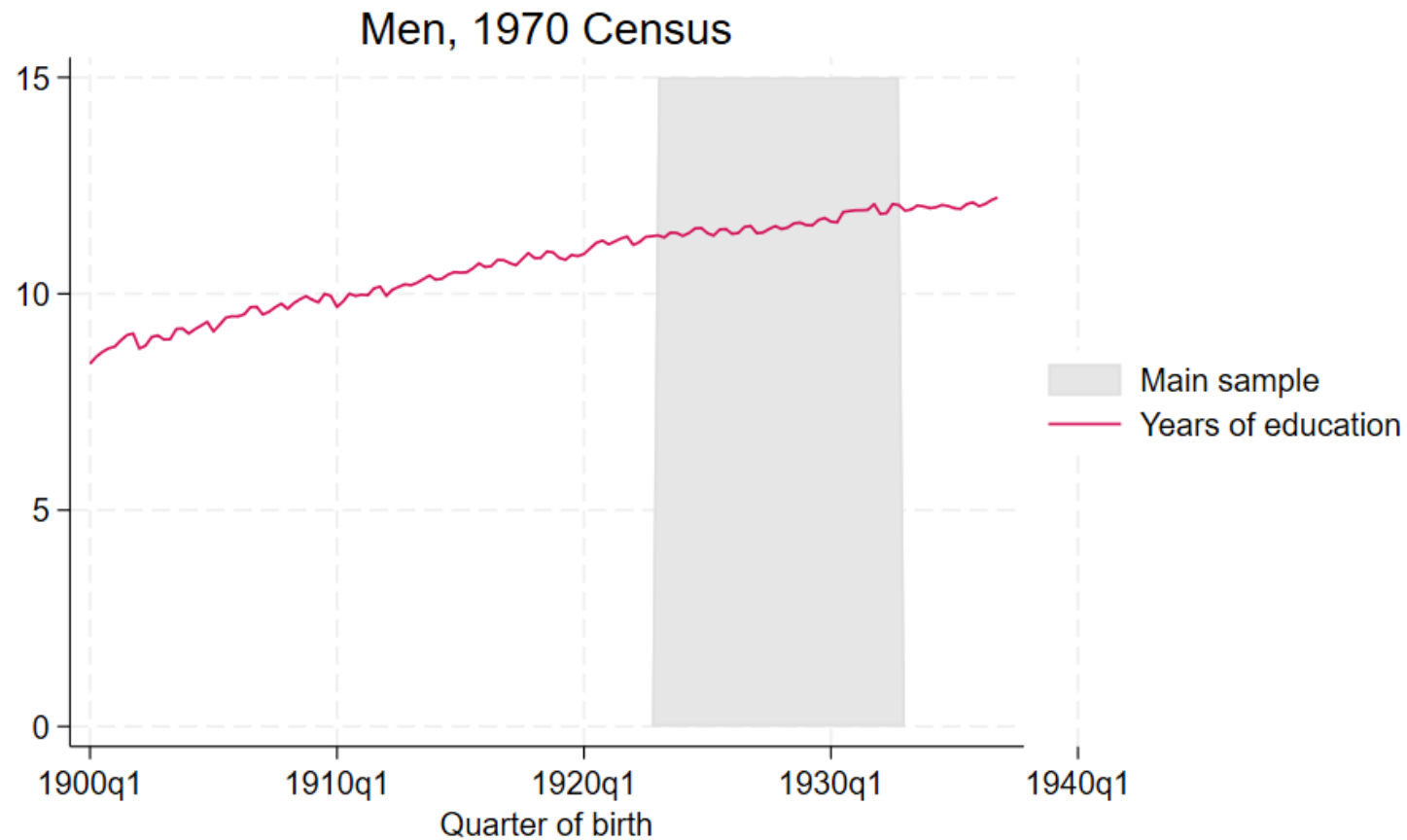Std. errors in parentheses, clustered by state-quarter of birth.

