Did the G.I. Bill increase vocational training after WWII?

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This project

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

- 1944: Servicemen's Readjustment Act (G.I. Bill) + Korean War extension (1952)
- Source of randomization → eligibility cut-off by birth quarter

"Vocational Education": "Educational programs […] directly related to the **preparation** of individuals in […] employment in current or emerging **occupations requiring other than a baccalaureate** or advanced degree." (1990 Perkins Act)

Difference from previous studies

- Strong evidence of increased:
  - College education (white)
  - High school attainment
  - Marital sorting
  - Home ownership
  - *Bound and Turner (2002), Stanley (2003), Fetter (2013), Thomas (2017), Larsen et al. (2015)*

Today: look at vocational (job) training as alternative use of G.I. benefits

Agenda

1. G.I. Bill background
2. Identifying subsidy effects
3. Empirical results
   - OLS
   - Multinomial Logit
   - RDD (preliminary)

Lead-up to G.I. Bill

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

– FDR statement to Congress, November 23, 1943

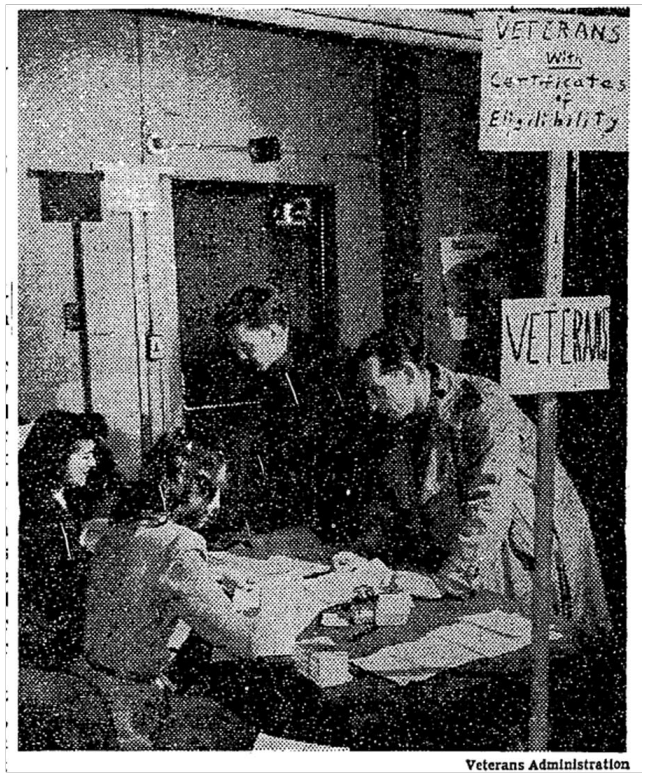
G.I. Bill aftermath – NYT July, 1956

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.



Veterans Administration

Oldest student

G.I. Bill tuition subsidy overview

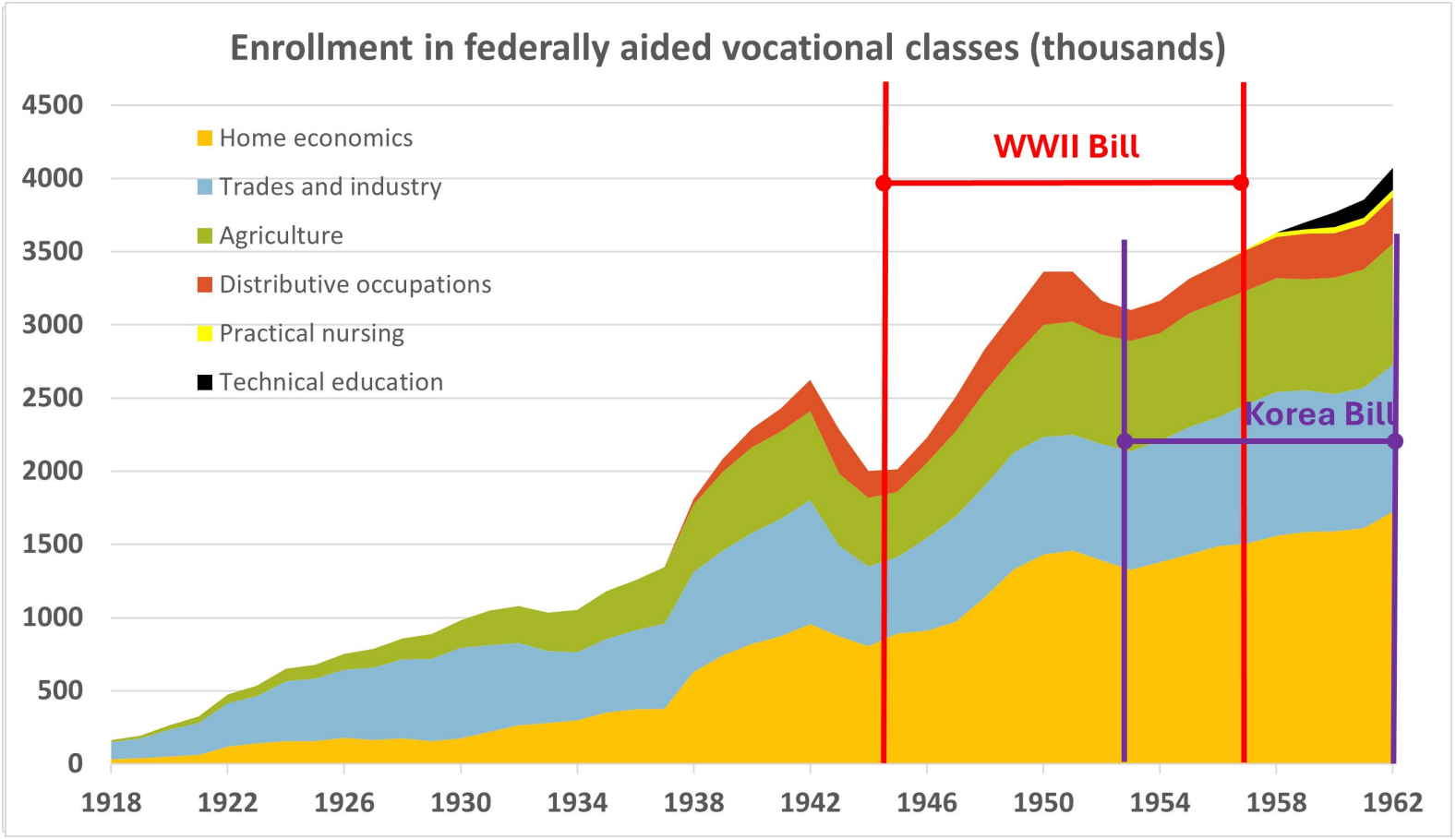
An Act to provide Federal Government aid for the readjustment in civilian life of returning World War II veterans. […] This Act may be cited as the "Servicemen's Readjustment Act of 1944".

– 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/education → up to 4 years depending on service
- Similar Bill for Korean War (served 1950-1955)

