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

David Card and Evgeny Yakovlev*

October 22, 2014

Abstract

The paper estimates the causal effect on health of serving in the Russian Army. We explore a kink in the year-of-birth profile of the probability of compulsory service that happened as a result of the demilitarization process initiated by Mikhail Gorbachev. We find that serving in the Russian Army significantly increases rates of alcohol consumption and smoking; it also results in a higher chance of getting hepatitis and tuberculosis, related to alcohol consumption and smoking chronic diseases and general health issues.

*David Card from UC Berkeley and NBER, e-mail: card@econ.berkeley.edu; Evgeny Yakovlev from HSE, eyakovlev@hse.ru. Preliminary and incomplete draft.

1 Introduction

The paper studies the health consequences of compulsory military service in the Russian Army.

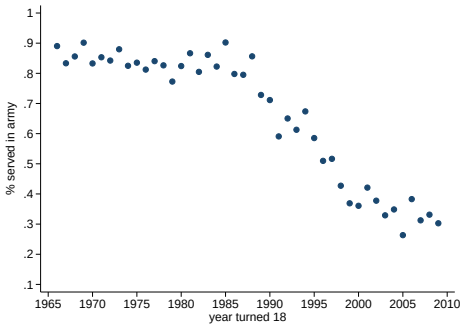
To find the causal effect of serving in the army on health we apply a Regression Kink Design (RKD) approach where we explore the kinked structure in year-of-birth profile of the rate of conscription. The kink in policy function is driven by the demilitarization process started in Russia at the end of 1980s.

Since the end of WWII and through the 40-years of the Cold War the Soviet Union had the largest active army in the world with size of men force of 4 to 5 million people. The end of Cold War and the following demilitarization process introduced by Gorbachev resulted in a significant decrease in the size of the Russian Army.[1] The share of military spending had fallen by more than half: from 8.5% of GDP in the middle of 1980s to around 4% in the middle of of 2000s (See Julian Cooper, 1997, 2007). The size of Russian army had decreased by two thirds from 2.7 million in 1992 to around 1 million in 2010 (see International Institute of Strategic Studies report, 2010).[2]

The same happened with the number of new conscripts. The share of Russian males who served in the army decreased gradually from more than 80% in the middle of 1980s to around 30% in 2000s.

Figure 1 illustrates this point. It shows that among males who turned 18 - official conscription age in Russia - in 1950-1980s eighty percent has served in army. Starting from the end of 1980s this share decreased gradually to 30% for those who turned 18 in 2000s.[3] Figure 20 in the Appendix shows trend in the size of the manpower of the Russian Army. It also shows kink in 1989.

Figure 1: Percentage of males serving in army by year turned 18



We show that this change in the distribution of males who went to mandatory

[1] Official end of Cold War is dated 1989, when Gorbachev and George Bush signed an arms control treaty and Soviet troops withdrew from Afghanistan.

[2] The size of the Soviet army at the beginning of 1990s was about 4 million people; the Russian part of it constitutes 2.7 million.

[3] Figure 21 in the Appendix shows that this pattern is not driven by selection on age bias: most of males had been conscripted between the ages 18-20.

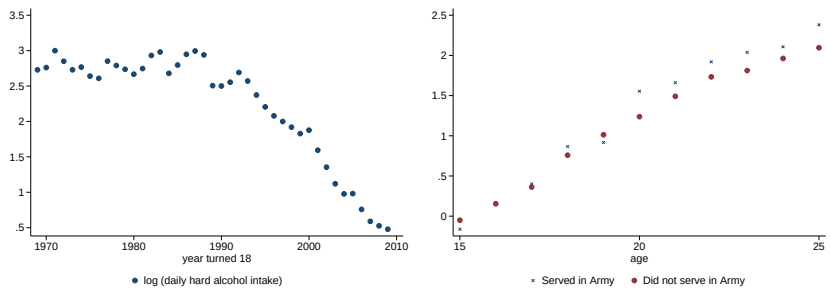
army service has strong consequences on the health of males.

First we find that male participation in risky behaviors, such as alcohol consumption and smoking significantly decreased. Chronic illnesses associated with alcohol abuse and smoking as well as the chance of getting hepatitis or tuberculosis significantly reduced.

Figures 2 and 3 below illustrate our main findings.

Figure 2 (left) shows year-turned-18 profile of (log) daily hard alcohol consumption for a sub-sample of Russian males. Similar to the serving-in-army profile there is a notable change in the slope at the end of 1980s. The fact that serving in the army significantly increases alcohol consumption also finds support from the data on those who recently came from compulsory service. Figure 2 (right) shows how consumption of hard alcohol changes with age for two subgroups of the young male population: those who served in the army and those who did not. There is a significant increase in the log of hard alcohol consumption at 20, the time when the majority of those who went to military service come back home.

Figure 2: Log of daily hard alcohol intake: year-turned-18 and age profiles



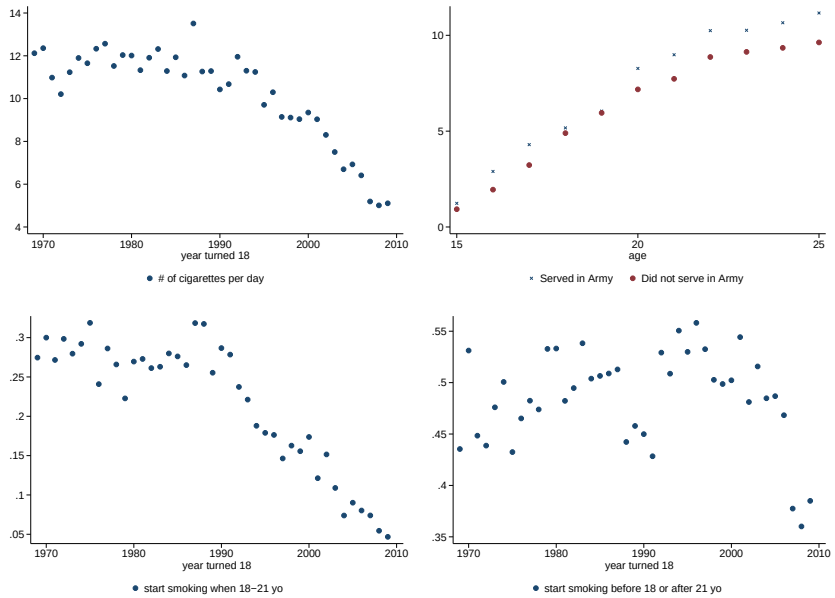
Note: year fixed effects are excluded from age profile of alcohol consumption.

A similar pattern is observed in age and year-turned-18 profiles of cigarette consumption: the age profile of cigarette consumption (Figure 3, upper left) shows an increase in cigarette consumption at 20. Year-turned-18 profile of daily cigarettes consumption (see Figure 3, upper right) shows notable change in the slope at the end of 1980s (although the profile is smoother compared to that of alcohol intake). Finally, Figure 3, lower left and Figure 3, lower right show year-turned-18 profile of the probability of starting smoking at 18-21 (age when males serve in the army) and in other age correspondingly.[4] 18-21 is the age when the majority of males have served in the army. Again, there is notable kink in the probability of starting smoking at 18-21. In contrast the probability of starting smoking before 18 or after 21 does not have a kink.

Our regression estimates support the story the graphs tell us. We show that males who went to compulsory military service consume more alcohol, smoke

[4]RLMS survey asks respondents about age when start smoking. Unfortunately, RLMS does not ask similar question for alcohol consumption.

Figure 3: Daily cigarettes consumption: year turned 18 and age profiles



Note: year fixed effects are excluded from age profile of cigarettes consumption

more cigarettes, and have higher share rates of liver or lung chronic diseases; hepatitis and tuberculosis, and in general have more health problems compared to those who did not go to army.

The effect of military service is high in magnitude: males who served in army drink twice as much hard alcohol, consume 4 more cigarettes per day, have 11% higher chance of having tuberculosis or hepatitis and 6% higher chance of having chronic lung or liver diseases.

Our results coincide with an extensive body of studies of war-era veterans which demonstrates the strong negative consequences of the army service (see Hearst et al. (1986), Bedard and Deschenes (2006), Autor et al (2011)). The fact that our results come from a (relatively) peaceful era of military service is striking, but not surprising.[5] Sociological studies and much anecdotal evidence emphasize the humiliating treatment that conscripts face in the Russian Army (see for example Bannikov 2002, Spivak and Pridemore (2004), Surkova, 2010, *or dedovshchina* article in Wikipedia).

The health consequences of serving in the military have long been studied in economics as well as in other social sciences. Hearst et al. (1986) docu-

[5]There were several military conflicts during the period of study in which USSR and Russia took part, among them Afghanistan and Chechen Wars. However the fraction of those who took part in these conflicts is low compare to total size of army force. Thus, only 2.5% of Soviet military manpower took part in Afghanistan War and 8% of Russian military manpower took part in Chechen War.

ment the strong effect of military service on the health and mortality of Vietnam War veterans. Bedard and Deschenes (2006) find strong long run consequences of serving in the military during WWII and the Korean War era on veterans' health. They find that a large fraction of excess veteran mortality is attributable to military-induced smoking. Autor et al. (2011) document a significant decrease in employment and a rise of disability welfare transfers for Vietnam–era veterans. Dobkin and Shabani (2009) find negative (although statistically insignificant) association between military service and health. Angrist et al (2010) find no effect of military service on overall work-limiting disability rates for Vietnam-era veterans.

The econometric complications of the analysis of the causal effect of military service is the non-random selection of those who went to military service. Those who go to military service are selected based on health status, and generally have better health; on the other hand those who go to military service usually came from poor neighborhoods and poor families, and thus have a higher chance of starting unhealthy habits, such as smoking, alcohol or drug consumption.

To overcome these difficulties, authors use various identification strategies.

In an ideal case as in Hearst, Newman, and Hulley (1986), Angrist (1990) and in subsequent studies the authors explore a randomized natural experiment (military draft lottery) to identify the effects of military service on health and earnings of Vietnam War veterans. In the absence of randomized experimental data researchers use alternative approaches. Bedard and Deschenes (2006) and Dobkin and Shabani (2009) employ IV strategy. Bauer et al (2009) use a regression discontinuity design to find the causal effect of serving in the army on wage and employment of German conscripts.