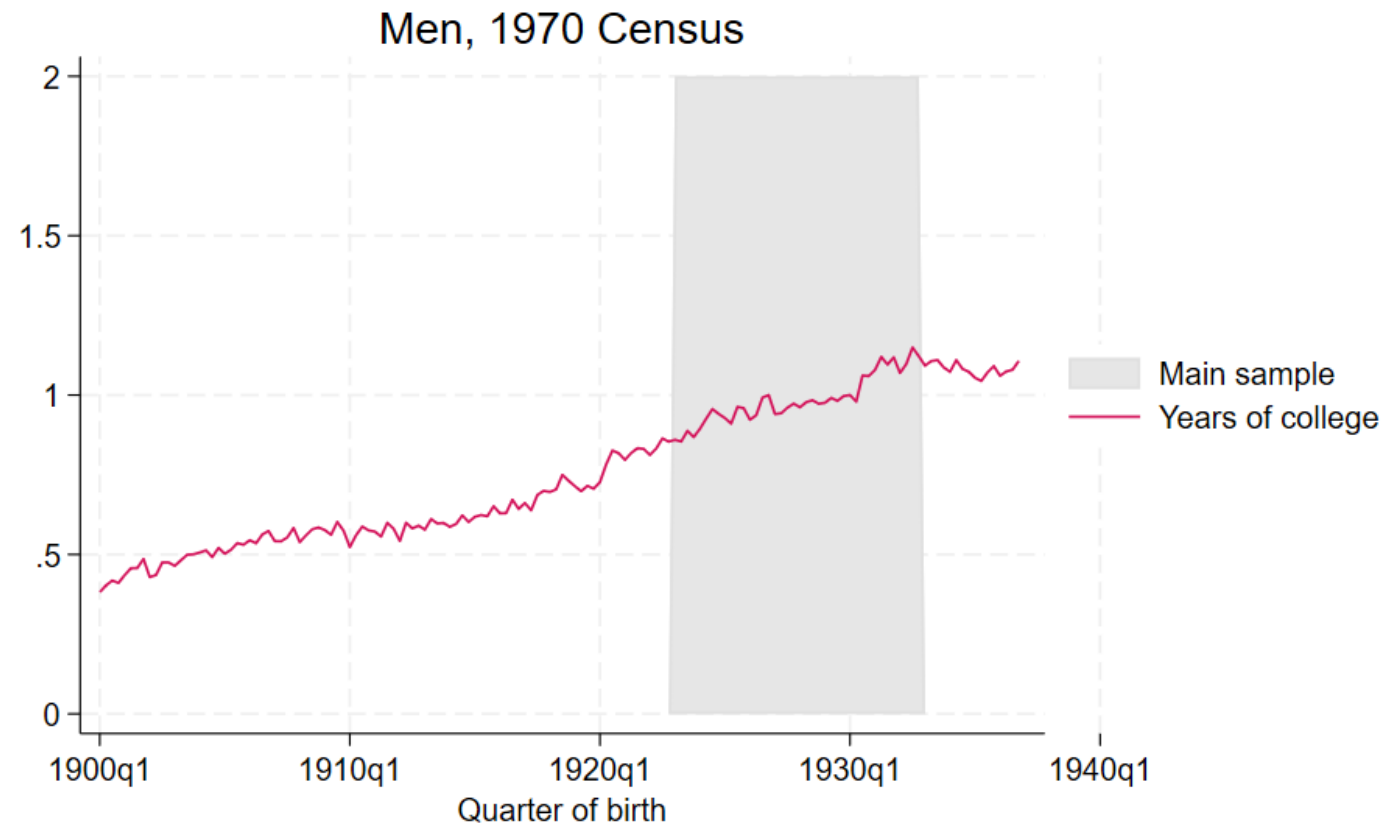# Appendix

Vocational training - detailed

Fraction of men, 1970 Census

Legend:
- Main sample
- Voc. training
- Voc. training, no college
- Trades/crafts
- Business
- Engineering/drafting
- Agriculture/home econ

x-axis: Quarter of birth

Back

Years of education

Men, 1970 Census

Back

Years of college

Back

Birth quarter mobilization

Table 2: Effect of WWII service on education (1923-1932 birth cohorts) - Quarter of birth