Costs of education

Motivation: vocational school enrollment



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

Motivation: education benefit take-up

Utilization of Veterans' Education Benefits

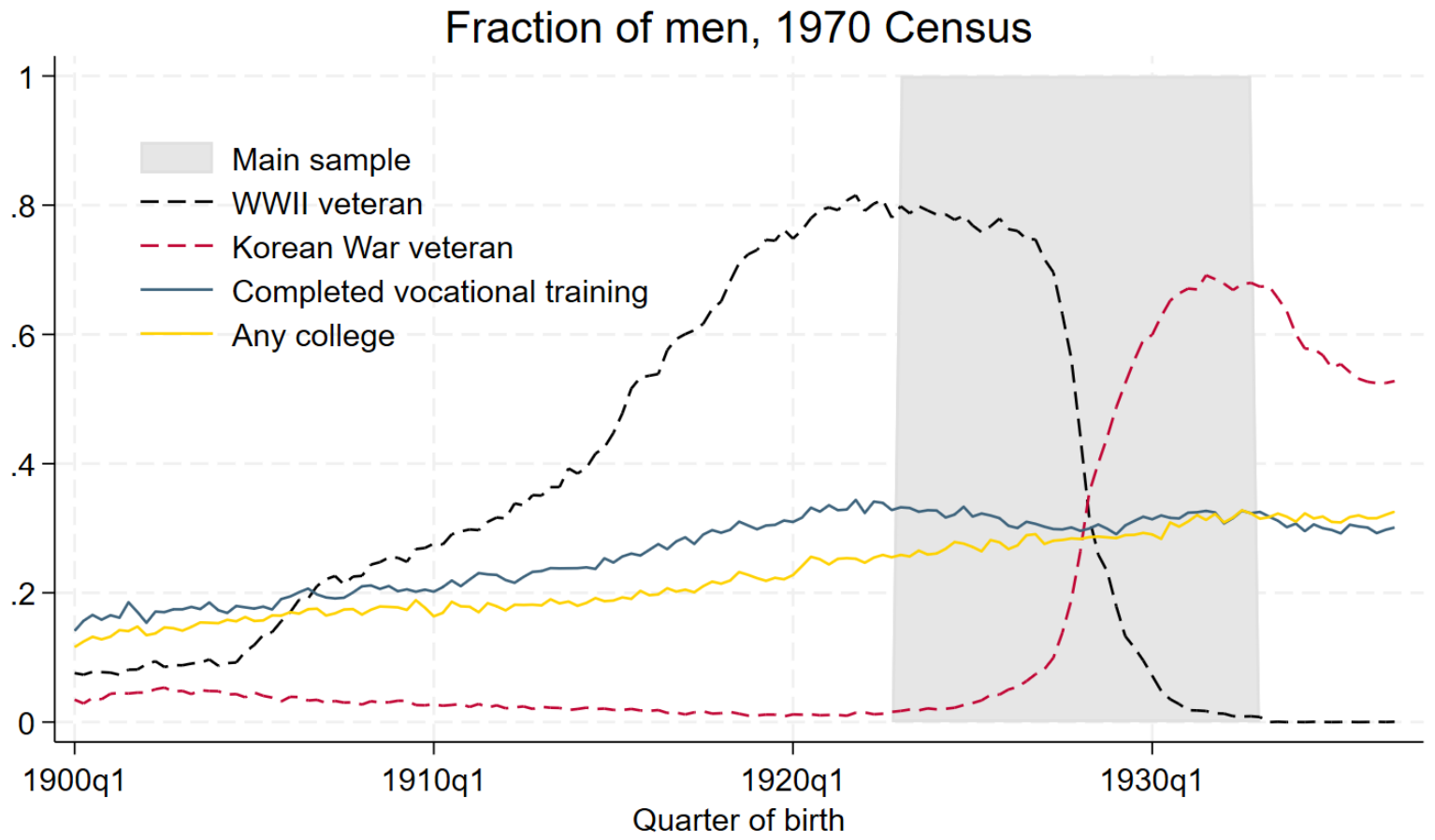
G.I. Bill	Number Eligible	Number of Veterans Enrolled				Program Cost (Billions of Dollars)
		College	Other Schools	On-the-Job Training	Farm Training	
World War II	15,440,000*	2,230,000	3,480,000	1,400,000	690,000	14.5
Korea	5,509,000	1,213,000	860,000	223,000	95,000	4.5
Vietnam	8,200,000	5,100,000	2,500,000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

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

Definition of educational institutions

Source: Bound & Turner (2002), Appendix B2

Veteran status + vocational training



Field breakdown

Vet. status + educ.

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 → vocational school take-up

Bound and Turner (2002), Larsen et al. (2015), Thomas (2017)

Empirical model #1 - OLS

$$Y_{ic} = \beta_0 + \beta_1 * WWII_c + \beta_2 * Korea_c + \beta_3 * State + \beta_4 * Black_i + \beta_5 * Trend + \beta_6 * Trend^2 + e_{ic}$$

Y_{ic}: Education/training attainment

$WWII_c$: fraction served in WWII (birth cohort)

$Korea_c$: fraction served in Korean War (birth cohort)

State: State of birth dummy

Trend: birth year – 1929 + birth quarter/4

Limitations to identification

- Coefficients are **NOT** directly identifying effect of subsidies on training take-up

- "Bundled treatment":
  1. Tuition assistance (G.I. Bill)
  2. Home loan guarantee (G.I. Bill)
  3. Vocational rehabilitation for disabled vets
  4. Experience/training in armed forces

- Can we at least rule out that the G.I. Bill had no effect on vocational school completion?

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)*

What kind of training?

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.

Did the GI Bill increase vocational training?

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	1.265**	0.0958	0.0539	0.0925**
	(0.418)	(0.0635)	(0.0288)	(0.0297)
Fraction Korea	2.007**	0.278*	0.0397	0.181***
	(0.672)	(0.105)	(0.0454)	(0.0462)
Fraction black	-1.509***	-0.198***	-0.117***	-0.0735***
	(0.0349)	(0.00416)	(0.00269)	(0.00498)
Fraction black=1 × Fraction WWII	-0.570***	-0.0261**	0.0216***	0.0198*
	(0.0655)	(0.00773)	(0.00488)	(0.00928)
N	607,302	607,302	607,302	304,607
Mean dep. var.	11.547	0.601	0.173	0.316

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

Acemoglu et al.

Higher take-up for trades/engineering

Effect of WWII service on vocational school (1923-1932 birth cohorts) - quarter of birth

	(1) Any training	(2) Trades	(3) Engineering	(4) Business	(5) Ag. + Home economics
Fraction WWII	0.0990**	0.0534*	0.0364	-0.00596	0.0216**
	(0.0314)	(0.0251)	(0.0192)	(0.0152)	(0.00705)
Fraction Korea	0.194***	0.0998*	0.0682*	0.00778	0.0233
	(0.0493)	(0.0383)	(0.0310)	(0.0252)	(0.0116)
Fraction black	-0.000105	-0.0000290	-0.0000420	-0.0000477	0.0000176
	(0.0000958)	(0.0000608)	(0.0000435)	(0.0000372)	(0.0000155)
Fraction black=1 × Fraction WWII	0.000202	0.0000263	0.000178*	-0.00000894	-0.0000349
	(0.000187)	(0.000129)	(0.0000706)	(0.0000748)	(0.0000283)
N	607,302	607,302	607,302	607,302	607,302
Mean dep. var.	0.316	0.177	0.041	0.042	0.011

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

Effects in the South

Effect of WWII service on education in South

	(1) Years ed.	(2) H.S. grad	(3) College	(4) Voc. training
Fraction WWII	2.421	0.225	0.0955	0.0999**
	(1.250)	(0.173)	(0.0631)	(0.0314)
Fraction Korea	3.786	0.424	0.126	0.195***
	(2.064)	(0.283)	(0.0990)	(0.0489)
Fraction black	-2.130***	-0.273***	-0.101***	-0.0000818
	(0.0636)	(0.00886)	(0.00569)	(0.0000972)
Fraction black=1 × Fraction WWII	-0.689***	-0.0277	0.00226	0.0000572
	(0.125)	(0.0171)	(0.00928)	(0.000313)
N	88,380	88,380	88,380	88,380
Mean dep. var.	10.773	0.521	0.150	0.316

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

Non-south

Effects in the South – different fields

Effect of WWII service on vocational school in South (1923-1932 birth cohorts) - quarter of birth

	(1) Any training	(2) Trades	(3) Engineering	(4) Business	(5) Ag. + Home economics
Fraction WWII	0.0999**	0.0538*	0.0367	-0.00576	0.0215**
	(0.0314)	(0.0250)	(0.0191)	(0.0150)	(0.00700)
Fraction Korea	0.195***	0.100*	0.0690*	0.00798	0.0231
	(0.0489)	(0.0380)	(0.0308)	(0.0249)	(0.0115)
Fraction black	-0.0000818	-0.00000408	-0.0000551	-0.0000103	0.0000121
	(0.0000972)	(0.0000462)	(0.0000455)	(0.0000333)	(0.0000141)
Fraction black=1 × Fraction WWII	0.0000572	-0.000105	0.000239**	-0.0000704	-0.0000215
	(0.000313)	(0.000213)	(0.0000874)	(0.0000816)	(0.0000351)
N	88,380	88,380	88,380	88,380	88,380
Mean dep. var.	0.316	0.177	0.041	0.042	0.011