In our paper we utilize a Regression Kink Design (RKD) approach. Similar to the RD (regression discontinuity) method, RKD explores the non-smoothness of policy function to find exogenous variation of the variable of interest: RKD explores the kinked structure of policy functions (for example a kink in the tax schedule) and uses variation in slopes of policy functions around the kink to identify a causal relationship. Under the assumption that all other factors behave smoothly in the neighborhood of the kink, RKD succeeds in identifying a causal effect by looking at the change in the slope in the outcome variable. For a theoretical treatment, statistical packages and discussion see Card, Lee, Pei and Weber (2012), Calonico, Cattaneo, and Titiunik (2013), Lee and Lemieux (2010).

The paper is organized as follows. In the next section we discuss the data. Part 3 discusses the empirical strategy. Part 4 provides graphical analysis, part 5 discusses regression estimates, part 6 discusses results and robustness checks, and part 7 concludes.

2 Data

In this study we utilize data from the Russian Longitudinal Monitoring Survey (RLMS).[6] The RLMS is a nationally-representative annual survey that covers more than 4,000 households (between 7413 and 9444 individual respondents), starting from 1992. Our study utilizes rounds 5 through 21 of the RLMS, a time span from 1994 to 2012, but excludes 1997 and 1999. The data cover 33 regions – 31 oblasts (krays, republics), plus Moscow and St. Petersburg. Two of the regions are Muslim. Seventy-five percent of respondents live in an urban area. Forty three percents of respondents are males. The percentage of male respondents decreases with age, from 49% for ages 13-20, to 36% for ages above 50. The data cover only individuals older than 13 years.

The RLMS data has a low attrition rate, which can be explained by low levels of labor mobility in Russia (See Andrienko and Guriev 2004). Interview completion exceeds 84%, lowest in Moscow and St. Petersbug (60%) and highest in Western Siberia (92%). The RLMS team provides a detailed analysis of attrition effects, and finds no significant effect from attrition.[7]

In our study we utilize rounds 5-21 of RLMS survey. We do not use rounds 1-4 because they were provided by different agency and have worse quality.

The RLMS survey contains questions asking about military service only in the three out of 16 rounds we use (rounds 14, 20, and 21).[8] Once we track answers to other rounds we have information about military service for 80 % of male population (see table 2). 62.4% of males older than 19 year old indicate that they have served in army. Out of them 48.4 % start serving at age 18; 28% started at age 19; 11% started at age 20, and 10% indicated that they went to military service at age 17, 21 or 22.

The RLMS survey contains rich information on the health of respondents, including information about smoking, alcohol consumption, various diseases and death events. It also contains rich data on the different demographic characteristics of respondents. Summary statistics of demographic characteristics and health outcomes are shown in Table 1.

In our paper we look on the sample of adults between 21 an 65 years old. At 21 most of males who served already came back from military service.

[6]This survey is conducted by the Carolina Population Center at the University of Carolina at Chapel Hill, and by the High School of Economics in Moscow. Official Source name: "Russia Longitudinal Monitoring survey, RLMS-HSE," conducted by Higher School of Economics and ZAO "Demoscope" together with Carolina Population Center, University of North Carolina at Chapel Hill and the Institute of Sociology RAS. (RLMS-HSE web sites: http://www.cpc.unc.edu/projects/rlms-hse, http://www.hse.ru/org/hse/rlms).

[7]See http://www.cpc.unc.edu/projects/rlms-hse/project/samprep

[8]Because of this, we were not able to analyze the effect of conscription on mortality, although data on mortality is available for all rounds. This is because we are restricted use only information on death events in last rounds (starting from 15), and because death is relatively rare event we do not have enough power to provide reliable estimates.

3 Empirical Strategy

We follow similar notation as in Card, Dobkin and Maestas (2008).

In our model we want to estimate the simple causal model of the effect of serving in army on health

$$y_{ia18} = X_{ia18}\alpha + f(a18) + A_{ia18}\delta + u_{ia18} \tag{1}$$

y_{ia18} is a outcome (health status or alcohol/tobacco consumption) for individual i and date when person turned eighteen years, $a18$. X_{ia18} stands for set of observable characteristics, $f(a18)$ is a smooth function (polynomial) representing the birth date profile of the outcome y, A_{ia18} is a dummy variable indicating whether individual i went to compulsory military service, and u is a error term.

The main problem in estimation of this equation is that A_{ia18} is endogenous: Males who go to army are selected based on health evaluation and in general have better health. Besides those who come to army usually came from poorer families and/or neighborhoods, and may have higher chance to be induced to smoking and alcohol consumption before as well as after they come from military service.

To overcome endogeneity we use instrument for A_{ia18}. The source for instrument is year 1989 and associated with this year a kink in the year-turned-eighteen profile of chance to be conscripted. Before 1989 year-turned-eighteen profile was flat: those who born later have the same chance to be conscripted as those who born earlier. After 1989 year-turned-eighteen profile is downward-sloping: those who born later have smaller chance to be conscripted (see Figure 1 in introduction).

Then the first stage of the regression have following form.

$$C_{ia18} = X_{ia18}\alpha + f(a18) + (D_{1989}g(a18))_{a18}\pi + \varepsilon_{ia18} \tag{2}$$

where D_{1989} is dummy variable that person turned eighteen years in or later than 1989 and $g(a18)$ is a smooth function of date (year) when person turned 18 that have equal to zero at kink $a18 = 1989$.

The potential issue of this regression is that some other factors (not only the chance of being conscripted) that might also change not smoothly around year 1989 and that may affect outcome variables too. Many things happened in Russia that time, among them collapse of Soviet Union in 1992, liberalization of markets since 1992, end of Gorbachev Anti-Alcohol campaign in 1991. These changes may result in (not smooth) changes in personal preferences (of consumption unhealthy goods), changes in healthcare system and thus contaminate our results. To control for these factors we use females as a control group in our analysis (see also Card and Lemieux (2001) for similar approach). Under (strong) assumption that the other factors affect both sexes in similar way the model then is identified.

With additional group, our model can be rewritten in following way. For two groups of population, females ($j = 0$) and males ($j = 1$) we estimate the system of two equations (second and first stages) with group-specific coefficients:

$$y_{ija18} = X_{ija18}\alpha_j + f_j(a18) + D_{1989}g(a18)\xi_j + A_{ia18}\delta_j + u_{ija18} \tag{3}$$

$$C_{ija18} = X_{ija18}\alpha_j + f_j(a18) + (D_{1989}g(a18))_{ja18}\pi_j + \varepsilon_{ija18} \tag{4}$$

The identification assumption of this model is that (1) other factors (than chance of being conscripted) that may have kink in 1989 affect males and females equally, or in notation ξ in second step does not have subscript j; and (2) In first stage $\pi_1 \neq \pi_0$. Because $\pi_0 = 0$ in 1st stage, the second assumption becomes simply $\pi_{01} \neq 0$.

Finally, discrete nature of running variable and relatively small size of our data does not allow us to analyze the effect of serving in army in very close neighborhood of kink and to apply no-parametric approach. We follow suggestion of Card, Dobkin and Maestas (2008) and Card and Lee (2013) and parametrize $g_j(a18)$ and $f_j(a18)$ to be polynomial functions and treat model specification error as random error term. This assumption implies that error terms have specific clustered structure (clustered at $a18$*$gender$ level).

In linear regression framework with linear parametrization of $g()$ and $f()$ the model can be estimated by following two-stage regression.

$$\begin{aligned} Y_{it} \quad = \alpha + \quad & \beta_0 A_i + \beta_1 D_{1989}(a18_i - 1989) + \rho_{10}(a18_i - 1989) + \Gamma_0' X + \delta_t + \delta_r \\ & + I(Male)(\gamma_1 + \rho_{11}(a18_i - 1989) + \Gamma_1' X + \delta_t + \delta_r)) + e_{it} \end{aligned} \tag{5}$$

where A_i is instrumented by variable $I(Male)D_{1989}a18$.

Variable $I(Male)D_{1989}a18$ captures change in slope in year-turned-18 profile of probability of going to army. In this regression and further in text $a18$ stays for date when person turned eighteen years.

Set of controls includes year and regional fixed effects, relative personal income, indicator if person lives in a regional capital, and smooth (polynomial) function of age. We force coefficients with set of control variables to be equal for male and female groups: $\Gamma_0 = \Gamma_1$.

To account for specification error, standard errors are clustered at ($a18$*$I(Male)$) level.

Then we estimate a model where we allow $g()$ and $f()$ to be approximated by forth order polynomial function. The model specification in this case is as follows

$$\begin{aligned} Y_{it} \quad = \alpha + \quad & \beta_0 A_i + \beta_1 D_{1989} a18_i + \sum_{k=1}^{4} \rho_{0k}(a18_i - 1989)^k + \Gamma_0' X + \delta_t + \delta_r \\ & + I(Male)(\gamma_1 + \sum_{k=1}^{4} \rho_{1k}(a18_i - 1989)^k + \Gamma_1' X + \delta_t + \delta_r)) + e_{it} \end{aligned} \tag{6}$$

In this case A_i is instrumented by forth order polynomials of $a18_i$ multiplied by $I(Male)D_{1989}$ and set of controls also includes second-order polynomial function of age $\sum_{k=1}^{2} \gamma_{jk}(age_i - 21_i)^k$, $j \in \{0, 1\}$.

4 Graphical analysis

This section provides graphical analysis that illustrates our findings.

4.1 Army

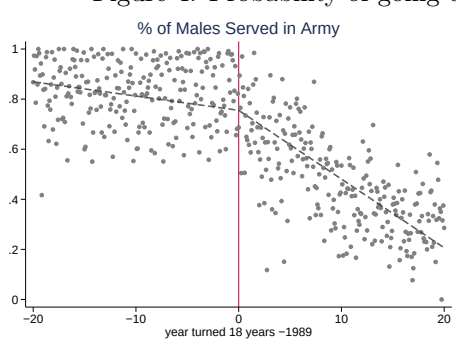
In graphical illustration we look on sub-sample of people who turned eighteen in years 1970-2010 i.e. within twenty-years interval of year 1989. We put January 1st 1989 to be a "kink" date: Official end of Cold War is dated by year 1989, when Michael Gorbachev and George Busch signed arms control treaty and Soviet troops withdrew from Afghanistan, and Russia started demilitarization process.