	(1) Years ed.	(2) H.S. grad	(3) College	(4) Voc. training
Fraction WWII	1.388**	0.0880	0.0783*	0.156**
	(0.456)	(0.0631)	(0.0303)	(0.0452)
Fraction Korea	1.810**	0.216*	0.0659	0.234***
	(0.588)	(0.0826)	(0.0426)	(0.0594)
Fraction black	-1.532***	-0.202***	-0.118***	-0.0748***
	(0.139)	(0.0150)	(0.00824)	(0.00651)
Fraction black=1 × Fraction WWII	-0.552***	-0.0224***	0.0212***	0.0194*
	(0.0492)	(0.00628)	(0.00442)	(0.00884)
N	574,644	574,644	574,644	288,438
Mean dep. var.	11.605	0.606	0.173	0.315

Std. errors in parentheses, clustered by birth quarter.

Back

County mobilization (non-movers)

Table 3: Effect of WWII service on education (1923-1932 birth cohorts) - County mobilzation

	(1) Years ed.	(2) H.S. grad	(3) College	(4) Voc. training
Fraction WWII	1.100***	0.0948***	0.0452***	0.0335*
	(0.128)	(0.0121)	(0.00547)	(0.0132)
Fraction Korea	1.021***	0.124***	0.0338***	0.0171
	(0.0956)	(0.00856)	(0.00592)	(0.0149)
Fraction black	-1.799***	-0.222***	-0.100***	-0.0970***
	(0.159)	(0.0139)	(0.0104)	(0.0137)
Fraction black=1 × Fraction WWII	-0.167	-0.00178	0.00416	0.0476
	(0.0943)	(0.00941)	(0.00916)	(0.0270)
N	94,891	94,891	94,891	46,690
Mean dep. var.	11.444	0.593	0.147	0.312

Std. errors in parentheses, clustered by birth cohort-state of birth.

Back

Mobilization – Acemoglu et al. (2004)

Table 4: Effect of WWII mobilization on education (1923-1932 birth cohorts) - Acemoglu et al. (2004)

	(1) Years ed.	(2) H.S. grad	(3) College	(4) Voc. training
d1844	0.740	0.0755	-0.0366	0.566*
	(3.754)	(0.398)	(0.423)	(0.220)
Fraction black	-11.14***	-0.966***	-0.0830	-0.460***
	(1.252)	(0.151)	(0.137)	(0.0753)
Fraction black=1 × d1844	20.00***	1.609***	-0.0626	0.831***
	(2.586)	(0.315)	(0.301)	(0.169)
N	344,582	344,582	344,582	173,205
Mean dep. var.	11.671	0.613	0.178	0.320

Std. errors in parentheses, clustered by birth cohort-state of birth.