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

Non-south

Korean War veterans

Effect of Korean War service on education (1932-1935 birth cohorts) - quarter of birth

	(1) Years ed.	(2) H.S. grad	(3) College	(4) Voc. training
Fraction Korea	0.696	0.0978	0.0598	0.125**
	(0.414)	(0.0578)	(0.0330)	(0.0358)
Fraction black	-1.155***	-0.175***	-0.111***	-0.000163
	(0.0625)	(0.0123)	(0.00448)	(0.000179)
Fraction black=1 × Fraction Korea	-0.635***	-0.0395	-0.0169	0.000250
	(0.152)	(0.0269)	(0.0104)	(0.000461)
N	228,201	228,201	228,201	228,201
Mean dep. var.	11.920	0.668	0.192	0.310

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

Korean War veterans by vocational field

Effect of Korean War service on vocational school (1932-1935 birth cohorts) - quarter of birth

	(1) Any training	(2) Trades	(3) Engineering	(4) Business	(5) Ag. + Home economics
Fraction Korea	0.125**	0.0627*	0.0302*	0.00729	-0.0102
	(0.0358)	(0.0253)	(0.0107)	(0.0205)	(0.00560)
Fraction black	-0.000163	-0.000147	-0.0000785	-0.000122	-0.0000140
	(0.000179)	(0.000109)	(0.0000718)	(0.0000915)	(0.0000323)
Fraction black=1 × Fraction Korea	0.000250	0.000374	0.0000777	0.000162	0.0000586
	(0.000461)	(0.000227)	(0.000151)	(0.000167)	(0.0000645)
N	228,201	228,201	228,201	228,201	228,201
Mean dep. var.	0.310	0.170	0.043	0.042	0.009

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

Korean War veterans – southern sample

Effect of Korean War service on education in South

	(1) Years ed.	(2) H.S. grad	(3) College	(4) Voc. training
Fraction Korea	2.708*	0.290*	0.170	0.124**
	(1.071)	(0.111)	(0.0867)	(0.0364)
Fraction black	-1.872***	-0.297***	-0.112***	-0.000245
	(0.200)	(0.0347)	(0.0119)	(0.000246)
Fraction black=1 × Fraction Korea	-0.226	0.0549	0.0123	0.000464
	(0.448)	(0.0740)	(0.0364)	(0.000649)
N	34,846	34,846	34,846	34,846
Mean dep. var.	11.280	0.600	0.167	0.310

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

Non-south

Empirical model #2 – Multinomial Logit

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

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

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

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

- *K* alternatives
  - Less than H.S.
  - H.S. but no vocational training
  - Vocational school
  - Some college, but no vocational training
  - College

Multinomial logit – base = less than H.S.

Effect of WWII service on education decisions

	(1) H.S.	Vocational_training	Some_College__no_voc_	College
Fraction WWII	1.611	1.928**	0.818	2.005**
	(0.430)	(0.466)	(0.350)	(0.449)
Fraction Korea	4.661***	4.063***	0.911	3.034**
	(2.037)	(1.614)	(0.639)	(1.116)
N	363,275			

Odds ratios reported. Std. errors in parentheses.

Alternate ordering

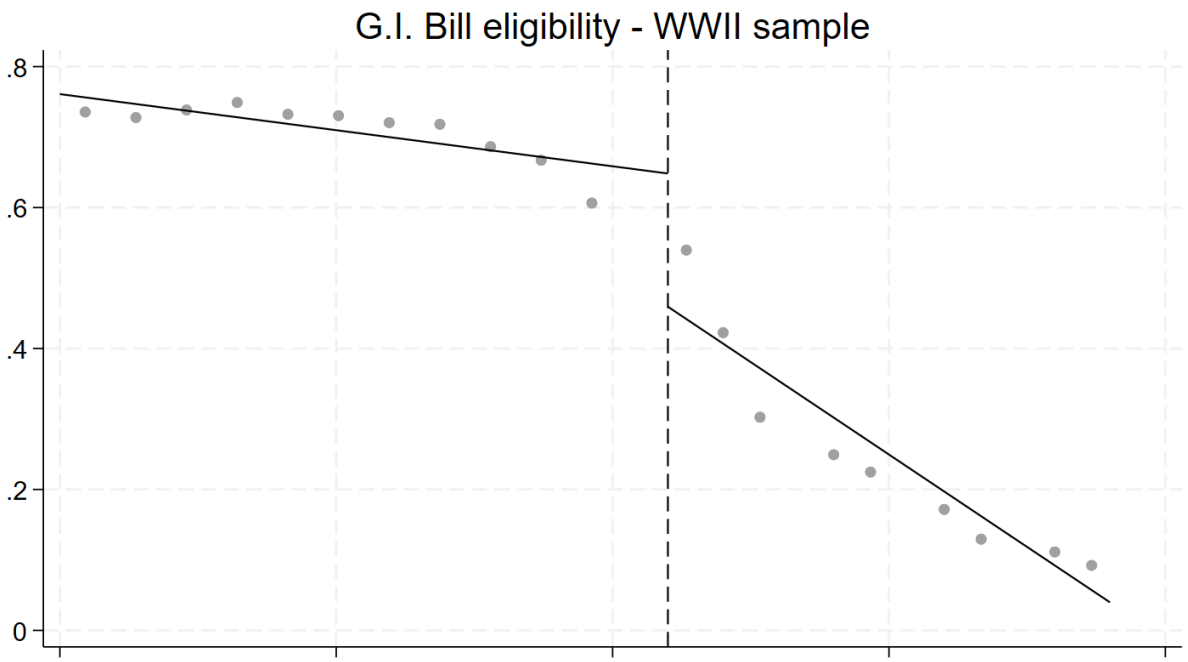
Empirical model #3 - RDDiT

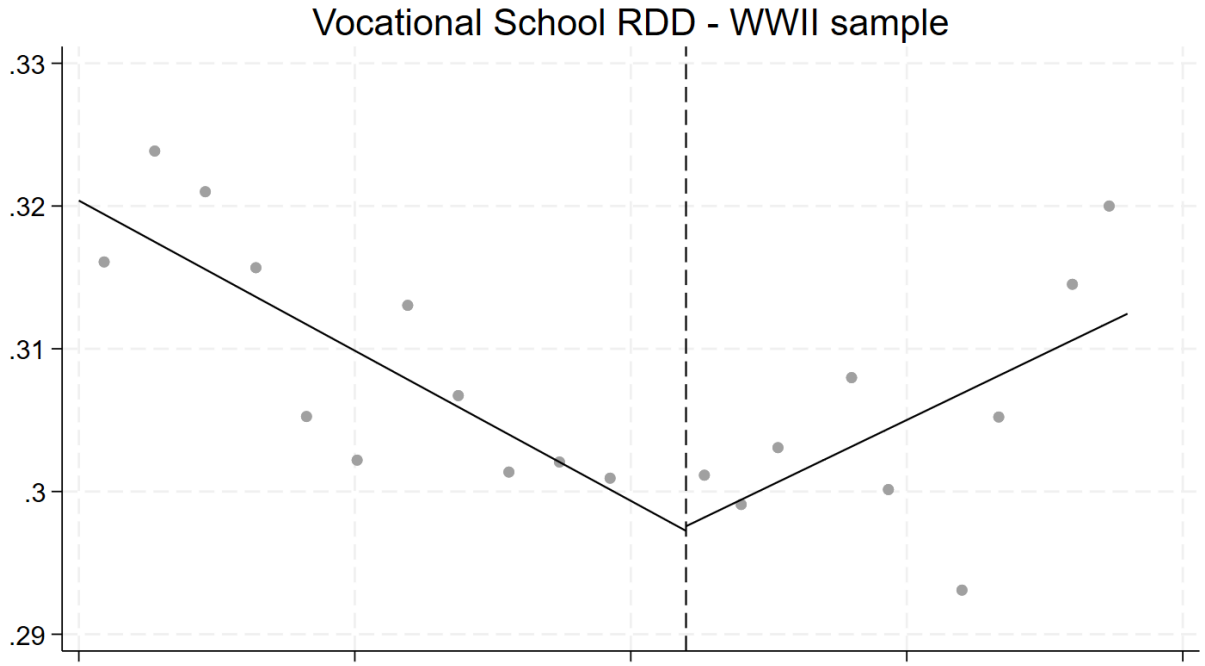
- Based on Fetter (2013)
- Exploit drop-off in military service probability

$$Y_{it} = \beta_0 + \beta_{1t} * \mathbb{1}(QoB_{it} < c) + \beta_{2t} * \mathbb{1}(QoB_{it} - c) * \mathbb{1}(QoB_{it} < c) + \beta_{3t} * \mathbb{1}(QoB_{it} - c) * \mathbb{1}(QoB_{it} > c) + \beta_{4t} * Controls_{it} + e_{it}$$

