The Causal Effect of Serving in Army on Health: Evidence from Regression Kink Design and Russian Data

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Our paper

- Analysis of the effect of compulsory military service on health based on Russian micro-level data
- Contribute to the growing literature that studies consequences of conscription in different countries
  - New evidence came from quasi-natural experiment (Gorbachev' demilitarization reform)
- Contribute to the analysis of health consequences of military service: first evidence from peaceful-era drafts
- Apply RKD

Literature: Consequences of Compulsory Service in Army in Economics Literature

- Effect on
  - Earning (Angrist,1990, Angrist, Chen, and Song, 2011); Health (Hearst et al. 1986, Autor et al., 2011); Education (Angrist and Chen, 2011, Card and Lemieux 2010); Household Stability (Conley and Heerwig, 2011); Crime (Galiani et al., 2011)
- Evidence from different countries
  - Recent elimination of compulsory service in many countries + new data/methods available renewed interest to this question
  - German data: Bauer et al, 2012; Dutch data: Imbents and van der Klaav, 1995; Portuguese: Card and Cardoso, 2011; 2014; British : Grenet et al. 2011; Swedish: Albrecht et al. 1999; Argentina: Galiani, Rossi, and Schargrodsky, 2011; India: Oliver Vanden Eynde (2013)

Literature: Army and Health

- Most studies find negative effect
- Death rates, suicides, car accidents: Hearst et al. 1986, Vietnam War veterans
- Mortality, smoking and related to smoking diseases (lung cancer) for World War II and Korean War veterans: Bedard and Deschenes, 2006
- Post traumatic syndrome, stress
- Decrease in employment and rise of disability welfare transfers for Vietnam War veterans: Autor et al., 2011
- No effect: Angrist et al, 2010
- Negative but insignificant effect: Dobkin and Shabani, 2009
- Previous studies: Mainly evidence from war era drafts, Our paper: evidence from peaceful draft

Our paper

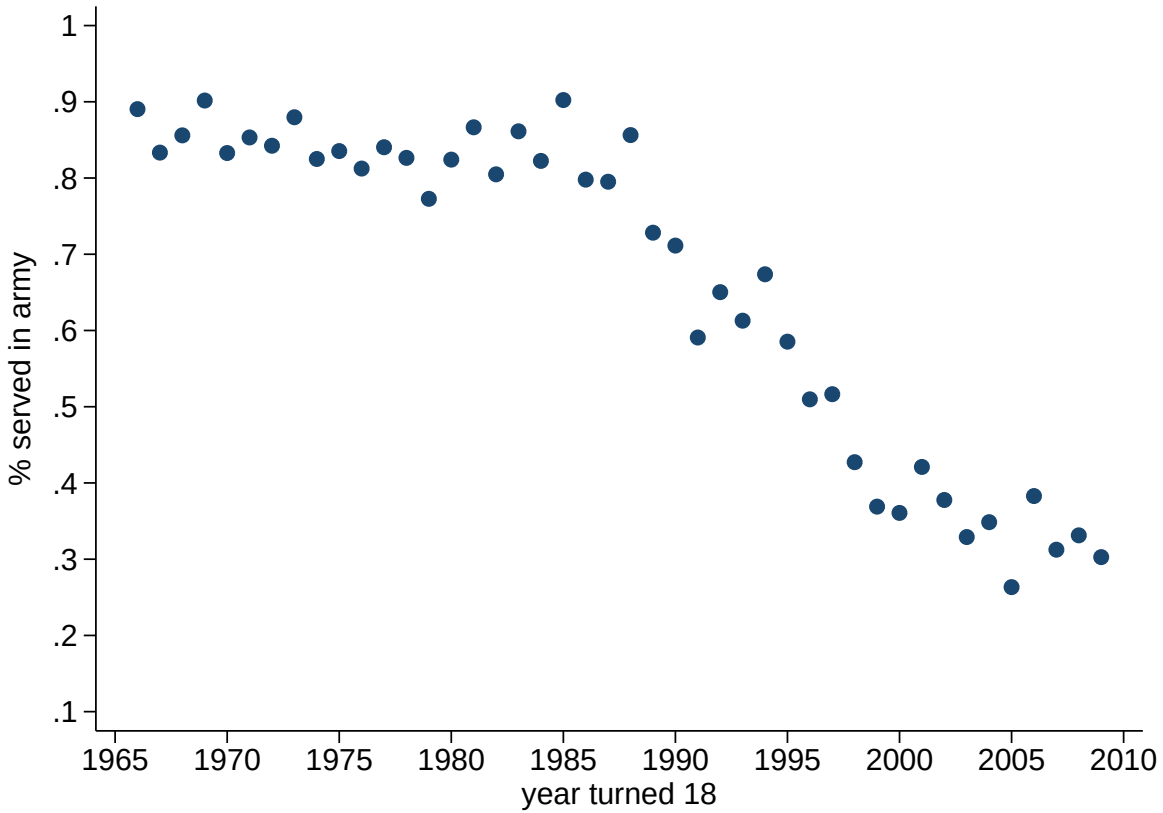
- Use Russian micro level data (RLMS survey, 1994-2012)
- Find strong effect of compulsory military service on smoking, alcohol consumption and related to smoking and alcohol diseases
- Serving in army results in
  - increase in daily alcohol consumption (in days when drinks) by 45 ml (of pure alcohol)
  - increase in daily cigarettes consumption by 5 cigarettes
  - 13% higher chance of getting tuberculosis / hepatitis / chronic lung or liver
  - 13% higher chance of having general health problems

Our paper: why Russia?

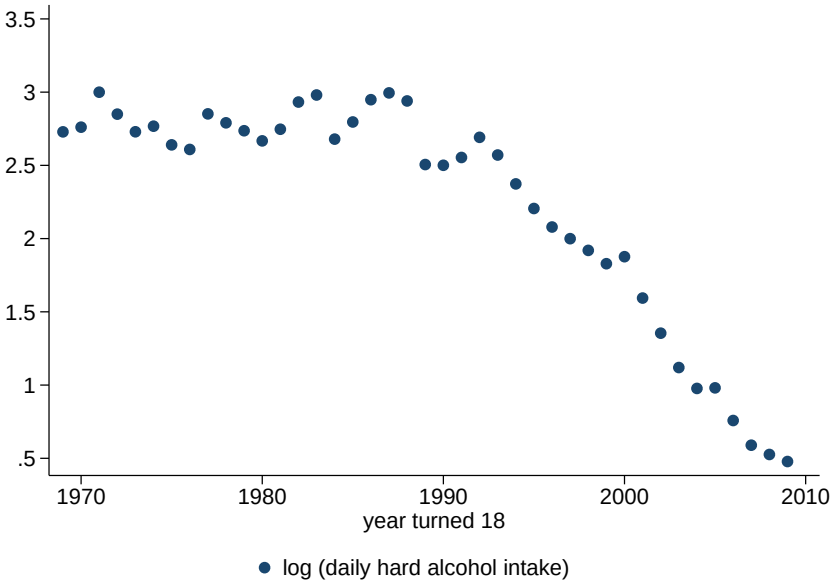
- Rich data, can expect some other interesting results
- Provides quasi-natural experiment that can answer many interesting questions
- Demilitarization reform started in 1988 with the end of Cold War
    - In December 1988, in the UN General Assembly, Gorbachev announced a unilateral reduction of Soviet armed forces to 500 thousands Man, 10 thousands Tanks, 8,500 artillery pieces and 800 combat aircraft
    - In 1989 Mikhail Gorbachev and George Busch signed arms control treaty and Soviet troops withdrew from Afghanistan
- Next decade: gradual decrease in chance of being conscripted