Scatter

Back

Vets in census vs. state mobilization data
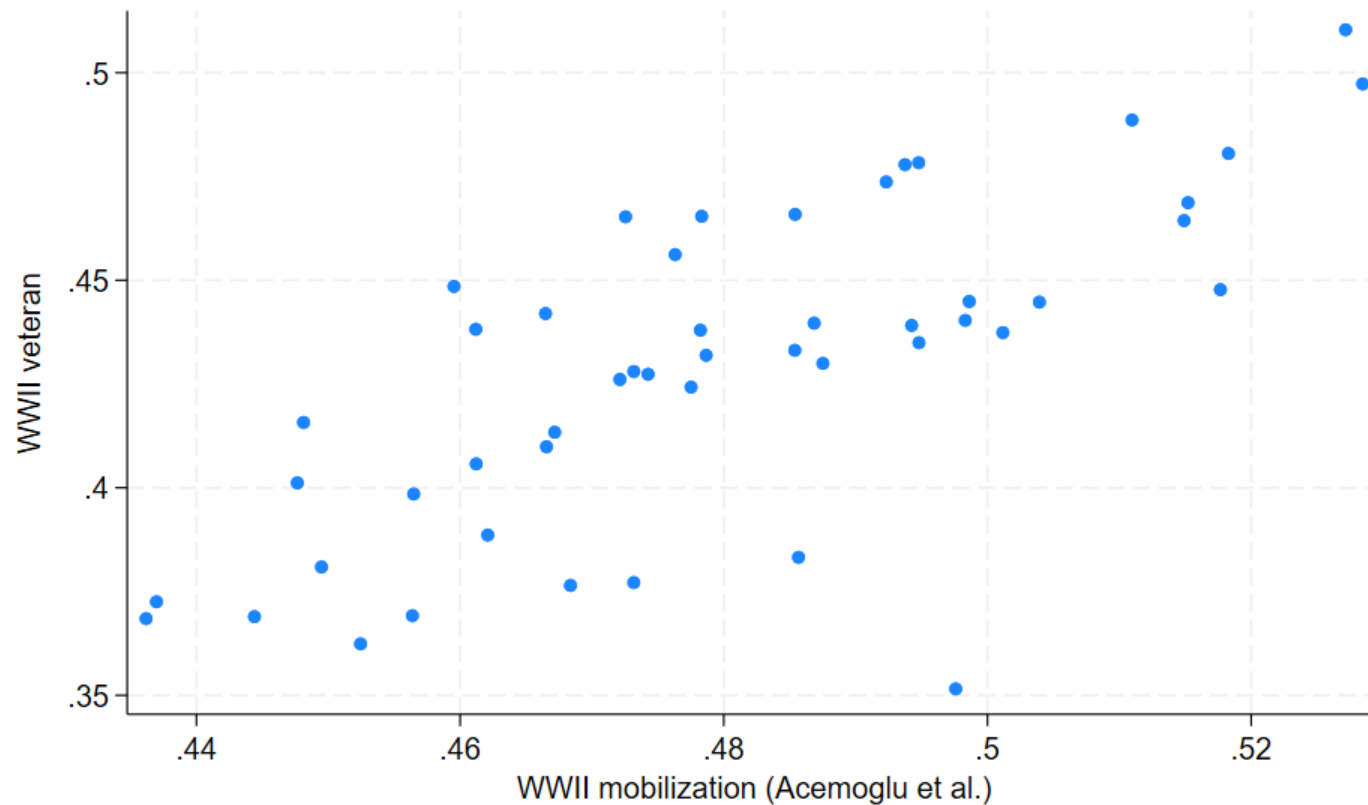
Back

Non-South sample

Table 6: Effect of WWII service on education - Non-South

	(1) Years ed.	(2) H.S. grad	(3) College	(4) Voc. training
Fraction WWII	0.652***	0.0138	0.0653***	0.0409
	(0.105)	(0.0143)	(0.0101)	(0.0209)
Fraction Korea	0.722***	0.0970***	0.0520***	0.0743**
	(0.121)	(0.0208)	(0.0135)	(0.0242)
Fraction black	-1.421***	-0.177***	-0.121***	-0.0725***
	(0.132)	(0.0131)	(0.0104)	(0.00846)
Fraction black=1 × Fraction WWII	-0.478***	-0.0332***	0.0205***	0.00864
	(0.0654)	(0.00802)	(0.00389)	(0.00771)
N	487,647	487,647	487,647	244,737
Mean dep. var.	11.749	0.622	0.177	0.321

Std. errors in parentheses, clustered by birth cohort-state of birth.

Back

Effects by race – southern states

Table 8: Effect of WWII service on education - Black, southern sample

	(1) Years ed.	(2) H.S. grad	(3) College	(4) Voc. training
Fraction WWII	0.949	0.101	0.00439	0.0938
	(0.577)	(0.0627)	(0.0288)	(0.0767)
Fraction Korea	1.261*	0.0709	0.0166	0.0339
	(0.502)	(0.0556)	(0.0221)	(0.0504)
N	10,795	10,795	10,795	5,427
Mean dep. var.	8.437	0.247	0.045	0.199

Std. errors in parentheses, clustered by birth cohort-state of birth.