- **QoB**: year-quarter of birth (running variable)
- **c**: G.I. Bill eligibility cutoff
  - 1928 for WWII
  - 1931 for Korean War

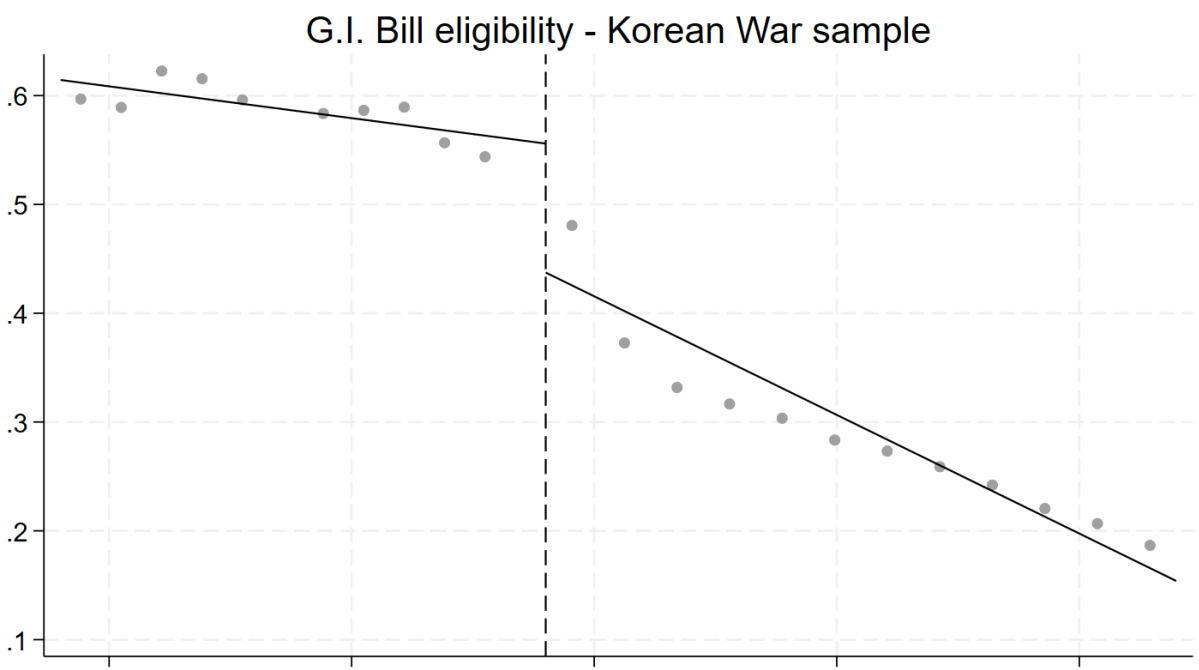
RDD preliminary results (1925-1929)

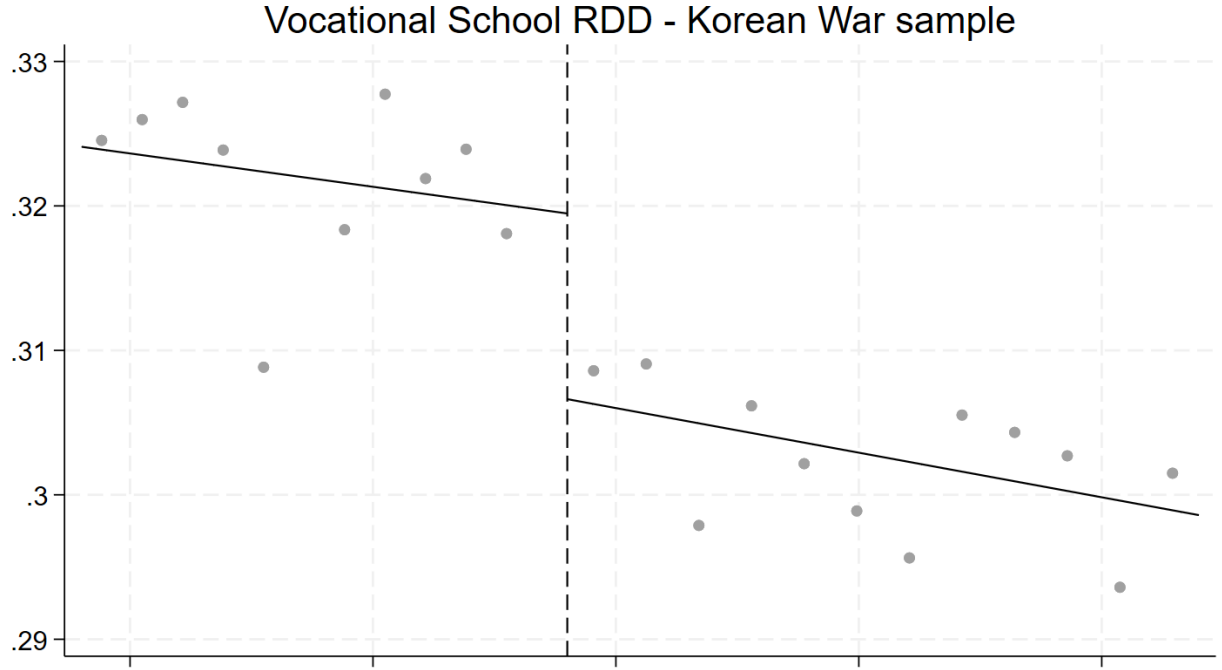




Veterans by Cohort

RDD preliminary results (1931-1935)





Appendix

Oldest WWII beneficiary

MAJOR, 'OVER 60,' TAKES G. I. COURSE

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

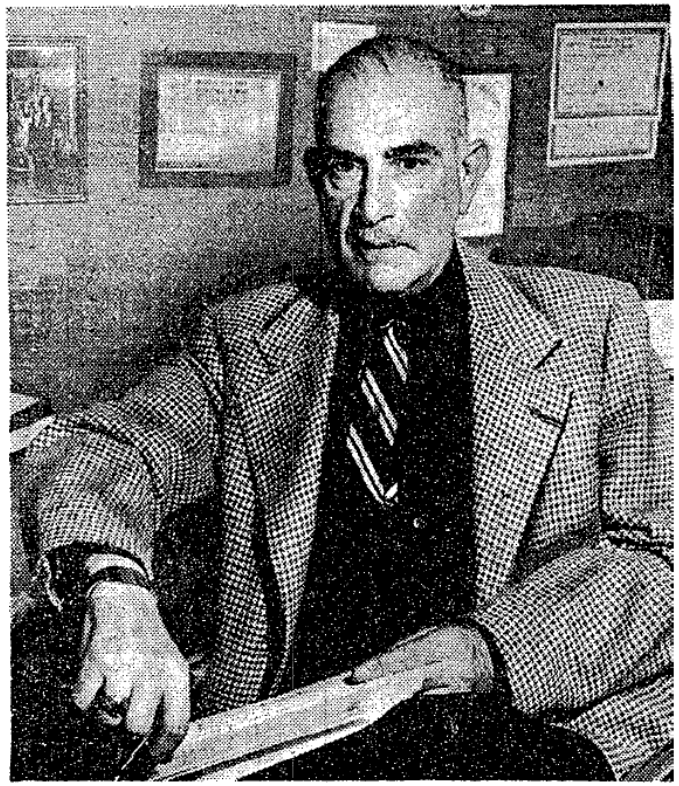
Four evenings out of every seven, Maj. Peter Rodyenko squeezes his six-foot frame into a midget British car and drives purposefully from his home at Plandome, L. I.