Following RKD terminology we define (time) running variable to be a date (month X year) when person turned eighteen years. In our graphs we put number of bins to be equal 100 before and after kink point, and normalize running variable to be equal 0 for those who turned 18 in January 1989.

We start our analysis with graphical illustration of how share of those who went to compulsory military service has changed.

Figure 4 shows age-turned-18 profile of share of males who goes to army. To show presence of kink, we also include approximation of data with linear global polynomials before and after threshold. As Figure 4 shows, there is clear kink at 0.

Figure 4: Probability of going to compulsory military service



To show how alcohol consumption, smoking and health have changed within neighborhood of kink we use the following approach.

The one issue that can contaminate impression from graphical illustration above is that consumption of unhealthy goods as well as many health outcomes depends on age in not-linear way. For example it is commonly agreed that

consumption of alcohol and smoking has reverse U-shape age profile (see for example chapter of Alcohol in Handbook of health economics, Cook and Moor, 2000). The same is happening with health outcomes: the chance of having disease increases with age non-linearly. Looking then on year-turned-18 profile of these variables may be misleading because one can mistakenly interpret quadratic age effects as presence of kink (reminder: year-turned-18 correlates with age). [9]

To deal with issue we also show year-turned-18 profile of health outcomes after we took out quadratic age effects from these variables. Although year-turned-18 and age are correlated, long panel structure of RLMS survey gives us ability to disentangle these two effects.

We first look on how health, smoking and alcohol consumption of males change with changes in running variable. In second set of graphs we follow Card and Lemieux (2001) strategy and use females as a control group. In these graphs we look on trends in health, smoking and alcohol consumption of men relative to those of women. Finally, we show (residual) profiles for females.

For each variable we show 4 graphs: unconditional year-turned-18 profiles of the variable for sample of males; and residual year-turned-18 profiles for males, differences between males and females, and females only.

Looking on males and on difference between males and females require fairly strong assumptions to claim that true effect of serving in army is observed in graphs. When look only on males we require that there are no other factors that can also have similar (to Pr(going to army)) non-smooth timing structure and also affect health outcomes. When comparing males with females we require that other factors affect equally males and females, and also that there is no peer influence of males on females. In last case the effect of army on (say) smoking and alcohol consumption may be understated.

4.2 Alcohol consumption and health outcomes

We start our discussion with analysis of the effect of army on alcohol consumption.

Russian males are famous for their heavy drinking. Alcohol abuse is frequently sited to be the main cause of low life expectancy of Russian males (see Nemtsov 2000, Bhattacharya et al 2010). Peer influence and other factors such as bad army conditions can facilitate drinking when person serves in Army, and then consequently affect drinking patterns later on though habits. Habits toward alcohol beverages may be very persistent, and may affect consumption pattens and consequently health outcomes through all future life (see Kueng and Yakovlev, 2014, Yakovlev, 2013).

Figures 5 and 6 below shows year-turned-18 profiles for daily alcohol intake and hard alcohol consumption. At the end of paper we also show year-turned-18 profiles for other measure of alcohol consumption, log of hard alcohol intake and

[9] Figure 15 shows age profile of health outcomes, alcohol consumption and smoking.

share of hard drinks in total alcohol intake (see Figures 11 and 12).[10] Figures 5 and 6 show strong evidence of kink at the level zero of running variable for total alcohol intake and for consumption of hard alcohol. The difference in slopes is observable when we eliminate age effects, as well when we look on difference between male and female consumption. We find little evidence of the kink for female consumption profile: for total alcohol intake it shows no kink, and for hard alcohol consumption it shows slight kink of different sign.

Next, Figure 7 below and Figure 13 at the end of the paper shows year of birth profile of daily cigarets consumption and share of smokers. Smoking is perhaps the most documented effect of serving in army. Bedard and Deschenes, 2006; Hearst et al. (1986) as well as many others show that percentage of smokers, as well percentage of smoking-related diseases and mortality is significantly higher among US army veterans. Authors argued that these negative outcomes in particular related with US Army policy of subsidizing smoking for conscripts. Russian army has smoking subsidization policy till today: every conscript get 10 free cigarettes per day.

Figure 7 and Figure 13 show smoother - compare to alcohol consumption - birth of year profiles of cigarets consumption. Still, linear approximation show difference in slopes before and after threshold; the difference remains even after we exclude quadratic age effects, and when we compare males and females.[11]

Figure 5: Alcohol consumption profiles

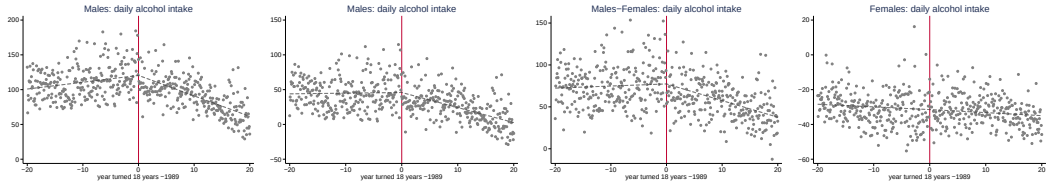
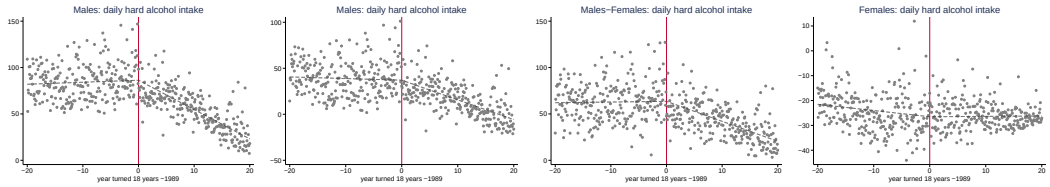


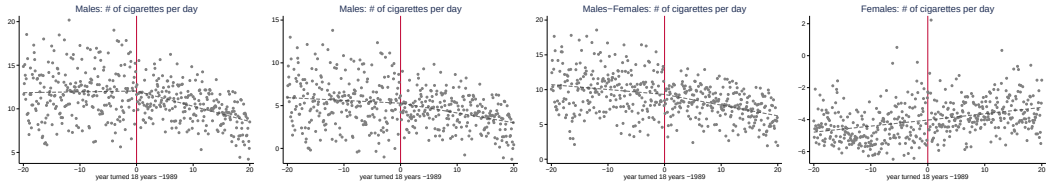
Figure 6: Hard alcohol consumption profiles



[10] We distinguish between different kinds of alcoholic beverages because hard alcohol itself is considered to be more harmful for health: in particular Kueng and Yakovlev, 2014 show that consumption of hard alcohol but not light alcohol affect males mortality rates of Russian males.

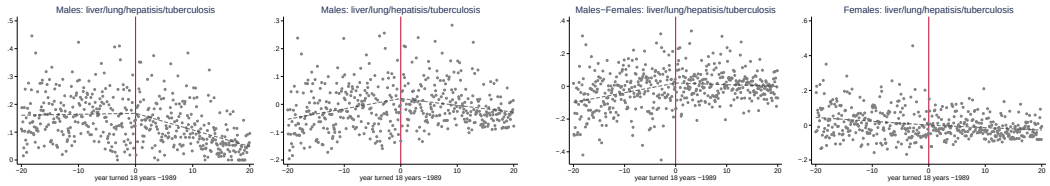
[11] Again, as Figure 3 shows there is noticeable kink in profile of probability of starting smoking at age 18-21, and there is no kink in probability of starting smoking before 18 or after 21. So although initially kink in birth of year profiles of cigarets consumption existed, it was to some extend smoothed over time.

Figure 7: Cigarettes consumption profiles



Next figure (Figure 8) shows trends in diseases that are primarily related with consumption of unhealthy goods: liver or lung chronic diseases, hepatitis and tuberculosis. Because of relatively small sample size, and relatively small chance of getting one particular disease, we aggregate them into one variable. We look on share of those who have been diagnosed with hepatitis, tuberculosis or have chronic diseases of liver or lung. Again, figures show change in slope at zero level of running variable for sample of males as well as differences between males and females.

Figure 8: Liver or lung chronic diseases, hepatitis or tuberculosis profiles



The similar pattern is observed for general health problems (see Figure 14 at the end of paper). The complication with representation of profile of this variable is that it has u-shape age profile: the share of those who has health problem decrease initially, and reach minimum for those who are 25 years old, and the start to increase (see Figure 15 at the end of paper). Thus why first graph that show us u-shape in year-turned-18 profile. Eliminating the (quadratic) effect of age gives us concave form of the profile. Again, linear approximation shows presence of kink at the threshold for both (males) and (males-females) profiles.

5 Results of Estimation

Table 2 at the end of the paper shows estimation results.

OLS estimates show that those who went to army smoke 1.4 cigarettes more per day, drink 28% more hard alcohol (see Table 3, OLS-1 results). At the same time they are generally more healthier: they suffer less with chronic diseases of lung or liver, tuberculosis or hepatitis, and have experience less health problems. OLS estimates however show correlation rather than causal effect of serving in army. For example, those who are selected to who go to army are selected on health basis and generally have better initial health status.

Our base RKD specification (RKD at individual level data) shows that causal effect of army on health is strictly negative (see Table 3, RKD-1). Serving in army results in increase in daily consumption of cigarets by 4.65 cigarettes, and in increase in alcohol consumption by 47 grams of pure alcohol a day, as well as in increase in hard alcohol consumption by 50 grams of pure alcohol a day or by approximately 50 percents. It also results in increase of share of hard drinks by 10%. Also, serving in army results in increase of diseases associated with alcohol consumption and smoking: it results in increase in chance of getting hepatitis and tuberculosis or chronic lung or liver diseases by 13.1%, and results in increase in chance of having any health problems by 13%.