Back

HBCU – binary measure

Table 10: Effect of WWII service on education - Black sample + HBCU (0/1)

	(1) Years ed.	(2) H.S. grad	(3) College	(4) Voc. training
Fraction WWII	0.973***	0.0540**	0.0236*	0.0361
	(0.131)	(0.0194)	(0.0110)	(0.0291)
Fraction Korea	0.957***	0.127***	0.0322*	0.0205
	(0.156)	(0.0272)	(0.0141)	(0.0255)
HBCU in birth state	-0.493***	-0.0531***	-0.000992	-0.0215
	(0.0793)	(0.00953)	(0.00399)	(0.0115)
N	49,405	49,405	49,405	24,598
Mean dep. var.	9.389	0.336	0.052	0.231

Std. errors in parentheses, clustered by birth cohort-state of birth.
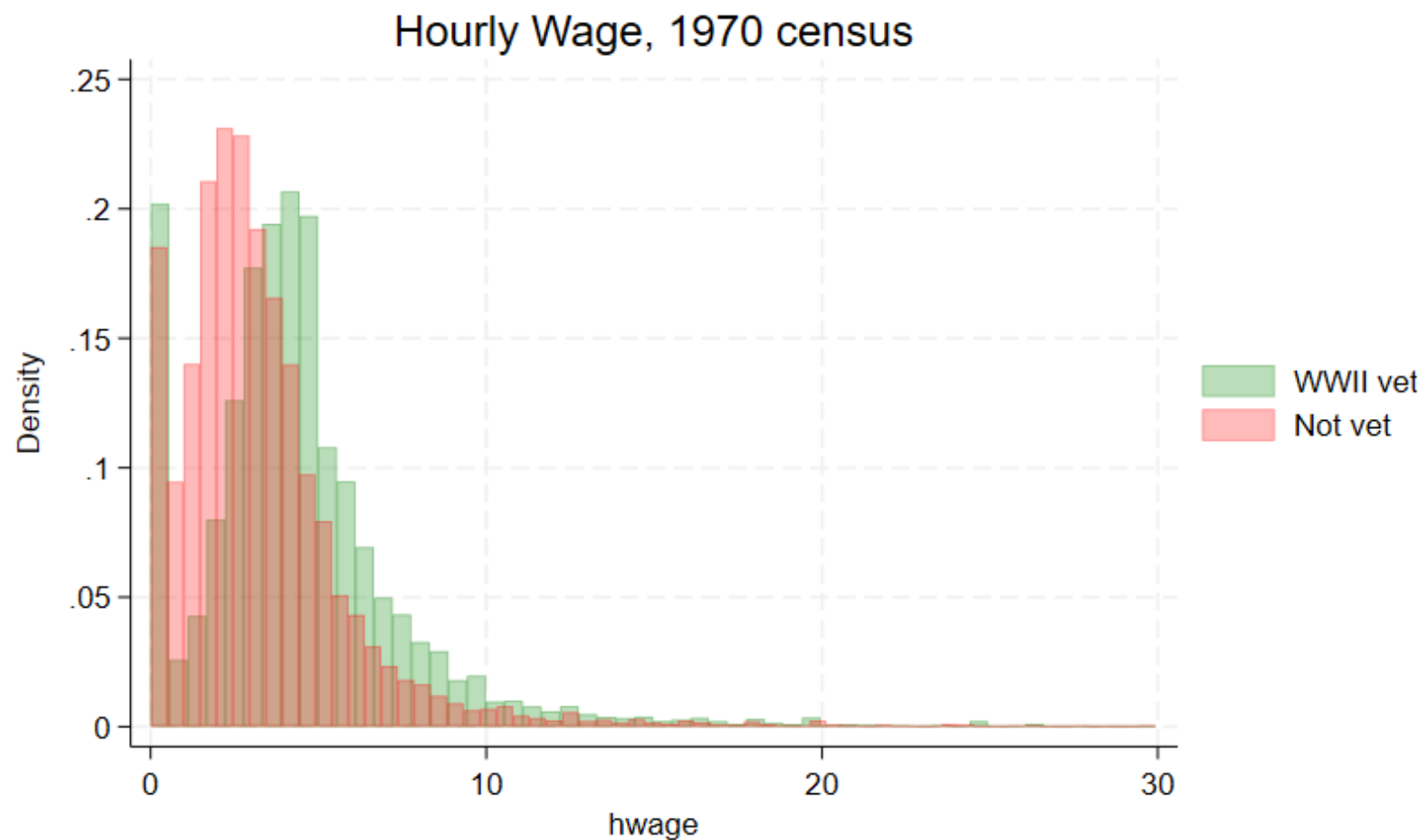
Back

Multinomial logit – 2 yrs. college = voc. ed.