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

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Direct + opportunity costs of college

College Cost Reduction due to the World War II and Korean War GI Bills

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

Source: Stanley (2003), Table 1

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“Educational or training institutions”

*“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 shall also include business or other establishments providing **apprentice or other training on the job**, including those under the supervision of an approved college or university or any State department of education, or any State apprenticeship agency or State board of vocational education, or any State apprenticeship council […]”*

- 1944: Servicemen's Readjustment Act, Chapter 4, Education of Veterans

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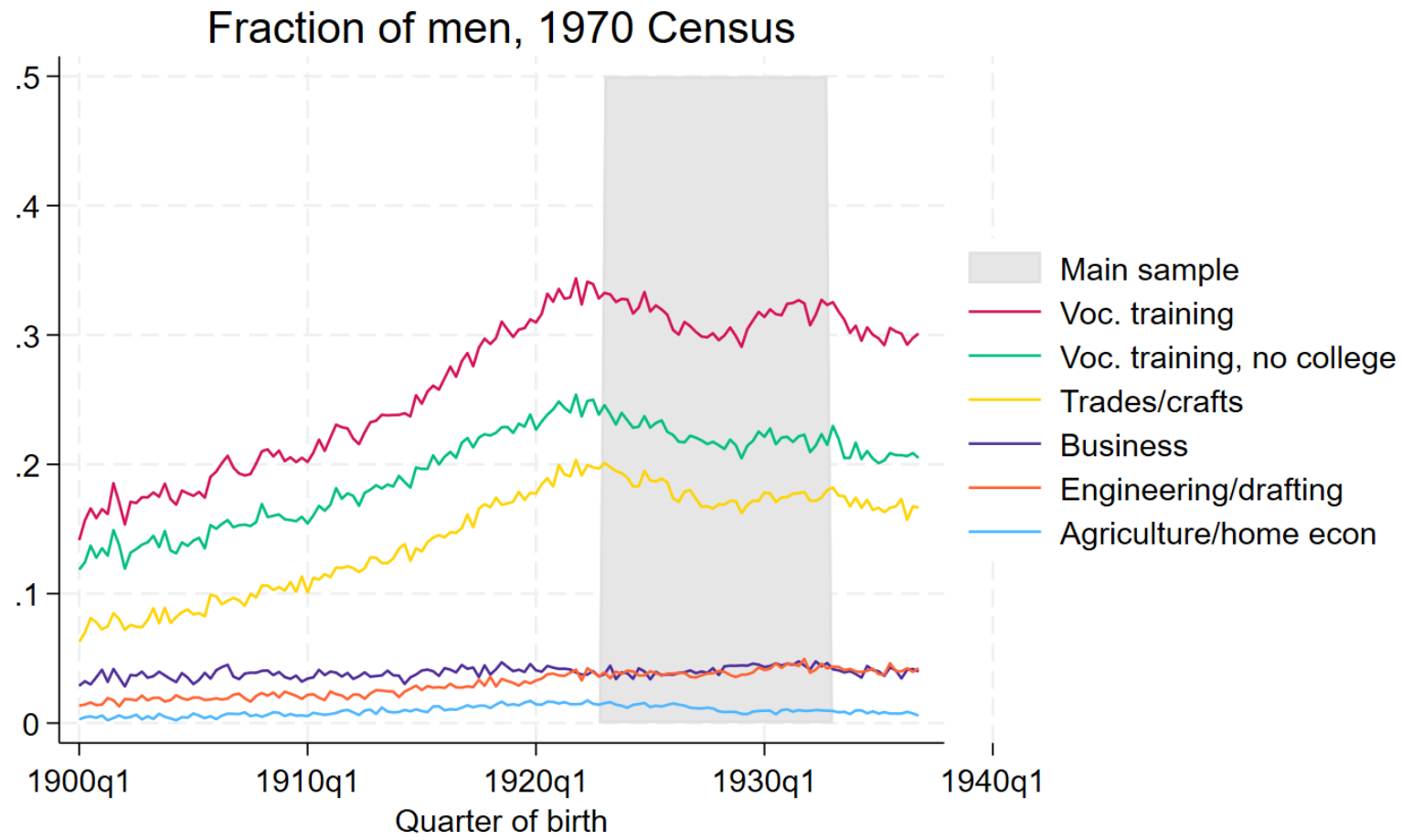
Vocational training - detailed



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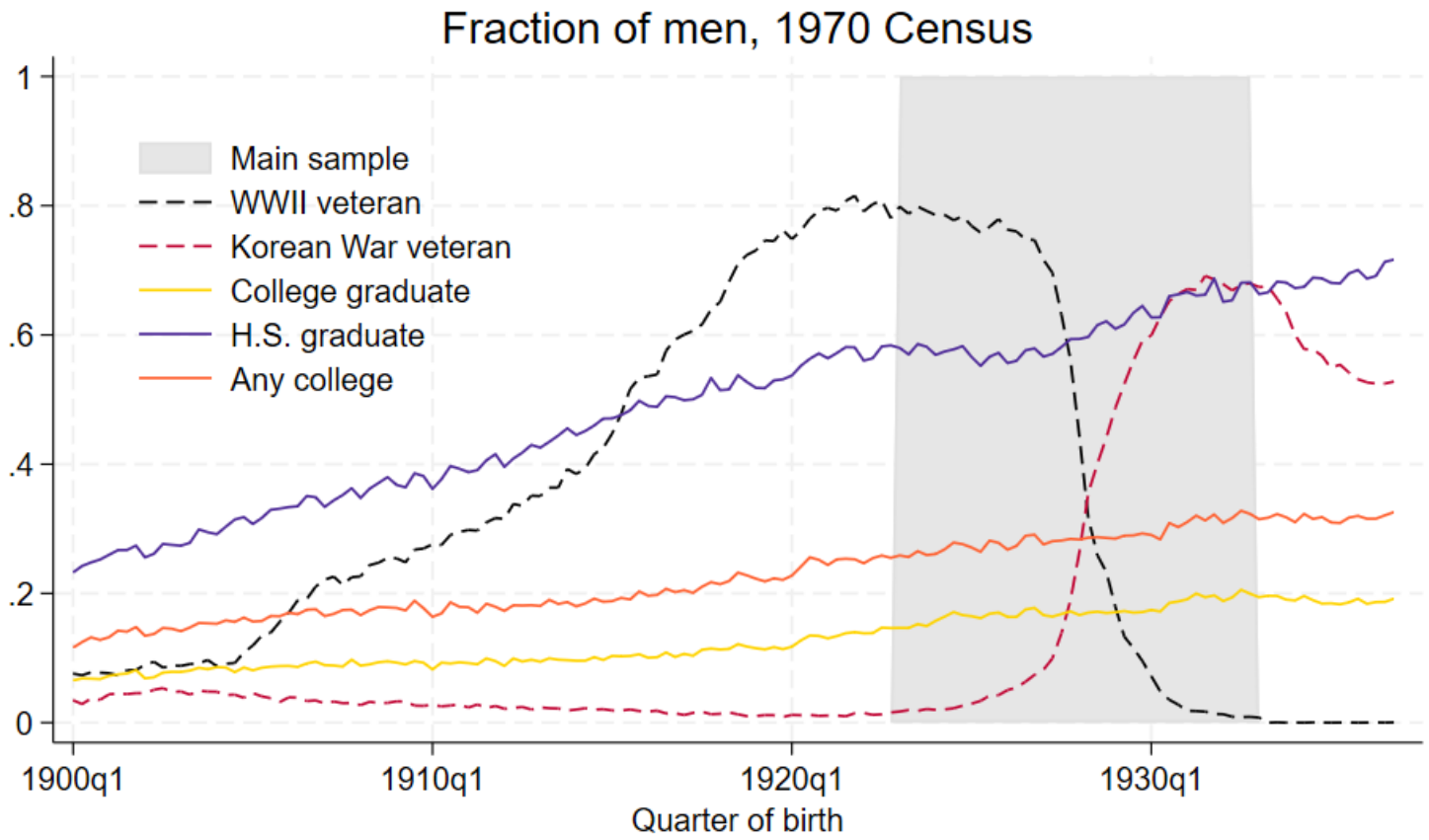
Education + veteran status