The alternative estimations give similar (and as a rule higher in magnitude) results. The results of linear 2SLS model based on individual level data show that serving in army increases daily cigarettes by 5.4 cigarettes, hard alcohol intake by 60%, results in increase of chance of getting chronic diseases by 8% and get hepatitis or tuberculosis by 13%, and having health problems by 11% (see 2SLS-1 estimates, Table 2). The results of RKD regression based on data averages within ($a18$*$gender$) cells data show that serving in army increase daily cigarettes by 5 cigarettes, hard alcohol intake by 30%, results in increase of chance of getting chronic diseases by 3% and get hepatitis or tuberculosis by 8%, and having health problems by 15% (see IV-2 and RKD-2 estimates, Table 3).

When we perform RKD analysis based on data on only males samples, the estimates of effect of army are higher in magnitude (see Table 3, RKD-3), but less precise (remind that in this case we have twice less clusters in sample). As we discussed before in the text these estimates however suffer for unobserved factors that can affect consumption patterns and chance of getting diseases, and for which we control using females as a control group.

To check that our results are not driven only by data that come in transitional 1994-2000 years we re-estimate model on sample to only years 2001-2012. In these years Russia had stable macroeconomic period. Based on this sample, we get similar results as well (see Table 4, RKD-1a). Base RKD specification shows that serving in army increases daily consumption of cigarettes by 5.2 cigarettes, and increases alcohol consumption by 44 grams pure alcohol a day; increases hard alcohol consumption by 51 grams of pure alcohol a day or by 48 percents; results in increase in chance of getting hepatitis and tuberculosis or chronic lung or liver diseases by 13.8% and in increase in chance of having any health problems by 14.5%.

The surprising fact is that IV and RKD estimates of the effect on alcohol and smoking is higher than OLS. One can expect that due to selection bias OLS may overestimate effect of army: those who come to army came from poorer environment and thus have higher chance to have unhealthy habits. There are several possible explanation why we this result. First, OLS estimates may suffer (to some extent) from attenuation bias because of measurement errors: thus around 2.7% of respondents give different answers on questions on their military service in different rounds (i.e. whether they served or not, and if yes, at what age). Second, to some extend it may be result of omitted variable

bias that is not captured by included controls: for example, in Russia alcohol is normal good: RLMS data indicates that richer males consume more alcohol (although smoke less). If including income variable (which is noisy variable) does not fully captures income effect, and if serving in army negatively affect earning, then IV estimates will have higher in magnitude effect.

6 Robustness check and Results Discussion

6.1 Alternative Explanations discussion

The starting point of changes in conscription in Russia coincides with year of collapse of USSR, and creating of new country, Russia, and moving from planned to market economy. With this big structural changes one can expect that many other things that potentially influence consumption of unhealthy goods and health outcomes can have non-smooth profile, and may contaminate RKD results.

We examine several possible candidates that may change profiles in consumptions and health outcomes: changes in alcohol and cigarettes market; changes in income and changes in medical care.

New regulations that imposed may have hard alcohol and tobacco less accessible and more costly, and new generation that start to consume alcohol and start smoking at age 18 (official drinking age in Russia) may decide to drink or smokes less; whereas old generation that already formed habits toward alcohol and smoking did not change consumptions (see Kueng and Yakovlev (2014)).

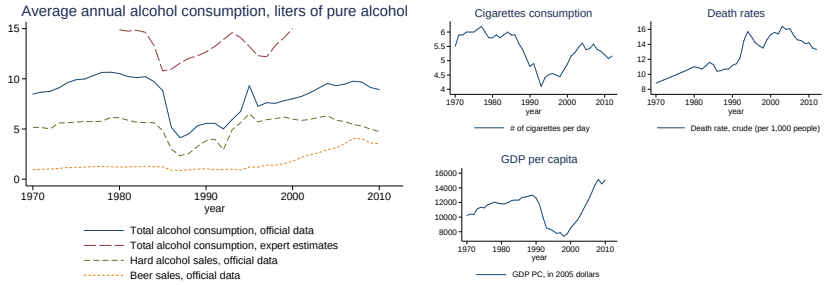
Decrease in income that occurs after collapse of USSR may also change consumption patterns. Eighteen year old males may consume less alcohol and smoke less because of lack of income, and then keep the same patterns of consumption over future life through habits. Finally change in access to medical care may directly result in change health outcomes if these changes affect 18 years old people people differently.

Figure 10 below show national trends in alcohol and tobacco consumption, GDP per capita and infant mortality rates over the last 40 years. Figure 10 shows no evidence of decrease in tobacco and alcohol consumption after year 1989, neither no evidence that year 1989 has kink in year-profile of alcohol and tobacco market structure. Indeed on can the change in consumption profile is happen 5 years earlier, in 1985-1887 (during so-called Gorbachev Anti-Alcohol campaign). Indeed, many researchers indicate that in 1990s Russia had experienced sharp drop in prices of alcohol resulted in sharp increase in alcohol consumption (see Zaridze et al 2009, Yakovlev (2013), Bhattacharia et al 2013). Figure 10 also shows increase in beer sales in Russia, but these changes happen later, in the second half of 1990s. The change in market structure may result in change of preferences from hard alcohol to beer, especially for young people, that start forming their preferences.

To control for possible changes in habits, preferences and quality of medical services we add national averages of alcohol and cigarettes consumption, beer

sales, national GDP per capita and national mortality rates at the time when person become 18 years old[12]. The contemporaneous effects of these variables are captured by time effects that are included in our regressions.

Figure 9: National trends of alcohol and cigarettes consumption, GDP, death rates, 1970-2010



The alternative estimates (with additional controls discussed above) show higher in magnitude (compare to base specification) results (see Table 4 in Appendix). According to our estimates, serving in army increases daily cigarettes by 6 cigarettes, hard alcohol intake by 120%, results in increase of chance of getting chronic diseases by 13% and get hepatitis or tuberculosis by 20%, and having health problems by 17% (see 2SLS-1 estimates, Table 4).

Finally, when we perform RKD analysis based on data on only males samples, the estimates of effect of army are much higher in magnitude (see Table 4, RKD-3). As we discussed before in the text these estimates however suffer for unobserved factors that can affect consumption patterns and chance of getting diseases, and for which we control using females as a control group.

We also check our robustness of our results by restricting age of adults in our regression to be below 45 years. In this case two groups of adults - that turned their 18 years before and after year 1989 have the same age in our sample. Table 5 in Appendix show 2SLS estimates for this sub-sample of adults (we restrict our self to only linear model because we get rid of many observations and thus lose power to provide more complicated analysis).

6.2 Alternative estimation of effect of army on smoking and alcohol intake and results discussion

Our results in previous section show significant difference in smoking and alcohol consumption between those who went to compulsory military service and those who did not go.

[12]Sources: Alcohol: RLMS, Goscomstat, Nemtsov (2002); Smoking: B. Forey, J. Hamling, P. Lee, and N. Wald "International International Smoking Statistics: A collection of historical data from 30 economically developed countries", 2002, and RLMS survey, GDP, mortality rates: Penn Tables, World Development Indicators

The surprising fact is that RKD and Linear IV estimates are bigger than OLS results.

In this section we check robustness of our results by looking on change in alcohol consumption and smoking in a interval of few years before and after people come back from military service. Our comparison group in this case are males who did not go to compulsory military service.

To quantify the effect that graphs above show we estimate following regression.

$$\begin{aligned} Unhealthy\ goods\ consumption_{it} \quad = \alpha + \quad & \theta I(Army)_i I(20\ or\ more\ yo)_i + \\ & \beta I(20\ or\ more\ yo)_i + \rho age_{it} + \delta_i + e_{it} \end{aligned}$$

where $I(20\ or\ more\ yo)_i$ stays for indicator if person is 20 or more years old; $I(Army)_i$ stays for indicator if person ever served or will serve in army; age_{it} stays for age, and δ_i stays for individual fixed effects. We restrict our sample to 15-25 years old males.

Table 7 show the effect of military service on smoking and alcohol consumption. According to Table 7, serving in army increases probability of smoking on 6%; increase consumption of hard alcohol by 22% and consumption of cigarettes by 1.35 cigarets per day.

These are smaller that those obtained in main specification, and closer to OLS estimates.

There are several explanations of why RKD estimates give higher in magnitude effect.

First the Dif-in-Dif estimates deal with males who only recently come to military service, whereas RKD estimates the effect on whole sample of males, i.e. also on those who went to military service before 1990s. The effect of Army on those who recently came to military service may be smaller because of peer effects.[13] Today, when only 30% of males go to Army and so majority (70%) of males do not serve and so have lower chance to be accustomed to alcohol and smoking. Once person come back from Army to less smoking (and drinking) environment he smokes (and drinks) less, and thus effect of army is smaller. We can also observe different equilibrium outcomes: older people came from environment where majority went to army - and end up in high-level consumption equlibria, whereas younger generation end up in low-level consumption equilibria. In addition, peer effects may be facilitated by incorrect beliefs: in situation when majority came from army and smokes (drinks) the person may have think that *everybody* around smokes and drinks, and thus may be affected by this strong peer pressure (see prospect theory literature (Kahneman and Tversky 1979 and subsequent studies).

[13] Peer effects in consumption of unhealthy goods is well documented and widely studied phenomenon: see for example Card and Giuliano, 2013, Kremer and Levy, 2008, Yakovlev 2013.

6.3 Test for presence of kink using placebo experiments

To check whether we indeed have a kink in year-turned-eighteen profiles of probability of going to army and of health outcomes we provide following placebo experiment.

We start with 25-years interval with center in year 1975, and pick up all people who became 18 years old within this interval. Then we move the center of the interval from year 1975 to the right till center reaches year 2000.

First check whether we have kink in age-turned-18 profiles of males. For every constructed sample of males we check how slope of $a18$ profile of variables of interest y changes at the middle of interval by looking on coefficient ξ of following regression:

$$\begin{aligned} y_{ija18} &= \beta_0 + \beta_1 a18_i + \xi(D_{central\ year_k}(a18_i - central\ year_k)) \\ &\quad + \beta_2 age + \beta_3 age^2 + u_{ija18} \end{aligned} \tag{7}$$

ξ shows the size of the kink in $a18$ profile of variable y_{ija18} at the center of picked interval, $central\ year_k$varies from year 1975 till year 2000. Other variables are the same as in specification (1). We expect that ξ reaches or highest in magnitude level (or the lowest value because $\xi < 0$) around year 1989, that means that at this year we observe highest in magnitude of link.