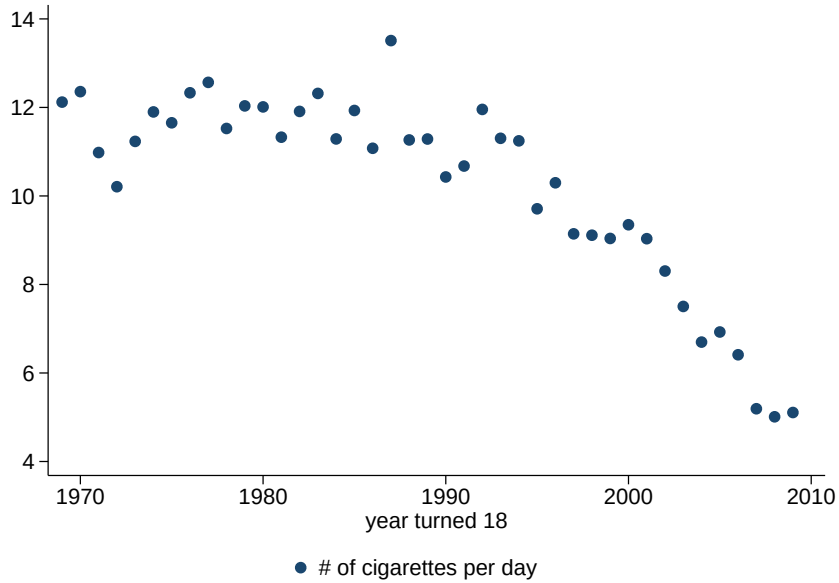
Share of conscripts: date-turned-18-profile

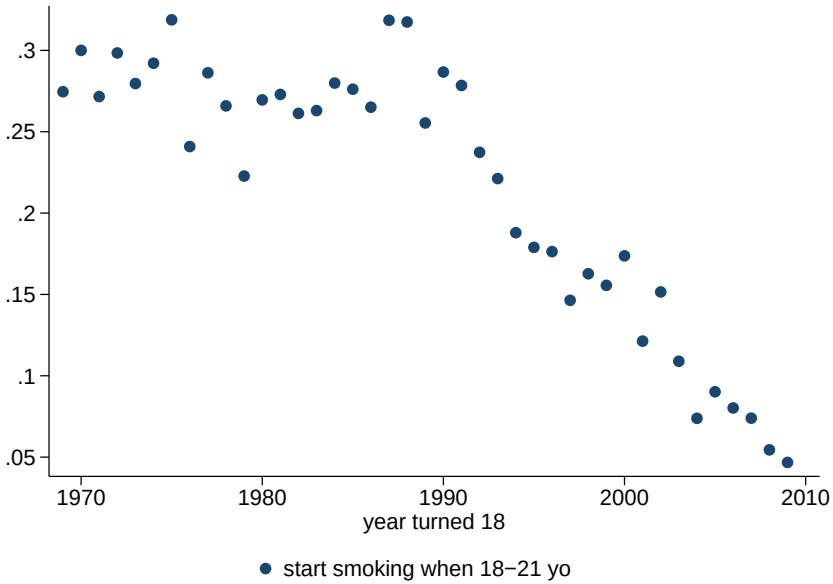
- There is clear kink in probability of being conscripted
- Regression Kink Design: use kink to identify causal relationship between serving in army and health

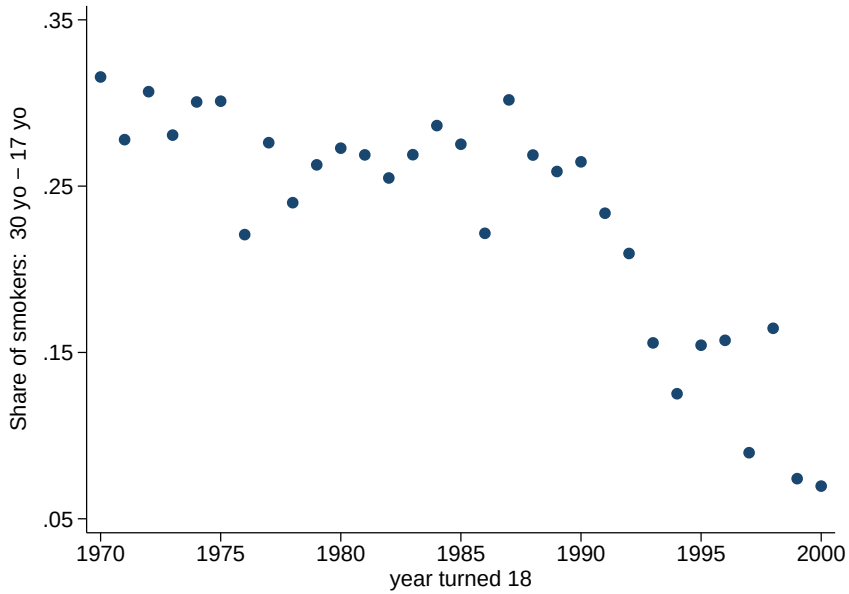


Alcohol and Smoking









Serving in army and health: How to identify causal relationship?

- Selection:
  - those who go to army are selected based on health status, so generally healthier
  - those who go to army usually from poor families and so easier involved in risky behavior (smoking, alcohol consumption, drugs)
- Ideal case:
  - Randomization: Hearst, Newman, and Hulley (1986), Angrist (1990) and subsequent studies: military draft lottery in Vietnam War draft
- In absence of randomization
  - IV: Bedard and Deschenes (2006) and Dobkin and Shabani (2009)
  - RD strategy: Bauer et al (2009)
  - RKD: our paper

Idea behind RKD

- Similar to regression discontinuity intuition
- Look on date-of-birth profile
- Look on change in slope before and after threshold
- Under assumption that other factors change smoothly in neighborhood of kink (with respect to assignment variable), we identify causal relationship

(Fuzzy) RK estimand

- Y : outcome
  - alcohol consumption, smoking, related chronic diseases, hepatitis, tuberculosis
- A is a dummy variable indicating whether individual i went to compulsory military service
- $v = a18 - 1989$, where $a18$ is a date $(year + \frac{month}{12} + \frac{day}{365})$ when person turned 18
- RK estimand
- $$\frac{lim_{v_0 \to 0+} \frac{dE(Y|v)}{dv}|_{v=v_0} - lim_{v_0 \to 0-} \frac{dE(Y|v)}{dv}|_{v=v_0}}{lim_{v_0 \to 0+} \frac{dE(A|v)}{dv}|_{v=v_0} - lim_{v_0 \to 0-} \frac{dE(A|v)}{dv}|_{v=v_0}}$$
- see Card, Lee, Pei, and Weber, 2015

Estimation (Main specification)