Years educ

Years college

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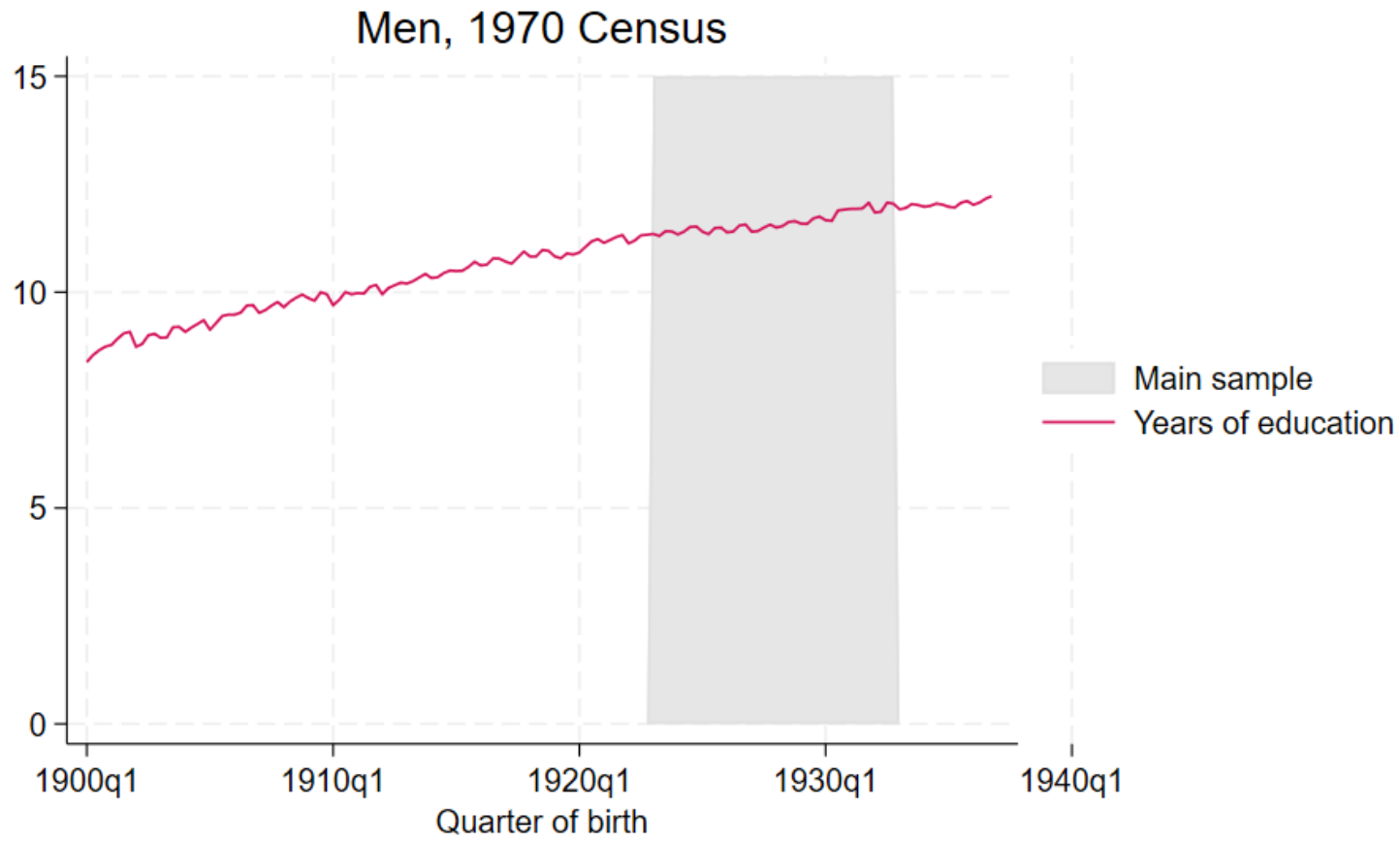
Years of education



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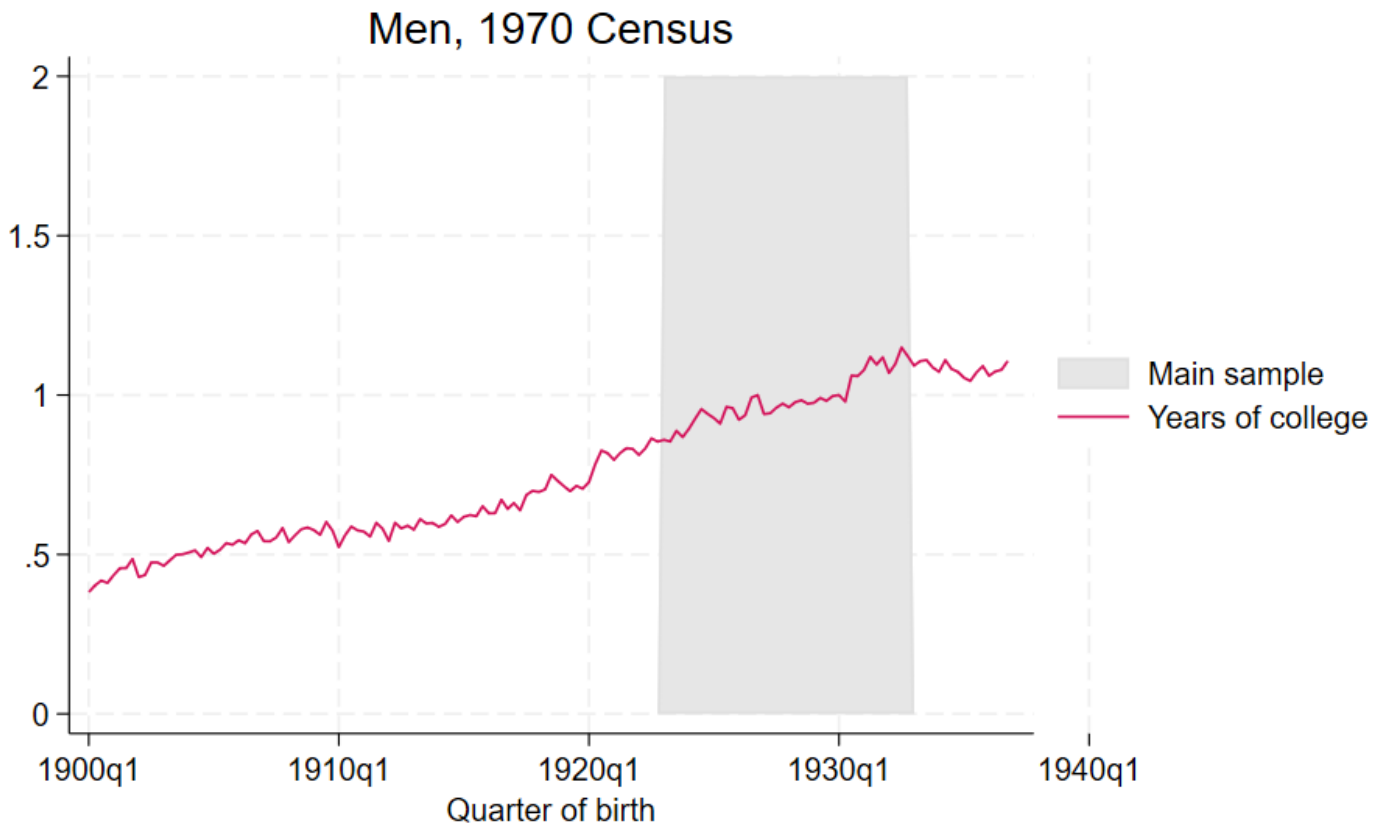
Years of college (education years