To check whether we have kink in (male-female) profile, we look both on males of females within constricted samples.

$$\begin{aligned} y_{ija18} &= \beta_0 + \beta_1 a18_i + \xi(D_{central\ year_k}(a18_i - central\ year_k)) + \beta_2 age + \beta_3 age^2 \\ &\quad + I(Male)(\alpha_0 + \alpha_1 a18_i + \theta(D_{central\ year_k}(a18_i - central\ year_k)) + u_{ita18} \end{aligned} \tag{8}$$

In this regression θ shows the size of the kink in $a18$ profile of difference between male and female averages of y_{ija18} at the center of picked interval.

Figure 9 below and figures 16 at the end of paper show results of placebo regressions for probability of going to army and alcohol consumption, smoking and health status correspondingly. Dashed line corresponds to 95% confidence interval with standard errors clustered at $a18$ level). Figure 9 shows visible u shape profiles, with minimum around year 1989.

Figure 10: Placebo experiments. Pr(Served in Army)

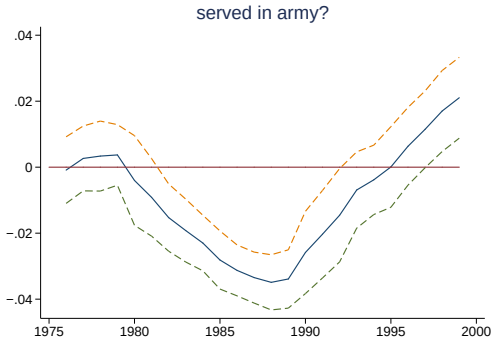


Figure 16 and 17 at the end of paper shows results of placebo experiments for alcohol consumption, smoking and for health outcomes. For alcohol consumption θ reaches minimum around year 1989. For health outcomes and smoking evidence of kink is not that straightforward. Thus, placebo experiment finds evidence of kink in probability of starting smoking at age 18-21, placebo experiment finds little support for presence of kink for current cigarettes consumption. For the health outcomes year 1989 is local minimum (within 10 years interval) when we look on difference between males and females profiles. Finally, figure 18 shows results of placebo tests for individual demographic characteristics - income, education and marital status. Placebo experiments for income and education do not show evidence of kink. Placebo experiments for marital status for male sample also do not show evidence of kink, however placebo for marital status based on males-females RKD estimates shows evidence of kink around years 1986 -1989. This however can be age effect that is not captured by *age* and age^2 variables: majority of people after 35 years are married, but before 35 years females tend to marry at earlier age, and the earlier age the higher differences between shares of married males and females.

6.4 Test for heterogeneous treatment effect

The issue we address in this section is heterogeneity in treatment effect.

During the Soviet Union most of the males (more than 80%) served in the army, whereas now only minority of them (30%) go to military service. Thus, the demilitarization reform affects about the half of total male population. This group of compliers (those who previously should go to army in 1970s or 1980s, but not going to army 1990s or 2000s) may be different from the remaining part of male population-those who would never go to the army and those who would always go to the army regardless at what time they were born (always-takers and never-takers).

Never-takers are likely to be or seeker or come from wealthier neighborhoods, have more educated parents than compilers, whereas always-takers may likely

to come from poor neighborhoods and less educated families. If serving in army affects differently males from the set of compilers and males from the set of always-takers or never-takers then estimated effect can be interpreted as the local treatment effect (average effect on compliers) rather than average treatment effect (average effects on whole male population).

Given that Army reform affects the half of male population, the estimate of local treatment effect is important itself. However to infer whether we can interpret this result as ATE too, we check whether we have the same distribution of our main dependent variables of interest (such as alcohol consumption and health outcomes) for the following groups of population: $F(Y(Army = 0)|never{-}taker)$ vs $F(Y(Army = 0)|complier)$; and for $F(Y(Army = 1)|always{-}taker)$ vs $F(Y(Army = 1)|complier)$.

To do so we do following exercise.

To infer who is never-taker we estimate the probability of serving in army based on the set of exogenous pre-army characteristics, that we can obtain from existing data: indicators whether person had chronic diseases before age 18; indicator whether at least one of parents have college degree; age of mother when person was born, occupation of parents when person was 15 years old, and indicator if person was born in urban area. Unfortunately data on parents characteristics is available only for one round (round 20), which restricts the size of data for our analysis. Given that all independent variables are constant for individual after (s)he reaches 21 years we extrapolate information that we have in particular round to all remaining rounds.

The we estimate the probability of being constricted using the set of characteristics described above and variables $a18$, $D_{1989}a18$

$$C_{ia18} = X_{ia18}\alpha + \gamma_1 a18 + \gamma_2 D_{1989}a18 + \varepsilon_{ia18} \tag{9}$$

Furthermore we eliminate the influence of $a18$, $D_{1989}a18$ from the predicted probability $\widehat{C_{ia18}residual} = \widehat{C}_{ia18} - \widehat{\gamma}_1 a18 - \widehat{\gamma}_2 D_{1989}a18$, and define comlpiers, always-takers and never-takers, as following: always-takers are those with $\widehat{C_{ia18}residual}$ in top 35%, never-takers are those with $\widehat{C_{ia18}residual}$ belongs to lower 15%, and remaining part are compliers. The thresholds for always-takers and never-takers are equal to probabilities of going to army for those who became 18-old before 1989 (for never-takers) and after 2000 (for always-takers).

Table 3 shows mean comparisons for subgroups of males discussed above.

Among those who did not go to army we compare compliers with never-takers. Compliers have higher level of alcohol intake and share of hard drinks, higher chance of having health problems, but lower chance of having chronic diseases or hepatitis or tuberculosis than never takers. All differences however are statistically insignificant so that these two groups of population are similar.

Among those who went to army we compare compliers with always-takers. Compliers have more health problems, less share of hard drinks compare to always takers, and these differences are statistically significant. So we can not conclude that compliers have similar characteristic as always takers.

Finally we compare age-turned-18 profiles of outcomes for all of these groups

(see figure18 and 19). These profiles do not differ that indicates that there is not strong selection effect.

6.5 Placebo: shortening interval around kink

In next placebo experiment we look how RKD estimates behave when we narrow the interval of observations around kink point.

In our experiment we start with the sample of adults that became 18 years old within 30 years from year 1989, i.e. in years 1959-2010. Then we shorten interval till the shortest sample we chose - the sample of those who become 18 years within 5 years from 1989. The small sample size and resulting impreciseness of the first stage does not allow us to restrict sample size further. Indeed, for interval with length less than plus/minus 10 years from the year 1989 F-statistics for 1st stage significantly smaller than 10 (indeed in range between 1.5 to 5.5). Only starting from interval with length of ten years F-statistics exceeds 10.

Figure 24 shows results of placebo experiment. For all variables and for all intervals starting from interval plus/minus 10 years around kink point RKD coefficients are stable and approximately equal that from RKD based on full sample.

6.6 Bootstrapped standard errors

To check the performance of standard errors we perform bootstrapped estimation. Table 6 in Appendix shows estimation results for our main specification with bootstrapped standard errors where sampling was made under assumption that data have clustered structure at a18Xgender level. Standard errors do not differ too much from main specification.

7 Conclusion

The paper studies the health consequences of compulsory military service in Russian Army.

To find the causal effect of serving in army on health we apply Regression Kink Design approach where we explore the kinked structure of year-of-birth profile of the rate of conscription. The kink in policy function is driven by demilitarization process started in Russia after the end of Cold War at the end of 1980s.

Our estimates show that serving in army increases consumption of unhealthy goods and has strong negative effect on health.

Serving in army increases daily consumption of cigarettes by 4.6 cigarettes, and daily alcohol intake by approximately 50 grams of pure alcohol (or 50%). Also, serving in army results in increase of diseases associated with alcohol consumption and smoking: it results in increase in chance of getting hepatitis and tuberculosis, chronic lung or liver diseases by 13.5% and in chance of having any (general) health problems by 13.8%.

References

Albrecht, James W. , Per-Anders Edin, Marianne Sundstrom, and Vroman Susan B. Career Interruptions and Subsequent Earnings: A Reexamination Using Swedish Data. Journal of Human Resources, 34(2):294–311, 1999.

Andrienko, Yuri and Sergei Guriev, "Determinants of inter-regional mobility in Russia," Economics of transition, 2004, 12 (1), 1–27.

Angrist, Joshua D., Lifetime Earnings and the Vietnam Era Draft Lottery: Evidence from Social Security Administrative Records. American Economic Review, 80(3):313–336, 1990.

Angrist, Joshua D., Chen, Stacey H., Frandsen, Brigham R., 2010. "Did Vietnam veterans get sicker in the 1990s? The complicated effects of military service on self-reported health," Journal of Public Economics, Elsevier, vol. 94(11-12), pages 824-837, December.

Angrist, Joshua D. and Stacey H. Chen. Schooling and the Vietnam-Era GI Bill: Evidence from the Draft Lottery. American Economic Journal: Applied Economics, 3:96–118, 2011.

Angrist, Joshua D., Stacey H. Chen, and Jae Song. Long Term Consequences of Vietnam-Era Conscription: New Estimates Using Social Security Data. American Economic Review, 2:334–338, 2011.

Autor, David H., Mark G. Duggan, and David S. Lyle. Battle Scars: The Puzzling Decline in Employment and Rise in Disability Receipt among Vietnam Era Veterans, American Economic Review, 2:339–344, 2011

Bauer, Thomas K., Stefan Bender, Alfredo R. Paloyo, and Christoph M. Schmidt (2009). Evaluating the Labor Market Effects of Compulsory Military Service, IZA Discussion Paper No. 4535.

Bannikov, K. (2002) Anthropology of extreme groups: dominant relations among servicemen of involuntary service of the Russian Army M.: "Nauka", 2002

Bedard, Kelly and Olivier Deschênes, 2006, The Long-term Impact of Military Service on Health: Evidence from World War II and Korean War Veterans. American Economic Review, 96(1), 176-194.

Bhattacharya, Jay, Christina Gathmann, and Grant Miller, "The Gorbachev Anti-alcohol Campaign and Russia's Mortality Crisis," American Economic Journal: Applied Economics, 2013, 5 (2), 232–60.