Table 12: Effect of WWII service on education decisions - alternate ordering

	(1) H.S.	Vocational_training	College
Fraction WWII	0.726***	1.337**	1.492***
	(0.0693)	(0.119)	(0.0950)
Fraction Korea	0.904	1.612***	1.513***
	(0.108)	(0.181)	(0.121)
N	574,628		

Odds ratios reported. Std. errors in parentheses.

Back
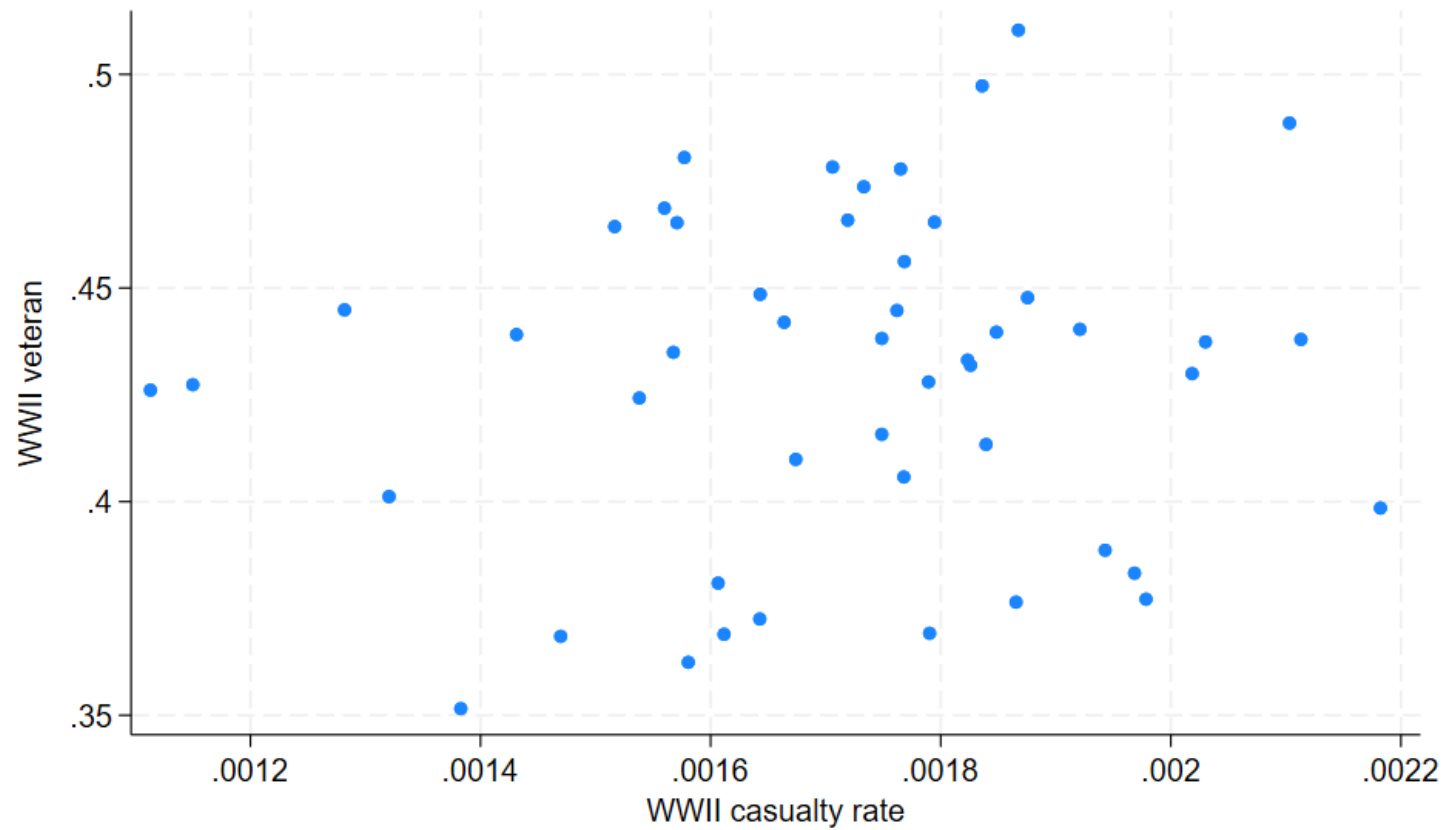
Wages by veteran status

Hourly Wage, 1970 census

Wages by cohort WWII service
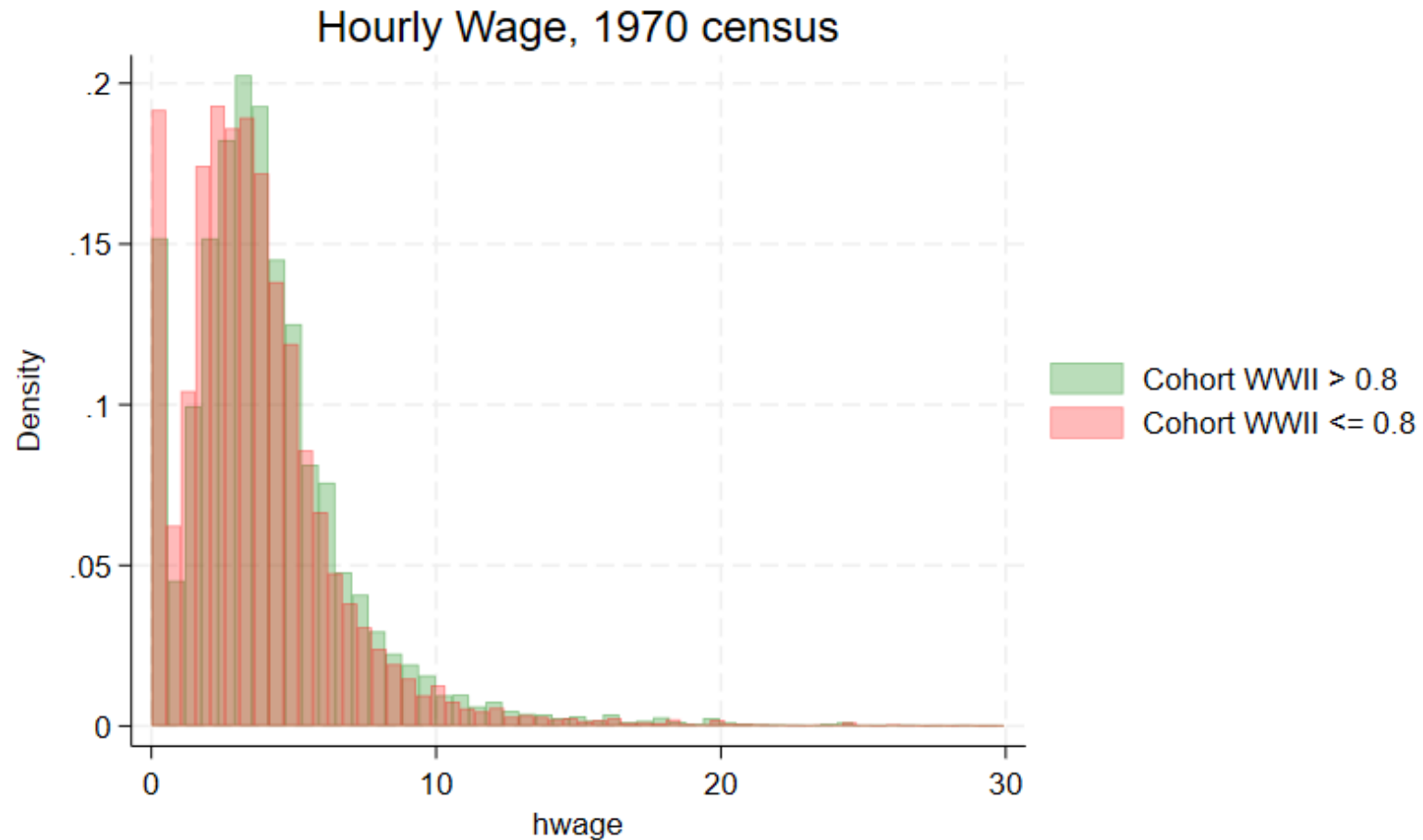
Vets in census vs. casualty data

Vocation training vs. casualties by state