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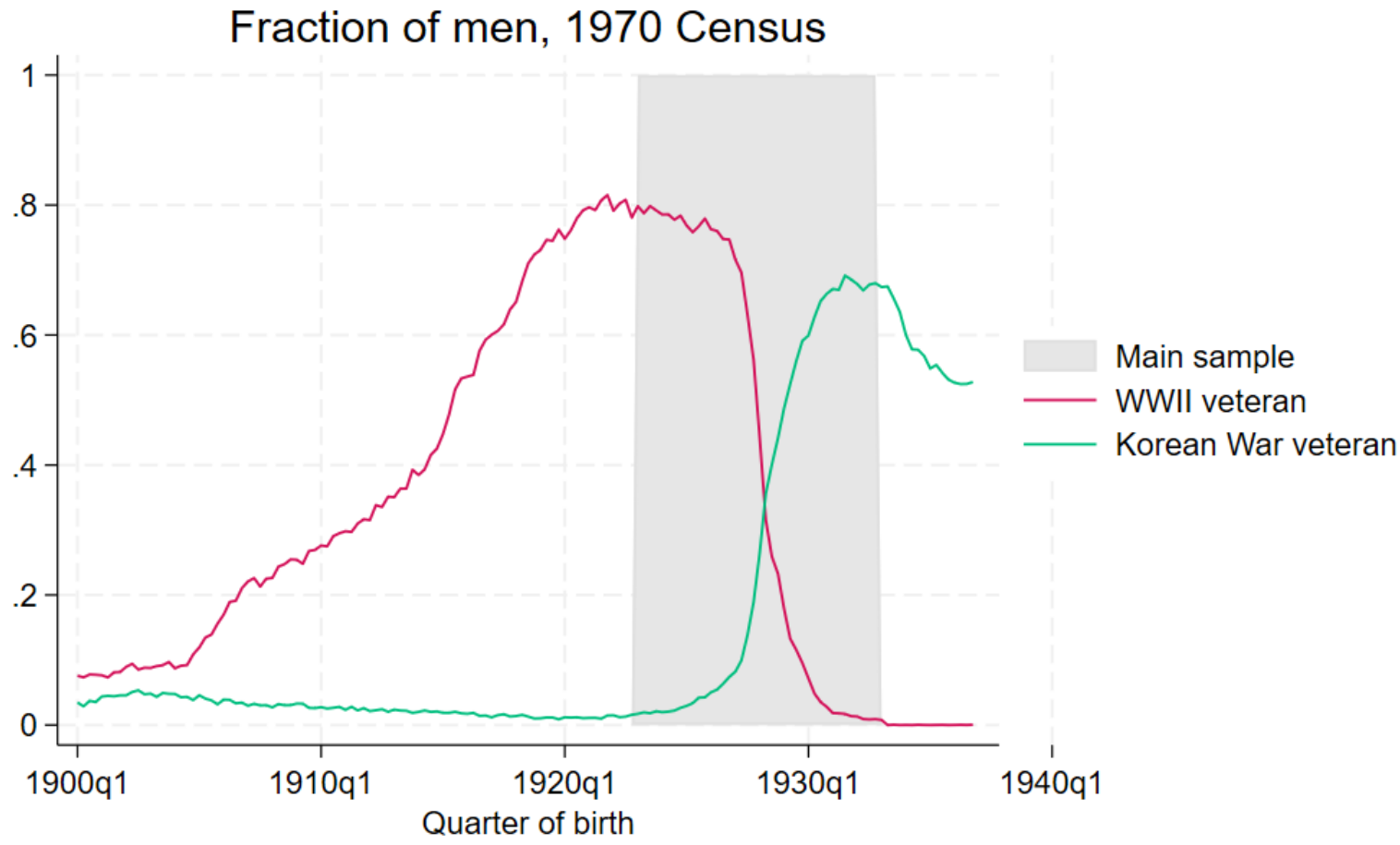
Variation in veteran status



WWII vs. Korean War veterans

WWII and Korean War Veteran Characteristics

	WWII mean	WWII only mean	Korea mean	Korea only mean
Fraction voc ed	0.29	0.29	0.31	0.31
Years of ed.	11.43	11.34	12.24	12.17
Employed	0.89	0.89	0.93	0.94
Married	0.87	0.87	0.89	0.89
Fraction black	0.06	0.06	0.07	0.08
N	358,300	328,490	154,963	125,153

Source: Question from 1970 census.

Mobilization – Acemoglu et al. (2004)

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
Mobilization rate	0.433*	0.145***	-0.0493	0.000268
	(0.211)	(0.0325)	(0.0261)	(0.000498)
Fraction black	-9.195***	-0.899***	-0.0270	-0.000931
	(0.272)	(0.0325)	(0.0176)	(0.000503)
Fraction black=1 × Mobilization rate	16.71***	1.497***	-0.0932*	0.00186
	(0.555)	(0.0698)	(0.0371)	(0.00101)
N	761,442	761,442	761,442	761,442
Mean dep. var.	11.452	0.617	0.131	0.316

Std. errors in parentheses, clustered by birth cohort.

Scatter

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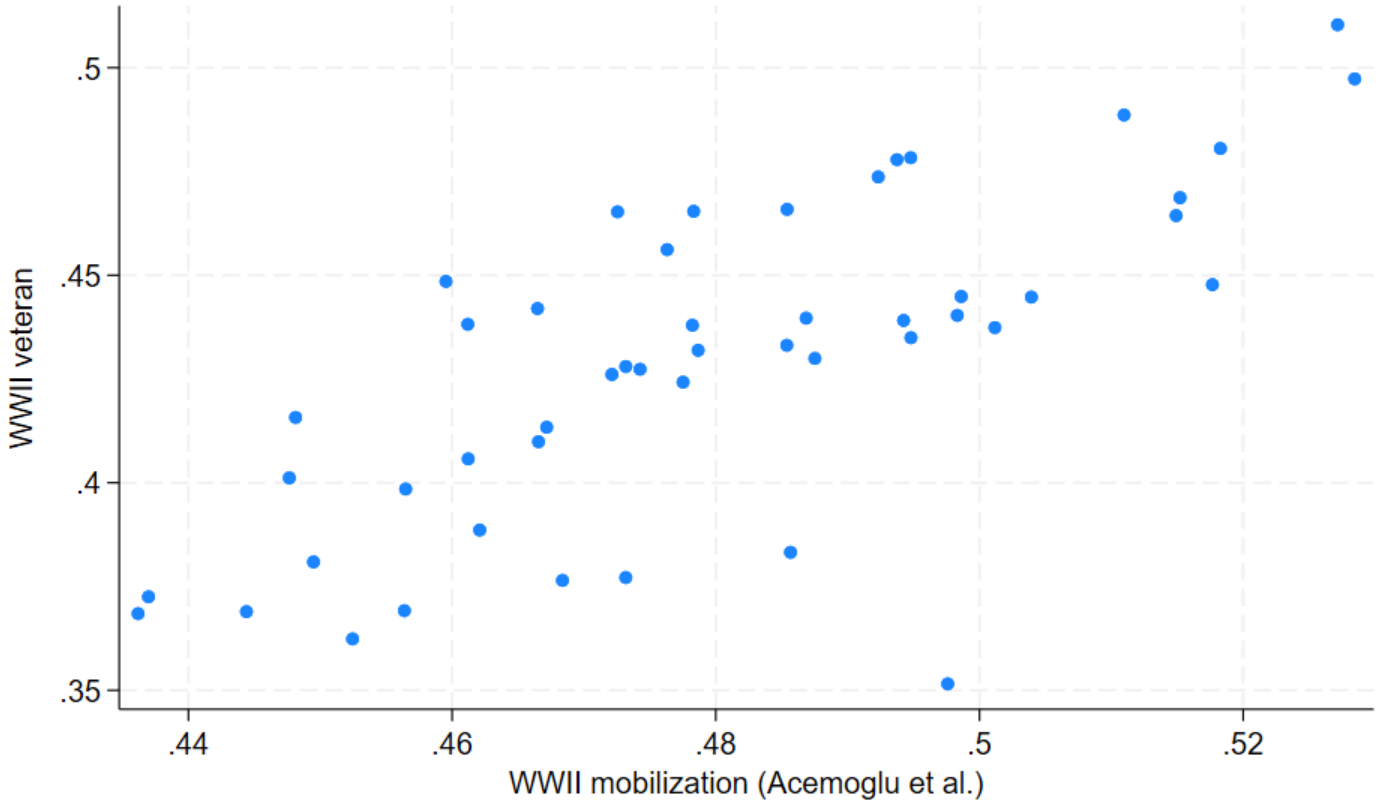
Vets in census vs. state mobilization data