Card, David and Ana Rute Cardoso. Can Compulsory Military Service Raise Civilian Wages? Evidence from the Peacetime Draft in Portugal. American Economic Journal: Applied Economics, 4(4):57–93, 2012.

Card, David, Carlos Dobkin and Nicole Maestas, 2004, Universal Insurance Coverage on Health Care Utilization and Health Evidence from Medicare, AER, 2004

Card, David, and Laura Giuliano, 2013 "Peer Effects and Multiple Equilibria in the Risky Behavior of Friends", Review of Economics and Statistics, forthcoming 2013.

Card, David and David Lee (2007) Regression Discontinuity Inference with Specification Error , Journal of econometrics, 2007

Card, David, David Lee, Pei Z, Weber A (2012). Nonlinear Policy Rules and the Identification and Estimation of Causal Effects in a Generalized Regression Kink Design." Working paper, University of California at Berkeley.

Card, David and Thomas Lemieux, 2001, Going to College to Avoid the Draft: The Unintended Legacy of the Vietnam War The American Economic Review, Vol. 91, No. 2, Papers and Proceedings of the Hundred Thirteenth Annual Meeting of the American Economic Association. (May, 2001), pp. 97-102.

Calonico , Sebastian, Matias D. Cattaneo and Rocio Titiunik, 2014, Robust Nonparametric Condence Intervals for Regression-Discontinuity Designs, Mimeo

Cook, Philip J. & Moore, Michael J., 2000. "Alcohol," Handbook of Health Economics, in: A. J. Culyer & J. P. Newhouse, Handbook of Health Economics, edition 1, volume 1, chapter 3 Community Health, Vol 52, 772-774

Cooper, Julian, Military expenditure in the Russian Federation during the years 2012 to 2015: a research note, Mimeo, 2012

Dobkin, Carlos and Reza Shabani. The Health Effects of Military Service: Evidence from the Vietnam Draft. Economic Inquiry, 47(1):69–80, 2009.

Forey, Barbara, Jan Hamling, Peter Lee, and Nicholas Wald "International International Smoking Statistics: A collection of historical data from 30 economically developed countries", Oxford Medical Publications, 2002

Galiani, Sebastian, Mart'ýn A. Rossi, and Ernesto Schargrodsky. Conscription and Crime: Evidence from the Argentine Draft Lottery. American Economic Journal: Applied Economics, 3:119–136, 2011.

Grenet, Julien , Robert A. Hart, and J. Elizabeth Roberts. Above and Beyond the Call: Long-term Real Earnings Effects of British Male Military Conscription in the Post-War Years. Labour Economics, 18(2):194–204, 2011

Hearst, Norman, Newman, Tom B. and Hulley, Stephen B., "Delayed Effects of the Miltary Draft on Mortality: A Randomized Natural Experiment," New England Journal of Medicine, March 6, 1986, 314, 620-24.

Kahneman, Daniel, and Amos Tversky. "Prospect Theory: An Analysis of Decision Under Risk". Econometrica. XLVII (1979): 263–291.

Keller, Katarina , Panu Poutvaara, and Andreas Wagener. Does Military Draft Discourage Enrollment in Higher Education? Evidence from OECD Countries. IZA Discussion Paper No. 4399, 2009.

Kremer, Michael, and Dan Levy. 2008. "Peer Effects and Alcohol Use among College Students. " Journal of Economic Perspectives, 22(3): 189–206.

Kueng, Loranz and Evgeny Yakovlev, 2014 How Persistent Are Consumption Habits: Micro-Evidence from Russian Alcohol Market, NBER working paper 20298

Lee D. and Thomas Lemieux, 2010. Regression Discontinuity Designs in Economics." Journal of Economic Literature, 48(2), 281-355.

McKinney, W. P. , D. D. Mclntire, T. J. Carmody, and A. Joseph. Comparing the Smoking Behavior of Veterans and Non-Veterans. Public Health Report, 112: 212–217, 1997.

Nemtsov, A. V. 2002. "Alcohol-Related Human Losses in Russia in the 1980s and 1990s," Addiction, 97, pp. 1413-25.

Paloyo, Alfredo R. Compulsory Military Service in Germany Revisited. RUHR Economic Paper No. 206, 2010.

Spivak A.L. and Pridemore W.A , 2004, Conscription and Reform in the Post-Soviet Russian Army, Problems of Post-Communism 51 (6) , 33-43

Surkova, Irina, 2010, "Social Problems in the Russian Army within the Framework of Social Work", Journal of Comparative Social Work 2010/2

Yakovlev, Evgeny, "Peers and Alcohol: Evidence from Russia," Working Paper, 2012

Zaridze, David, Paul Brennan, Jillian Boreham, Alex Boroda, Rostislav Karpov, Alexander Lazarev, Irina Konobeevskaya, Vladimir Igitov, Tatiana Terechova, Paolo Boffetta et al., "Alcohol and cause-specific mortality in Russia: a retrospective case–control study of 48 557 adult deaths," The Lancet, 2009, 373 (9682), 2201–2214.

Web:

en.wikipedia.org/wiki/Dedovshchina

Tables and Figures

Table 1: Summary statistics

	Males			Females		
variable	# of obs	mean	sd	N	mean	sd
Served in Army	49107	0.691	0.462	75553	0	0
Had hepatitis or tuberculosis	51307	0.086	0.280	64471	0.076	0.265
Chronic lung or liver disease	51286	0.090	0.286	64442	0.132	0.339
Smokes?	60527	0.647	0.478	74870	0.176	0.381
Daily cigarettes consumption	60010	11.074	10.375	74710	1.891	4.933
Daily hard alcohol intake	61002	73.4	104.0	75553	17.5	41.9
Log of hard alcohol intake	61002	2.533	2.394	75553	0.992	1.778
Daily alcohol intake	61002	102.6	122.0	75553	32.8	53.6
Log of daily alcohol intake	61002	3.316	2.235	75553	1.993	2.001
Health problem last month?	60477	0.267	0.442	74834	0.394	0.489
Age	61002	39.8	12.3	75553	41.3	12.9
Live in regional capital	60918	0.402	0.490	75437	0.421	0.494
Relative income	58315	1.444	1.928	73533	0.977	1.569
National average of daily cigarettes consumption	56623	5.330	0.635	69916	5.330	0.639
National average of annual alcohol intake	56623	7.972	1.951	69916	7.923	1.949

Table 2: # of males for whom we have information on their military service by round

year	round	# of males	# males answered army questions	# of males can track
1994	5	3900		1532
1995	6	3660		1612
1996	7	3603		1759
1998	8	3765		2115
2000	9	3903		2467
2001	10	4304		2869
2002	11	4505		3182
2003	12	4574		3505
2004	13	4587		3844
2005	14	4443	4023	4275
2006	15	5171		4283
2007	16	5055		4203
2008	17	4541		3835
2009	18	4985		4210
2010	19	7576		6114
2011	20	5387	4974	5097
2012	21	7870	7332	7373

Figure 11: Log of daily consumption of hard alcohol profiles.

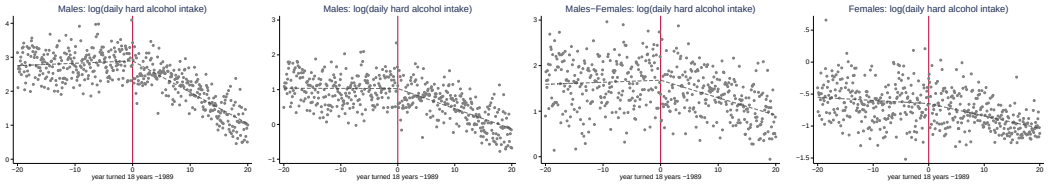


Figure 12: Share of hard drinks in total alcohol intake profile

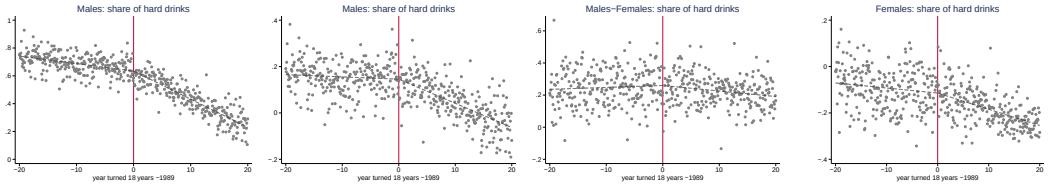


Figure 13: Share of smokers

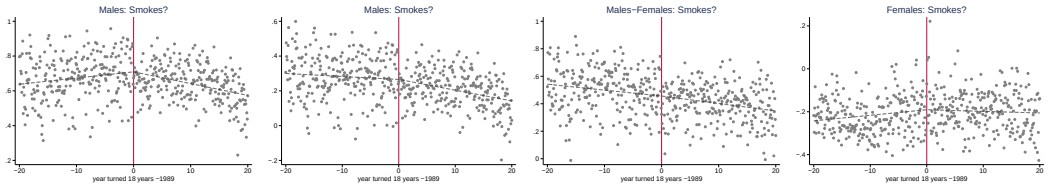


Figure 14: Health problems last months?