- Use females as a control group
  - If some factors that 1) affect young people more than old people and can persist till today; 2) change non-smoothly around kink then problem
  - $\Longrightarrow$ Use females as a control group
- Hepatitis, tuberculosis, chronic diseases are rare events
  - $\Longrightarrow$ global polynomial approximation
  - Repeat analysis for smoking & alcohol with local polynomial approximation

Estimation (Main specification)

- Two groups of population, females ($j = 0$) and males ($j = 1$)
- System of two equations with group-specific coefficients

$$y_{it} = A_i \delta_j + f_j(a18_i) + D_{1988} g(a18_i) + X_{it} \alpha_j + u_{it}$$
$$A_i = h_j(a18_i) + D_{1988} k_j(a18) + X_{it} \gamma_j + \varepsilon_{it}$$

Note: $g()$ is not gender-specific; $k_j()$ is gender-specific

- y_{it} health outcomes; A_i is a indicator that person went to army; $a18_i$ is a date when person turned 18
- D_{1988} is Dummy for person turned 18 in or after 1988
- $f()$, $g()$, $k()$, $h()$ are smooth function (polynomials)
- X_{it} set of observable characteristics: smooth function of age, I(live in city), income, marital status, δ_t, δ_r

Regression results

	alcohol intake	hard alcohol intake	Log hard alcohol intake	# of cigarets per day
I(served)	47.0***	54.6***	0.476**	4.921***
	[10.836]	[8.564]	[0.238]	[1.435]

	I(smokes)	start smoking at 18-21	hep/tub/ chronic diseases	Health problems
I(served)	0.103	0.199***	0.130**	0.131***
	[0.075]	[0.052]	[0.053]	[0.044]

Local polynomial implementation

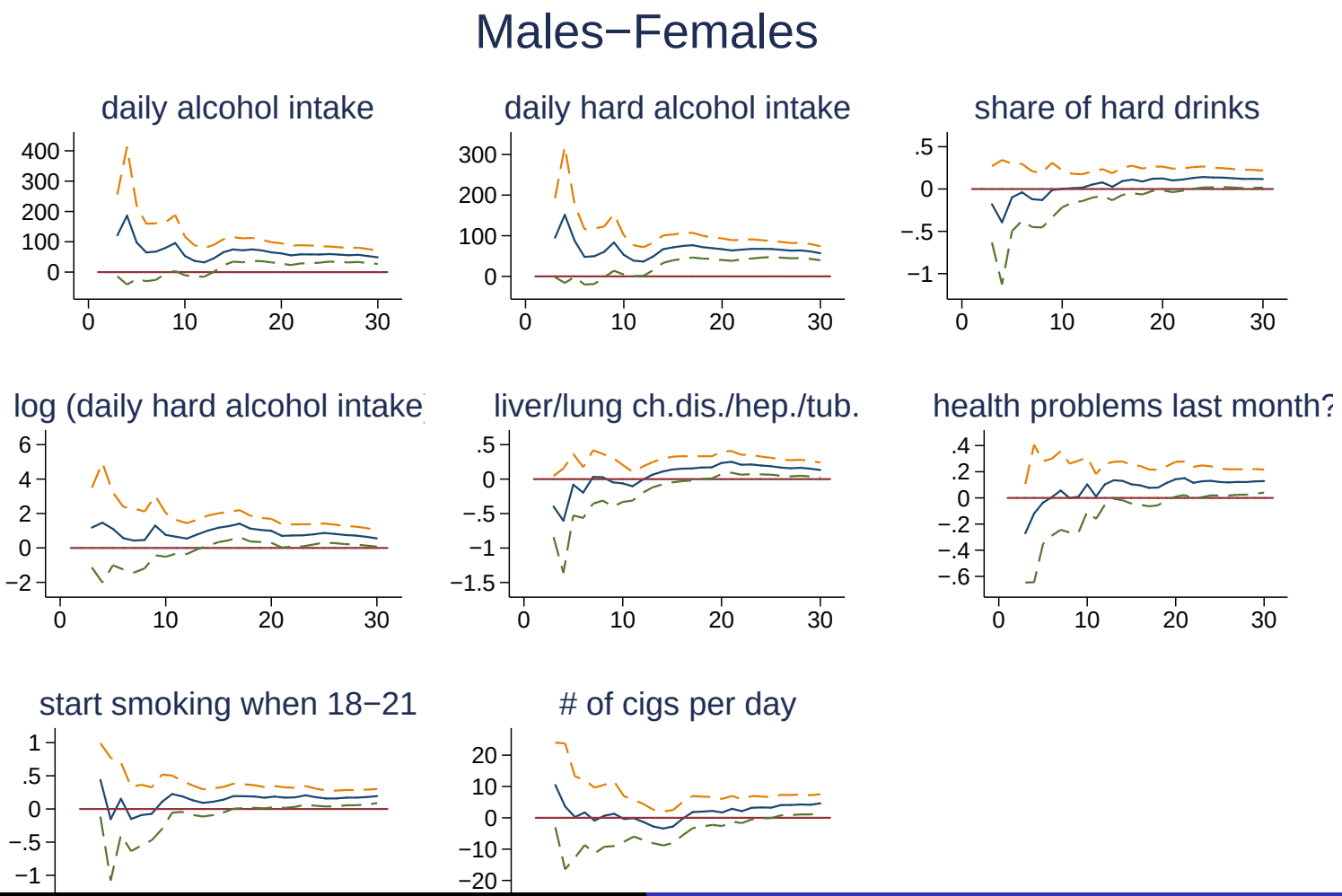
- Deal with panel data, clustered errors
- Bandwidth may be too small if work with pooled data
- Start with data on averages within a18 X gender cells
- Choose bandwidths according to CCT (Calonico, Cattaneo and Titiunik, 2015), and IK (Imbents, Kalyanaraman, 2012)
- Local linear regressions

Local polynomial implementation

	alcohol intake	hard alcohol intake	Smokes?	# of cigarets per day
I(served)	48.9***	57.2***	0.213**	4.4***
	[11.2]	[9.1]	[0.07]	[1.2]
BW	IK for first stage			
BW size	9.7			

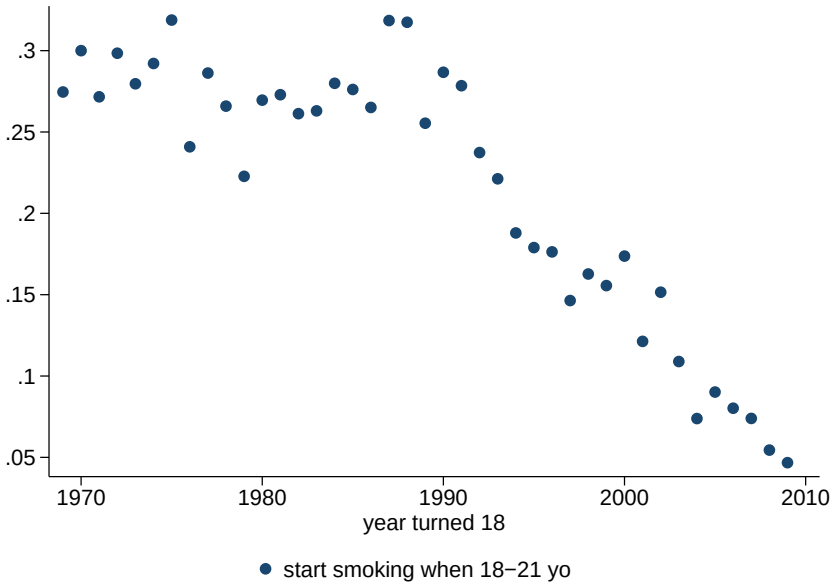
Local Polynomials: Starting from bw=3-5 years most results are similar