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Non-South sample

Effect of WWII service on education in Non-South

	(1) Years ed.	(2) H.S. grad	(3) College	(4) Voc. training
Fraction WWII	1.265**	0.0958	0.0539	0.0990**
	(0.418)	(0.0635)	(0.0288)	(0.0314)
Fraction Korea	2.007**	0.278*	0.0397	0.194***
	(0.672)	(0.105)	(0.0454)	(0.0493)
Fraction black	-1.509***	-0.198***	-0.117***	-0.000105
	(0.0349)	(0.00416)	(0.00269)	(0.0000958)
Fraction black=1 × Fraction WWII	-0.570***	-0.0261**	0.0216***	0.000202
	(0.0655)	(0.00773)	(0.00488)	(0.000187)
N	607,302	607,302	607,302	607,302
Mean dep. var.	11.547	0.601	0.173	0.316

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

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Non-South sample – different fields

Effect of WWII service on vocational school in Non-South (1923-1932 birth cohorts) - quarter of birth

	(1) Any training	(2) Trades	(3) Engineering	(4) Business	(5) Ag. + Home economics
Fraction WWII	0.0989**	0.0533*	0.0363	-0.00600	0.0217**
	(0.0315)	(0.0251)	(0.0192)	(0.0152)	(0.00706)
Fraction Korea	0.193***	0.0998*	0.0681*	0.00774	0.0233
	(0.0493)	(0.0383)	(0.0311)	(0.0252)	(0.0116)
Fraction black	-0.0000979	-0.0000281	-0.0000364	-0.0000593	0.0000197
	(0.000106)	(0.0000704)	(0.0000470)	(0.0000405)	(0.0000174)
Fraction black=1 × Fraction WWII	0.000233	0.0000540	0.000163*	0.00000554	-0.0000378
	(0.000181)	(0.000129)	(0.0000708)	(0.0000773)	(0.0000297)
N	518,915	518,915	518,915	518,915	518,915
Mean dep. var.	0.316	0.178	0.041	0.042	0.011

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

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Korean War - non-South sample

Effect of WWII service on education in Non-South

	(1) Years ed.	(2) H.S. grad	(3) College	(4) Voc. training
Fraction WWII	1.265**	0.0958	0.0539	0.0990**
	(0.418)	(0.0635)	(0.0288)	(0.0314)
Fraction Korea	2.007**	0.278*	0.0397	0.194***
	(0.672)	(0.105)	(0.0454)	(0.0493)
Fraction black	-1.509***	-0.198***	-0.117***	-0.000105
	(0.0349)	(0.00416)	(0.00269)	(0.0000958)
Fraction black=1 × Fraction WWII	-0.570***	-0.0261**	0.0216***	0.000202
	(0.0655)	(0.00773)	(0.00488)	(0.000187)
N	607,302	607,302	607,302	607,302
Mean dep. var.	11.547	0.601	0.173	0.316

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

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Multinomial logit – base = college

Effect of WWII service on education decisions

	(1) H_S_	Vocational_training	Some_College__no_voc_	None
Fraction WWII	0.803	0.962	0.408*	0.499**
	(0.201)	(0.215)	(0.170)	(0.112)
Fraction Korea	1.536	1.339	0.300	0.330**
	(0.626)	(0.490)	(0.205)	(0.121)
N	363,275			

Odds ratios reported. Std. errors in parentheses.

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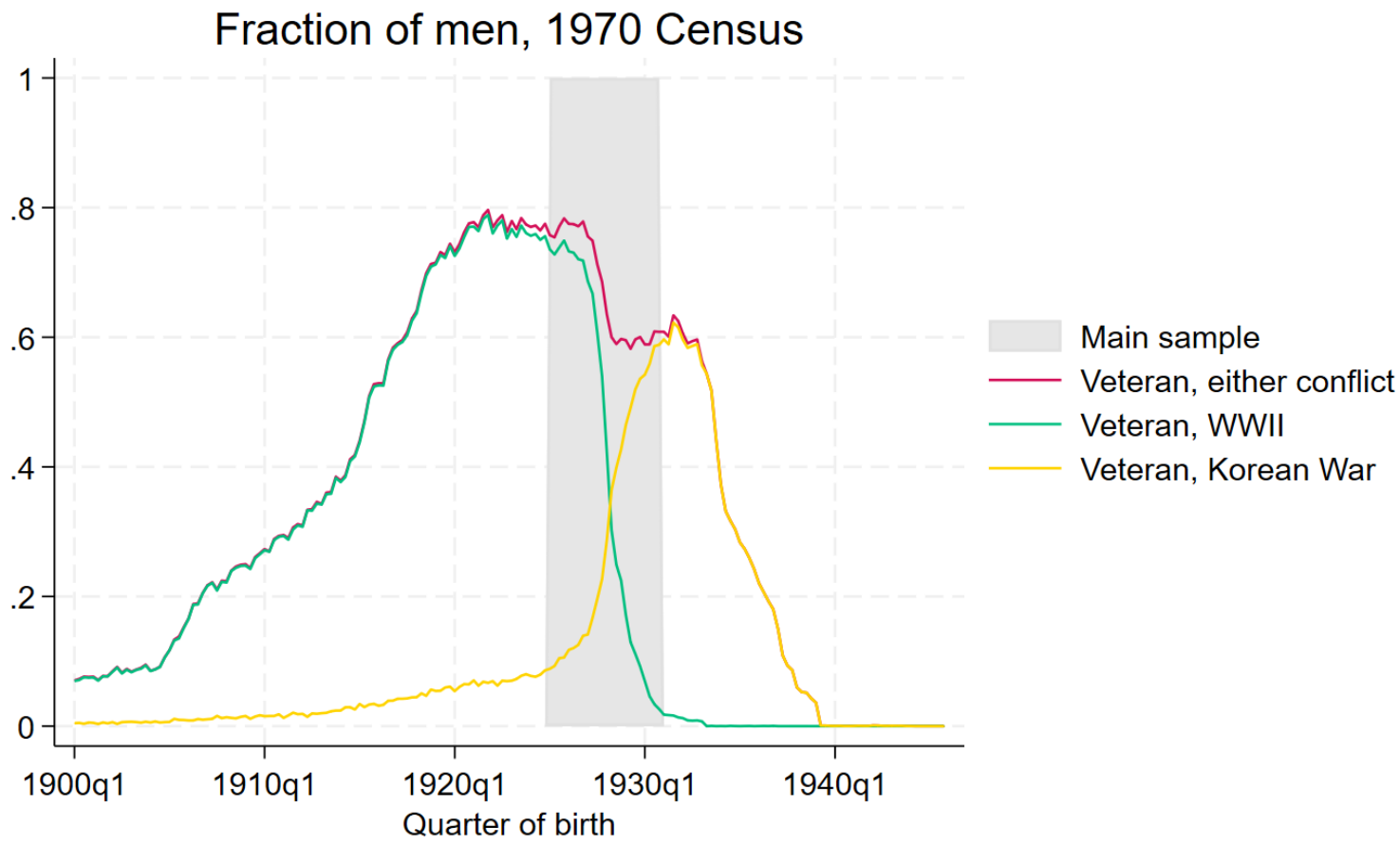
Veterans of either conflict



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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