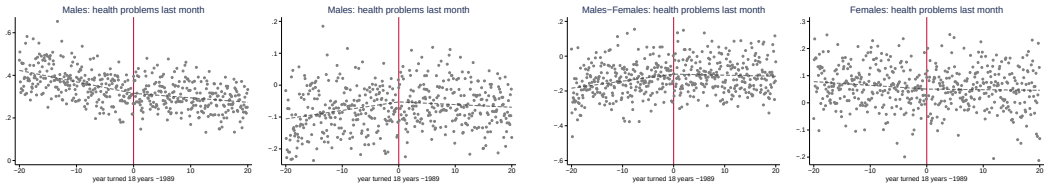


Figure 15: Health variables: age profiles

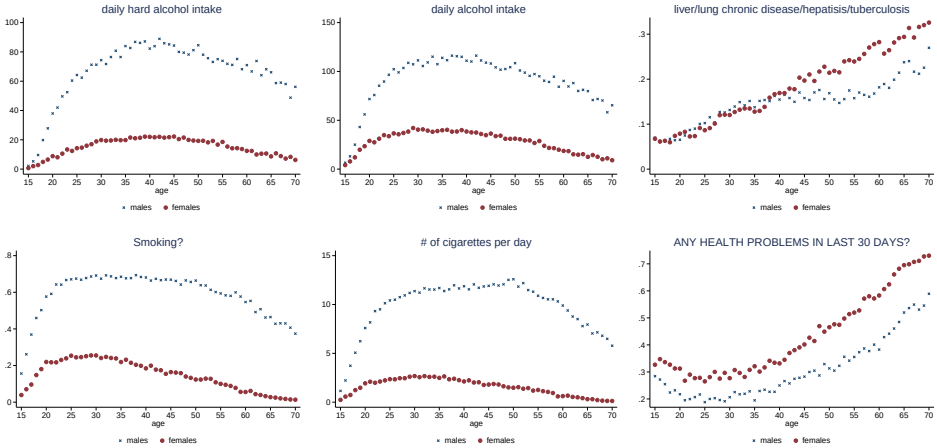


Figure 16: Placebo experiment: Males

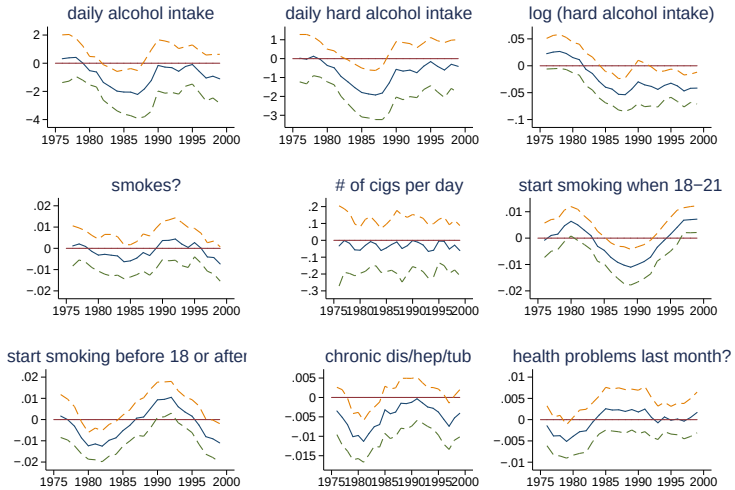


Figure 17: Placebo experiment: Males - Females

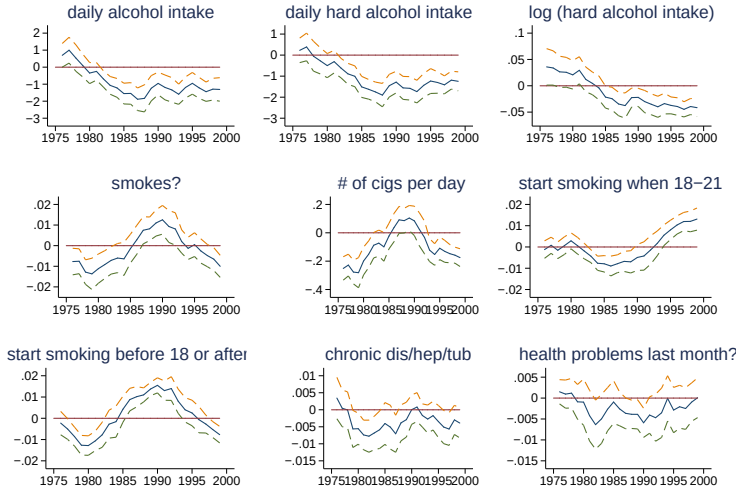


Table 3: Regression estimates. Alcohol consumption and health outcomes

	alcohol intake	hard alcohol intake	Log hard alcohol intake	# of cigs per day	I(smokes)	start smoking at 18-21	hep/tub/ chronic diseases	Health problems	F-stat, 1st stage	Sample
RKD-1	47.0***	54.6***	0.476**	4.921***	0.103	0.199***	0.130**	0.131***		M-F
	[10.836]	[8.564]	[0.238]	[1.435]	[0.075]	[0.052]	[0.053]	[0.044]	76.38	ind. lev.
OLS	12.5***	11.2***	0.273***	1.388***	0.078***	0.057***	-0.027***	-0.028***		M-F
	[2.197]	[1.748]	[0.049]	[0.287]	[0.014]	[0.010]	[0.010]	[0.008]		ind. lev.
IV -1	55.7***	63.7***	0.751***	5.751***	0.136*	0.182***	0.159***	0.136***		M-F
	[10.824]	[8.545]	[0.238]	[1.399]	[0.074]	[0.052]	[0.053]	[0.045]	241.9	ind. lev.
RKD-2	58.0***	57.5***	1.596***	-0.229	0.030	0.401***	0.205**	0.046		M
	[18.364]	[14.637]	[0.363]	[2.253]	[0.108]	[0.084]	[0.083]	[0.058]	26.04	ind. lev.
IV -2	101.5***	85.9***	2.843***	1.831	0.168	0.550***	0.441***	0.026		M
	[23.571]	[19.182]	[0.524]	[2.531]	[0.125]	[0.108]	[0.128]	[0.072]	58.16	ind. lev.
IV-3	61.2***	68.5***	0.747***	7.439***	0.239***	0.087*	0.126**	0.129***		M-F
	[10.434]	[9.003]	[0.220]	[1.502]	[0.079]	[0.045]	[0.052]	[0.047]	163.7	a18xG
RKD-3	48.9***	56.5***	0.346*	5.548***	0.136**	0.125***	0.092*	0.141***		M-F
	[9.671]	[8.344]	[0.201]	[1.322]	[0.068]	[0.042]	[0.052]	[0.042]	51	a18xG
IV-4	63.2**	61.0**	1.989***	3.624	0.118	0.561***	0.164	0.176		M
	[31.928]	[27.607]	[0.714]	[3.968]	[0.188]	[0.167]	[0.128]	[0.117]	16.44	a18xG
RKD-4	53.0**	51.1**	1.464***	-1.332	-0.110	0.316***	0.052	-0.000		M
	[23.832]	[20.213]	[0.453]	[3.375]	[0.173]	[0.103]	[0.095]	[0.100]	7.209	a18xG

Note: M-F= Males-Females; M=Males only; Ind.lev.=Individual level; a18xG=a18Xgender cells

Table 4: Regression estimates. Alcohol consumption and health outcomes. Sample: Years 2001 and later.

	alcohol intake	hard alcohol intake	Log hard alcohol intake	# of cigarettes per day	I(smokes)	start smoking at 18-21	hep./tub./ chronic diseases	Health problems	Sample	F stat, 1st stage
RKD-1	44.1***	51.3***	0.481**	5.201***	0.073	0.183***	0.135**	0.138***	Ind.Lev.	83.11
	[11.102]	[8.501]	[0.244]	[1.434]	[0.073]	[0.052]	[0.055]	[0.046]	M-F	
OLS	12.8***	11.4***	0.282***	1.429***	0.081***	0.054***	-0.026***	-0.031***	Ind.Lev.	
	[2.205]	[1.716]	[0.049]	[0.288]	[0.014]	[0.010]	[0.010]	[0.008]	M-F	
IV -1	52.7***	60.8***	0.761***	6.170***	0.110	0.164***	0.166***	0.148***	Ind.Lev.	262.2
	[11.171]	[8.584]	[0.246]	[1.412]	[0.073]	[0.052]	[0.054]	[0.047]	M	
RKD-2	122.6***	99.9***	3.487***	0.561	0.148	0.613***	0.519***	0.010	Ind.Lev.	36.17
	[34.268]	[26.923]	[0.748]	[3.567]	[0.166]	[0.151]	[0.154]	[0.100]	M	
IV -2	43.7**	47.2***	1.353***	-2.334	-0.085	0.353***	0.220**	0.022	Ind.Lev.	21.46
	[22.153]	[16.481]	[0.414]	[2.674]	[0.124]	[0.092]	[0.090]	[0.069]	M-F	
IV-3	55.7***	62.8***	0.620**	9.221***	0.269***	0.084*	0.122**	0.160***	a18xG	185.9
	[11.151]	[9.215]	[0.243]	[1.546]	[0.082]	[0.048]	[0.053]	[0.053]	M-F	
RKD-3	41.7***	48.7***	0.256	6.918***	0.149**	0.119***	0.080	0.157***	a18xG	59.68
	[10.572]	[8.721]	[0.231]	[1.335]	[0.070]	[0.045]	[0.052]	[0.048]	M	
IV-4	132.6**	106.9**	2.555**	1.352	0.120	0.730**	0.071	0.274	a18xG	9.524
	[63.341]	[51.059]	[1.191]	[6.436]	[0.302]	[0.302]	[0.184]	[0.194]	males	
RKD-4	61.2*	49.4*	1.106*	-6.680	-0.288	0.241*	-0.073	-0.017	a18xG	6.278
	[32.831]	[26.840]	[0.619]	[4.430]	[0.225]	[0.141]	[0.111]	[0.138]	males	

Note: M-F= Males-Females; M=Males only; Ind.lev.=Individual level; a18xG=a18Xgender cells

Figure 18: Placebo experiment: Demographics

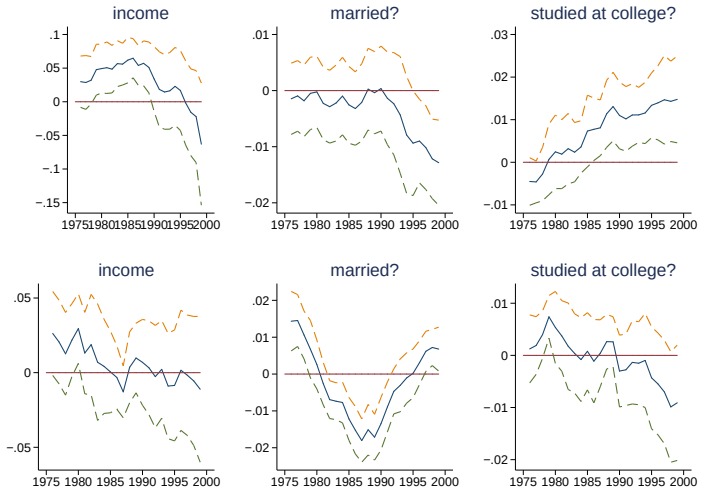
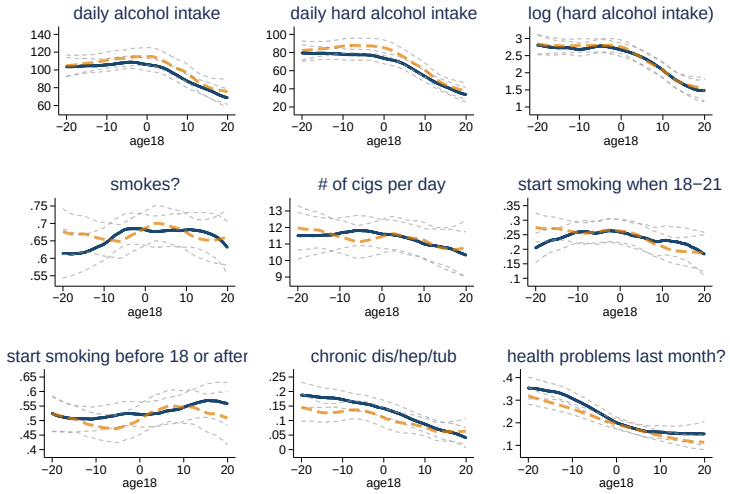