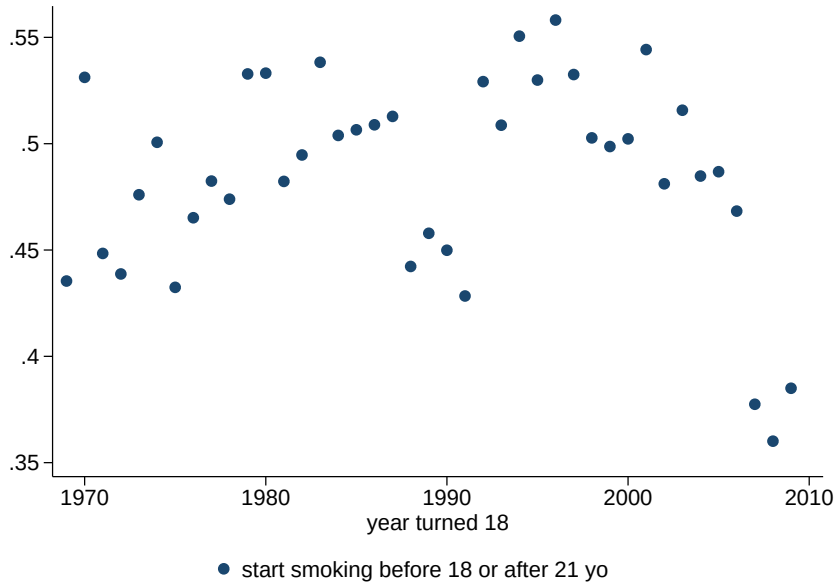
Figure: RK Estimates with Varying Bandwidths



Alcohol and Smoking

Why more smoking&alcohol?
- Initiating (facilitation) smoking&alcohol in army: cigarettes subsidies, peer influence
- Post traumatic stress syndrome, depression
- worse labor market conditions/family outcomes etc...

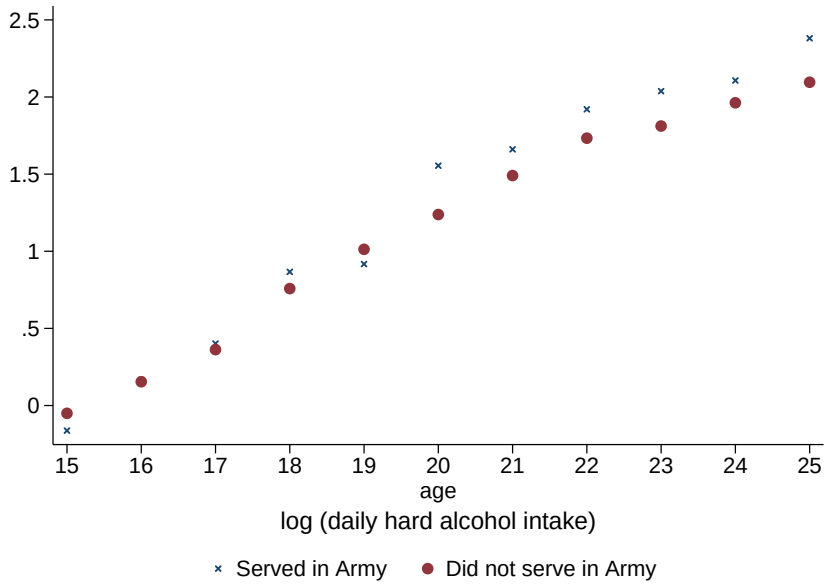


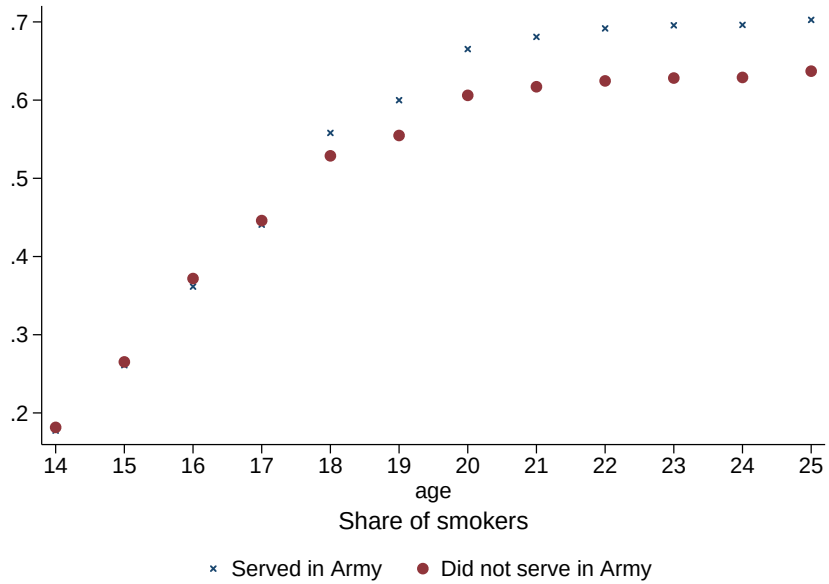


Robustness: Dif-in-Dif around Age 20, Young males

AGE PROFILE, YOUNG MALES:

Increase in alcohol consumption and smoking after compulsory service





Note: date fixed effects are excluded from # of cigarettes and alcohol consumption.

Dif-in-Dif estimates: Serving in army increases chance of smoking on 8%; consumption of hard alcohol by 22% and consumption of cigarettes by 1.35 cigarets per day

Robustness

RD around 1st January
FALL DRAFT dates November - December 31
Quite similar point estimates, (noisy for alcohol consumption)

Table: RD around January 1st

	alcohol intake	hard alcohol intake	# of cigarettes per day	I(smokes)	Served in Army
Served in Army	77.10	53.65	10.02	0.192	
robust se	[72.60]	[59.90]	[9.596]	[0.443]	
se	[35.48]	[30.35]	[3.274]	[0.140]	
I(after NY)					-0.077***
					[0.0280]
BW size	2 months	2 months	2 months	2 months	2 months

Note: Robust st.errors clustered at age18 level

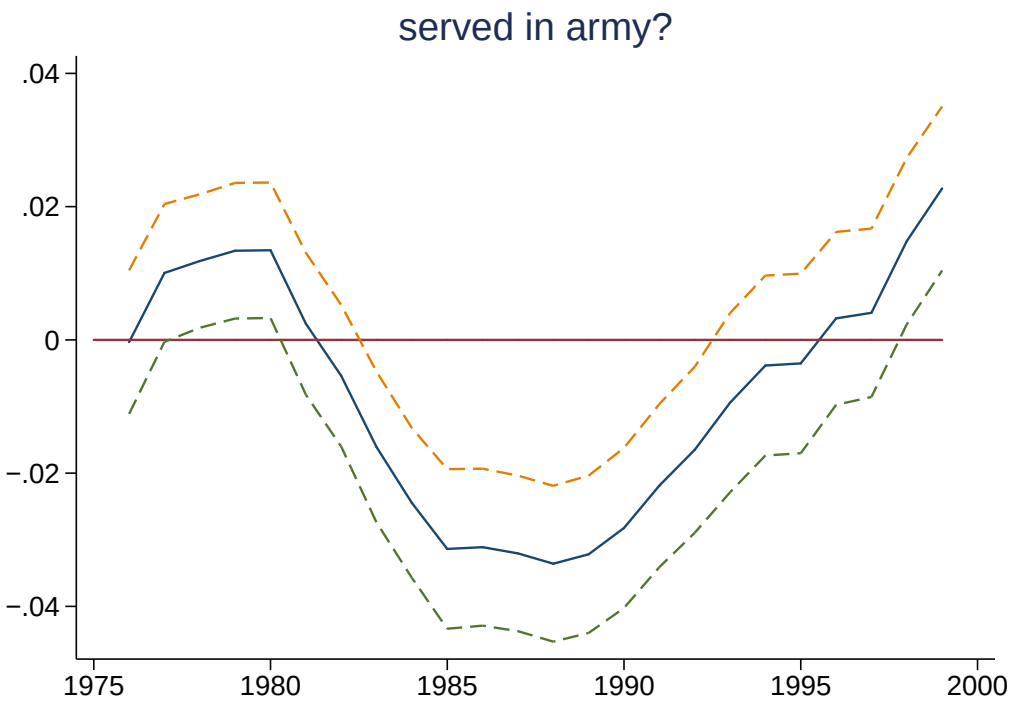
Robustness

- Sample of 2000-2011 dates only: similar results
- Look only on males: results are higher in magnitude
- Look on averages within (gender)*a18 cells rather than on individual level data: same results
- Add national averages of alcohol (beer, vodka, and ratio of beer to vodka) and cigarettes consumption at age 18 (with gender-specific coefficients): similar results (higher in magnitude)
- Add national GNP per capita, death rates etc at age 18 (with gender-specific coefficients): similar results
- Look only males who become 18 age old before 1998 (Expansion of beer industry): similar results with smaller magnitude and bigger standard errors
- RKD within 3-years neighborhood of kink: similar - with higher in magnitude results

Identification assumption: Placebo for kink

Placebo for kink: moving 20-year window of year-turned-18 profile

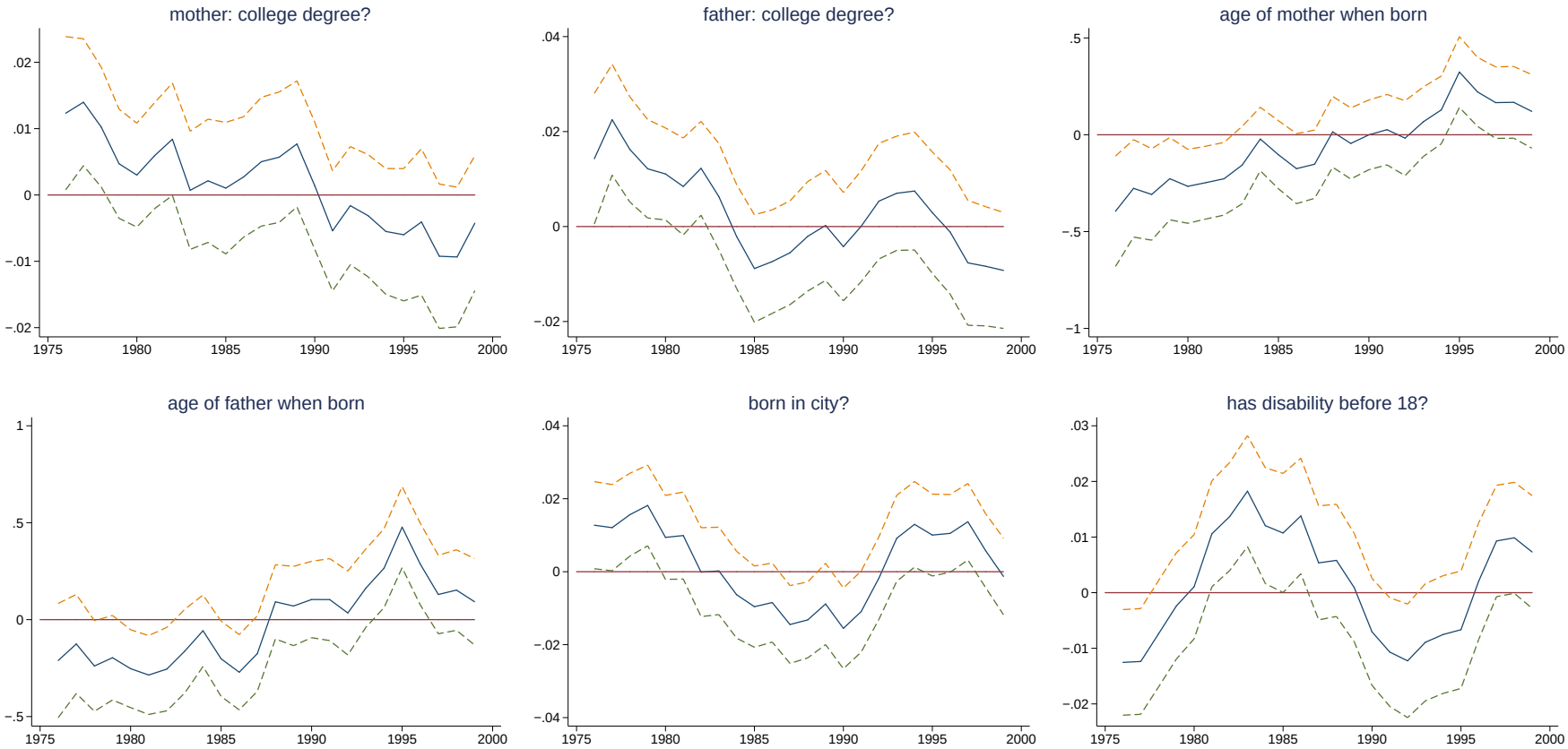
$$
\begin{aligned}
y_{ij} \quad = \quad & \beta_0 + \beta_1 a18_i + \xi(D_{central\ year_k}(a18_i - central\ year_k)) + \beta_2 age + \beta_3 age^2 \\
& + I(Male)(\alpha_0 + \alpha_1 a18_i + \theta(D_{central\ year_k}(a18_i - central\ year_k)) + u_{it}
\end{aligned}
$$



- Kink in risk of conscription around 1989

Placebo for kink

- No kinks in pre-determinant characteristics (parents demographics, education, location, height, early age diseases)

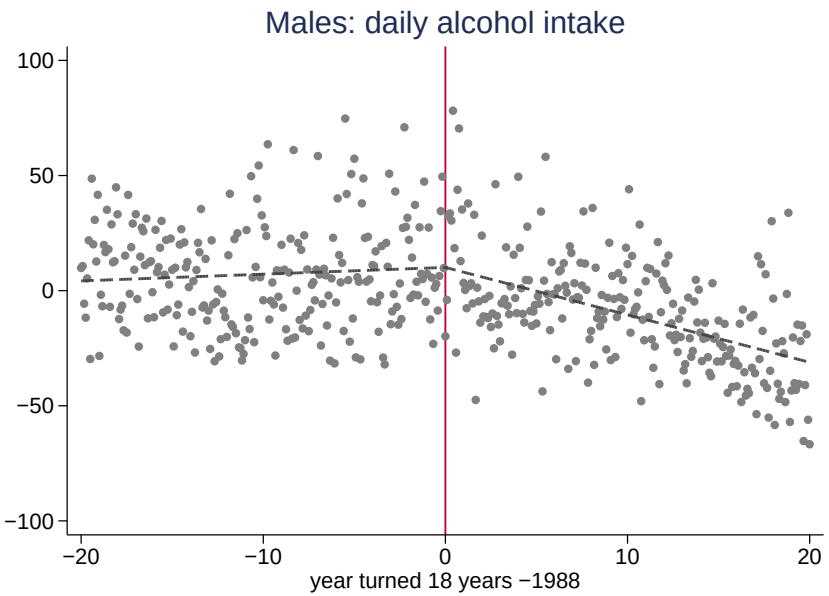


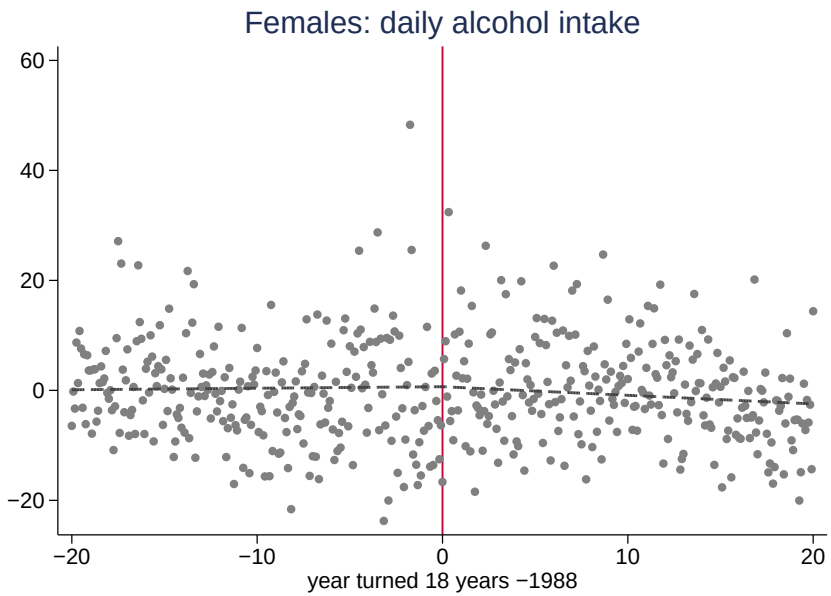
- No discontinuity in distribution of pre-determinant charact-cs

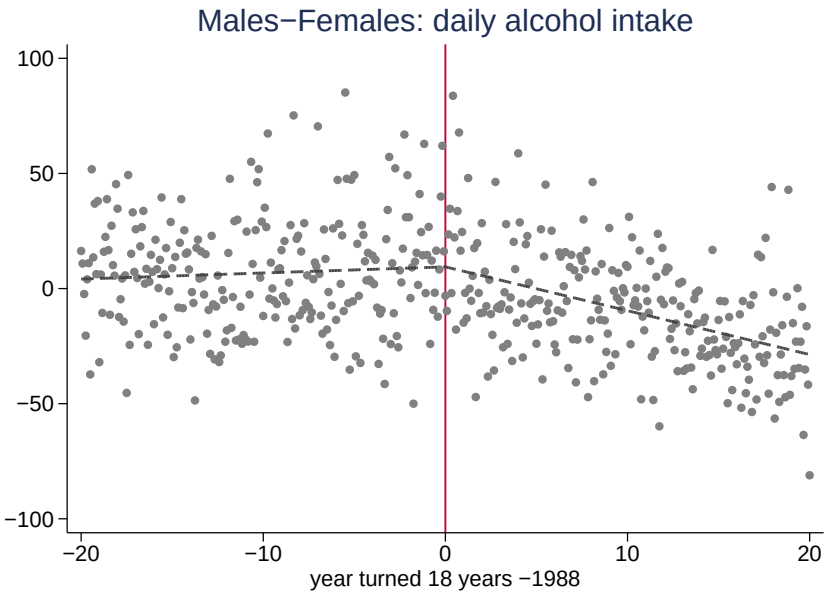
Graphical analysis: males vs females

- Indeed for females we do not observe kinks

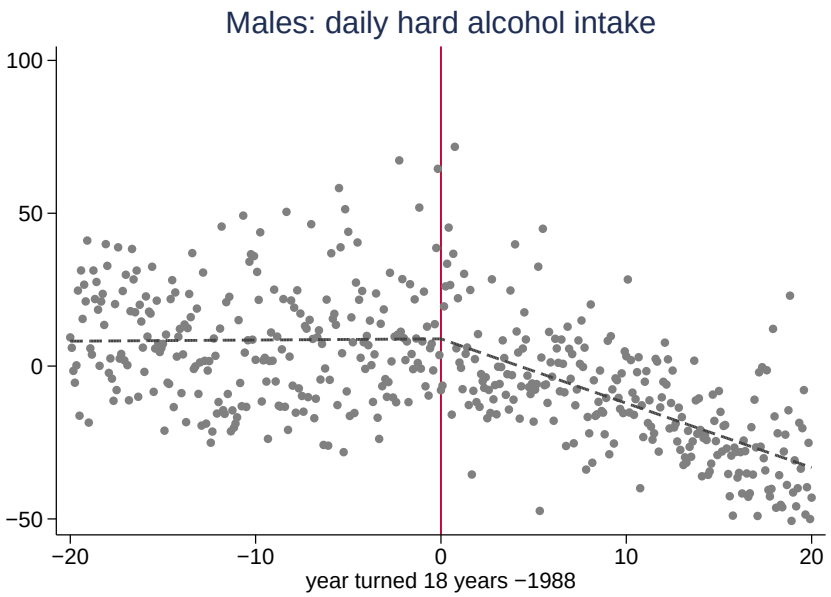
Alcohol consumption profiles

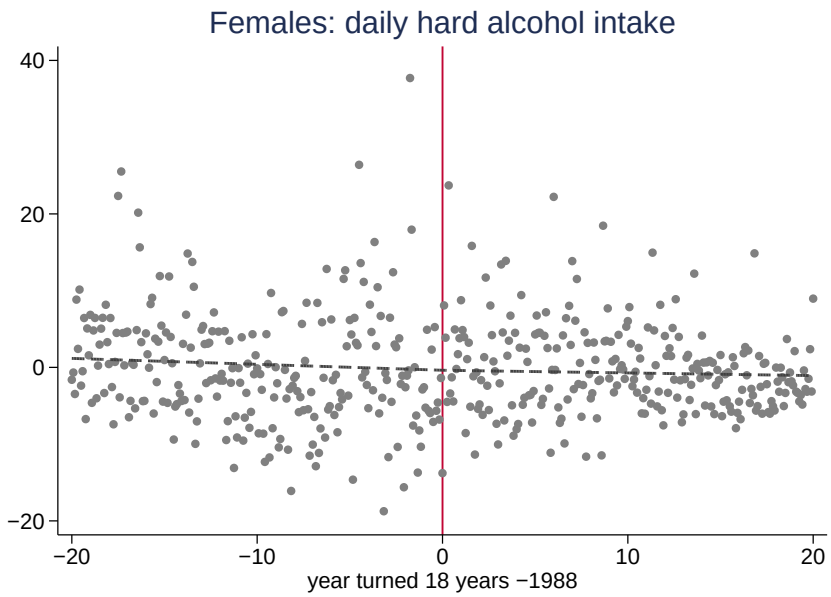


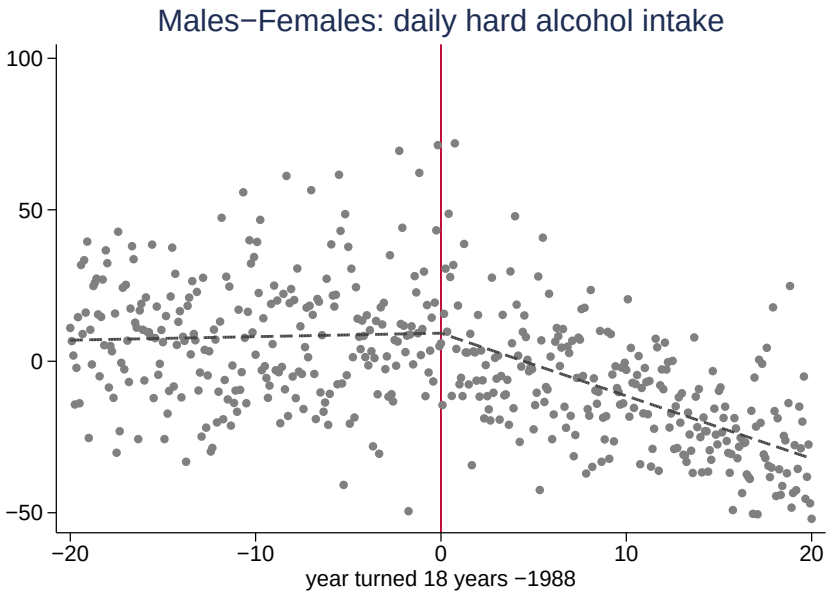




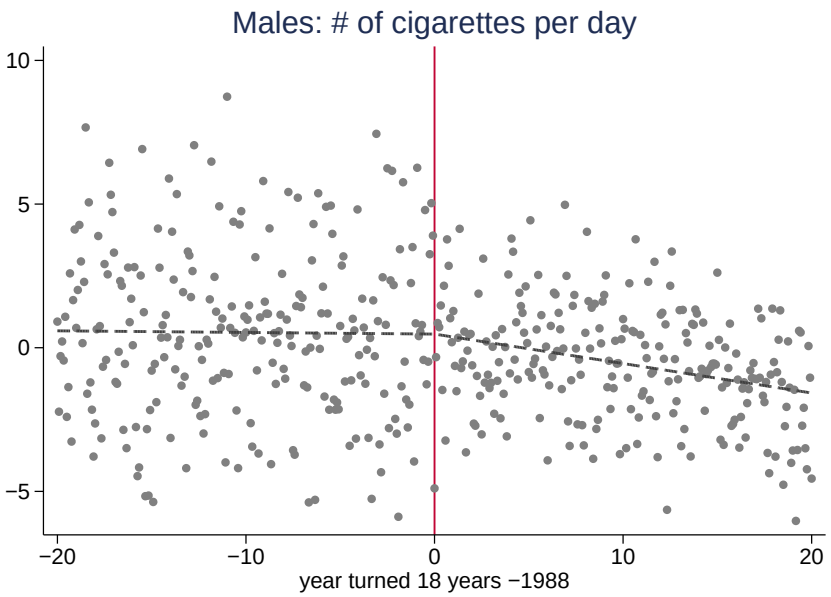
Hard Alcohol Consumption

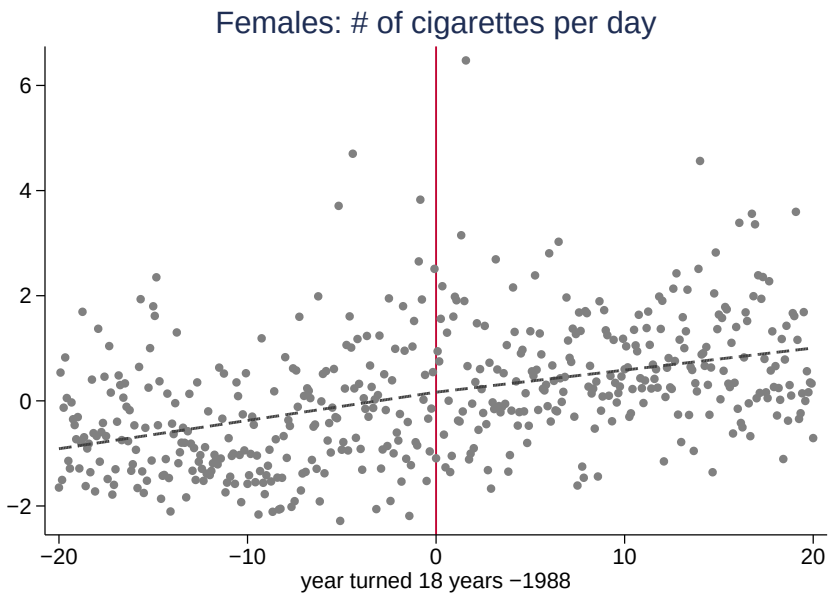


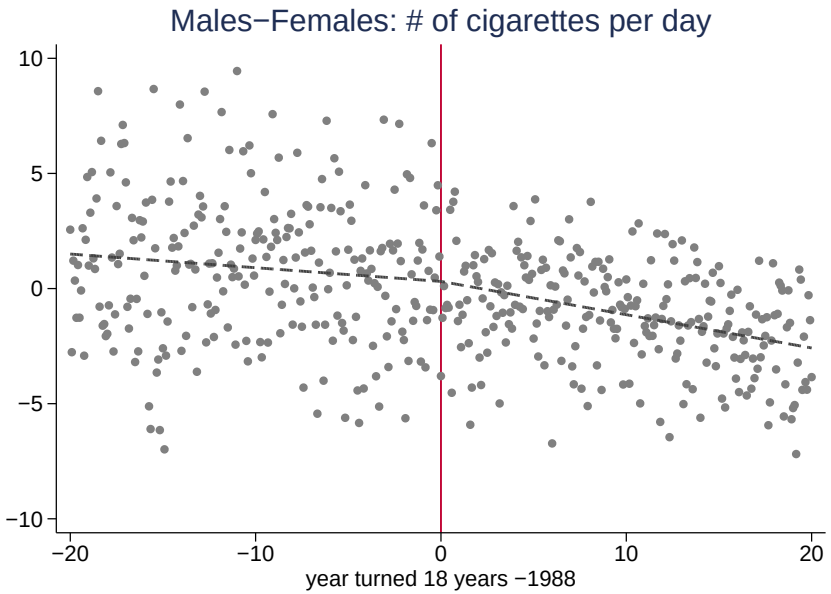




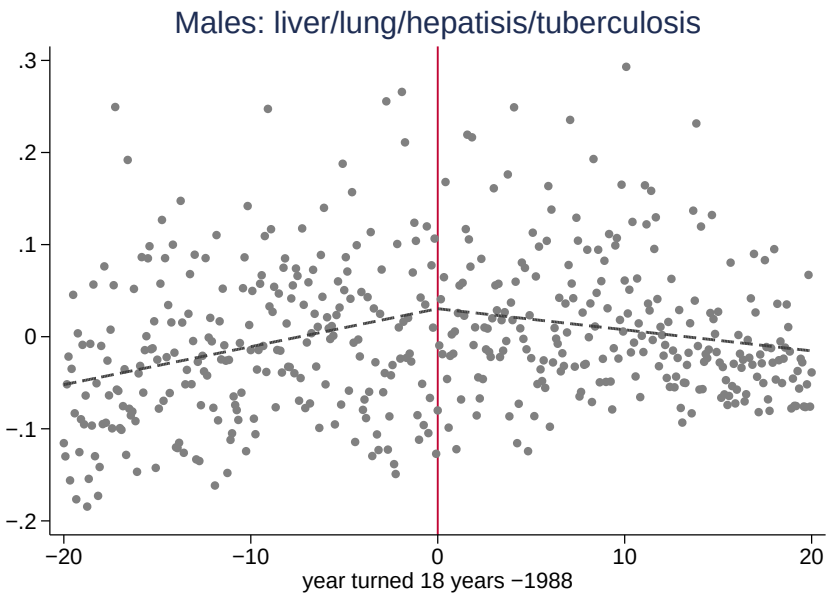
Smoking

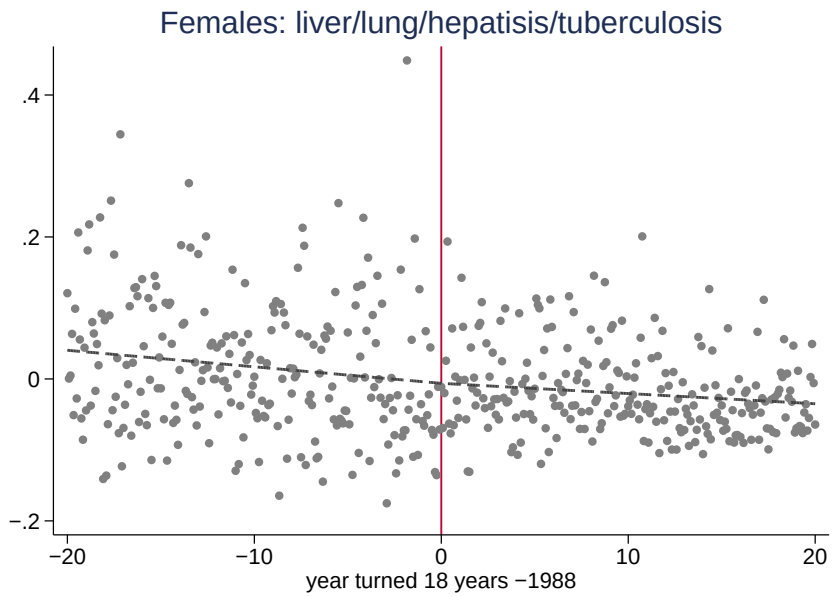

Males: # of cigarettes per day
10
5
0
−5
−20
−10
0
10
20
year turned 18 years −1988

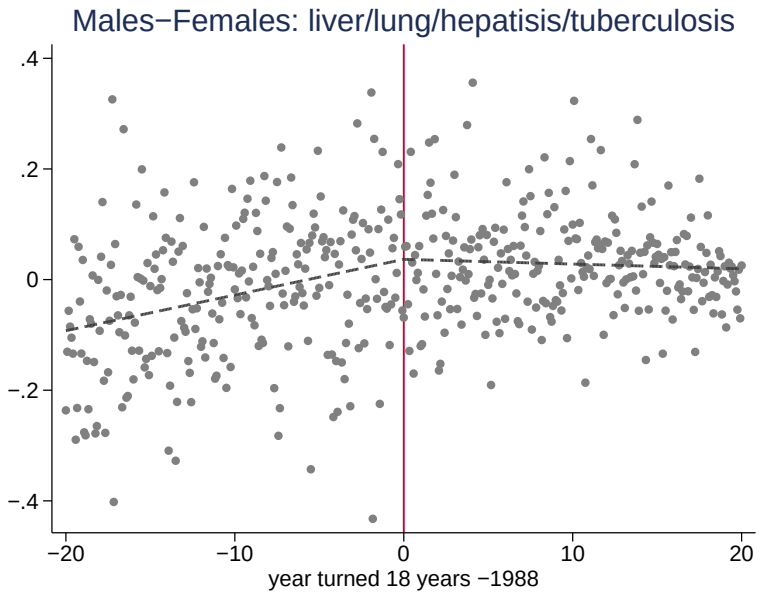

Females: # of cigarettes per day
6
4
2
0
−2
−20
−10
0
10
20
year turned 18 years −1988


Males−Females: # of cigarettes per day
10
5
0
−5
−10
−20
−10
0
10
20
year turned 18 years −1988

Hepatitis/Tuberculosis/Liver/Lung chronic diseases







Conclusion

- Analysis of the effect of compulsory military service on health
  - New evidence came from natural experiment (Russian/USSR Demilitarization Reform)
- Contribute to the analysis of health consequences of military service: first evidence from peaceful-era drafts
  - Strong effect on alcohol consumption, smoking, and related diseases
- Introduce new method (RKD) in health (and development) economics

Appendix

- Appendix

RKD implementation (not main specification)

$$y_{it} = A_i\delta + f(a18)_i + X_{it}\alpha + u_{it}$$

- y_{it} is a outcome (health outcomes)
- A_i is a indicator that person went to compulsory military service
- $f(a18)$ is a smooth function (polynomial) representing the date-turned-18 profile of the outcome y
- X_{it} set of observable characteristics (smooth function of age, I(live in city), income, marital status, time&regional FE)
- $a18_i$ is a date (year+month/12+day/365) when person turned eighteen

First stage

A_i is endogenous
Use kink (in year 1988) as an instrument for A_i

$$A_i = k(a18_i) + (D_{1988} g(a18))_i + X_{it}\alpha + \varepsilon_{it}$$

D_{1988} indicator that person turned 18 years in or later than 1988
$k(a18_i), g(a18)_i$ smooth functions of date when person turned 18,
$g(1988) = 0$
$D_{1988} g(a18)_i$ captures the kink

2 stage (fuzzy) RKD

- $y_{it} = A_{it}\delta + X_{it}\alpha + f(a18) + \delta_t + \delta_r + u_{it}$
- $A_{it} = X_{it}\alpha + f(a18) + (D_{1988}g(a18))_{it} + \delta_t + \delta_r + \varepsilon_{it}$

Ratio ratio of Males to Females by date of birth

Figure: Date-turned-18 profile of ratio of Males to Females