Table 5: Test for heterogeneity in treatment effect

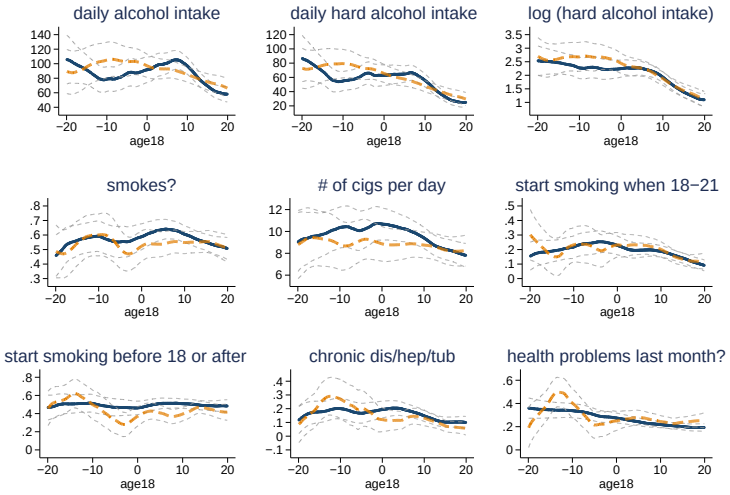
	Not served in army				
	compliers		never-takers		
	mean	se	mean	se	CI intersects?
daily alcohol intake	92.49	1.869	87.90	2.419	YES
daily hard alcohol intake	57.88	1.523	54.13	1.913	YES
log (daily hard alcohol intake)	2.122	0.040	2.039	0.050	YES
health problems last month?	0.244	0.007	0.273	0.010	YES
liver/lung chr.dis/hep/tub	0.160	0.006	0.139	0.008	YES
# of cigs per day	10.11	0.17	8.97	0.21	NO
start smoking when 18-21	0.18	0.01	0.19	0.01	YES
smokes?	0.61	0.01	0.55	0.01	NO
	Served in Army				
	compliers		always-takers		
	mean	se	mean	se	CI intersects?
daily alcohol intake	106.87	1.245	105.63	1.470	YES
daily hard alcohol intake	76.51	1.056	79.54	1.294	YES
log (daily hard alcohol intake)	2.659	0.026	2.589	0.029	YES
health problems last month?	0.247	0.005	0.221	0.005	NO
liver/lung chr.dis/hep/tub	0.145	0.004	0.107	0.004	NO
# of cigs per day	11.45	0.11	11.3	0.12	YES
start smoking when 18-21	0.26	0.01	025	0.01	YES
smokes?	0.65	0.01	0.66	0.01	YES

Figure 19: Age of turned 18 profile of health outcomes. Males who did not go to Army



Note: solid line is comlpiers; dash line is never-takers. Local polynomial approximation.

Figure 20: Age of turned 18 profile of health outcomes. Males who went to Army



Note: solid line is comlpiers; dash line is always-takers. Local polynomial approximation.

Appendix

Figure 21: Size of Army force, Russia 1984-2009

Source: Antony Cordesman and Arleigh Burke The Balance of Western Conventional Forces, CSIS, 2001; IISS:The Military Balance 1984-1985; 2008-2009.

Figure 22: Percentage of males serving in army in age 18-20 (RLMS survey)

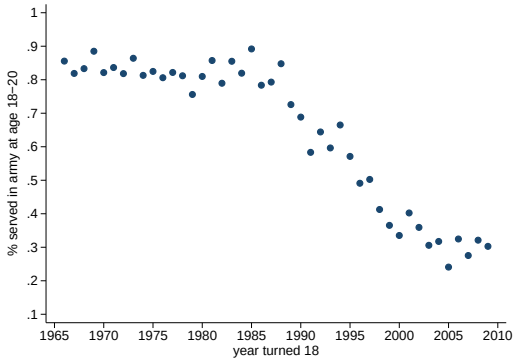


Figure 23: (Unconditional) Health variables profiles (Males-Females) year-turned-18 profiles.

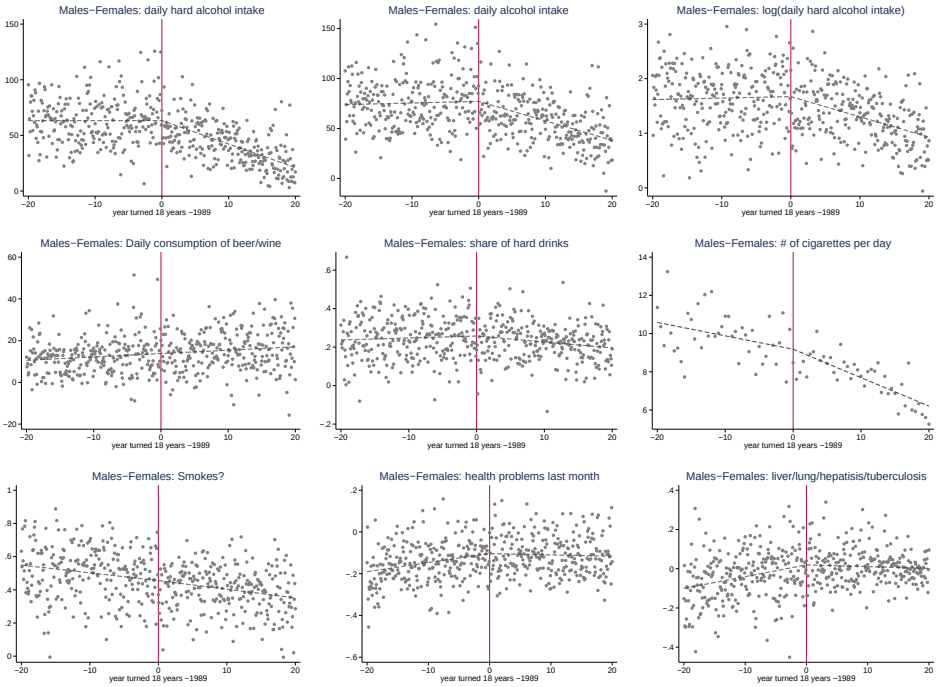


Table 6: Robustness check: Control for national averages at teenage.

	alcohol intake	hard alcohol intake	Log hard alcohol intake	# of cigarettes per day	I(smokes)	hep./tub./ chronic diseases	Health problems	Sample
RKD-1	53.8***	61.9***	0.665**	4.241***	0.066	0.151***	0.124**	M-F
	[11.943]	[9.409]	[0.261]	[1.573]	[0.081]	[0.058]	[0.048]	Ind.Lev.
OLS	12.6***	11.2***	0.270***	1.330***	0.075***	-0.024**	-0.029***	M-F
	[2.228]	[1.771]	[0.049]	[0.292]	[0.015]	[0.010]	[0.008]	Ind.Lev.
IV -1	62.1***	71.2***	0.946***	5.069***	0.097	0.179***	0.129***	M-F
	[11.823]	[9.351]	[0.260]	[1.534]	[0.080]	[0.058]	[0.049]	Ind.Lev.
RKD-2	57.9***	66.0***	0.472**	4.956***	0.098	0.125**	0.144***	M-F
	[10.820]	[9.526]	[0.226]	[1.470]	[0.075]	[0.060]	[0.047]	a18xG
IV-2	72.0***	80.7***	0.941***	6.358***	0.171**	0.170***	0.146***	M-F
	[11.834]	[10.526]	[0.250]	[1.624]	[0.084]	[0.060]	[0.054]	a18xG

Note: national averages of alcohol consumption, smoking; gdp per capita, and mortality rates at age 18 are included in the regression; M-F=males-females; Ind.lev.=Individual level; a18xG=a18Xgender cells

Table 7: Dif-in-Dif: males before and after they come back from army

	alcohol intake	hard alcohol intake	Log hard alcohol intake	# of cigarettes per day	I(smokes)	hep./tub./ chronic diseases	Health problems
$I(\geq 20yo)*$	9.434**	7.419**	0.223***	1.389***	0.066***	0.005	0.006
$I(Served\,in\,Aarmy)$	[3.905]	[3.143]	[0.086]	[0.271]	[0.016]	[0.011]	[0.020]
$I(\geq 20yo)$	3.828	1.470	0.082	0.251	-0.014	-0.011	-0.029
	[5.298]	[4.264]	[0.117]	[0.368]	[0.021]	[0.014]	[0.027]
Age	6.972***	4.579***	0.155***	0.730***	0.031***	0.004	-0.000
	[1.349]	[1.086]	[0.030]	[0.094]	[0.005]	[0.003]	[0.007]
Age^2	-0.576***	-0.219**	-0.011***	-0.069***	-0.006***	0.000	0.001**
	[0.107]	[0.086]	[0.002]	[0.007]	[0.000]	[0.000]	[0.001]
Age^3	-0.030	-0.048	-0.001	0.000	0.000**	-0.000	-0.000*
	[0.042]	[0.034]	[0.001]	[0.003]	[0.000]	[0.000]	[0.000]
Observations	11,467	11,469	11,469	11,278	11,379	10,018	11,388
R-squared	0.079	0.041	0.075	0.189	0.147	0.001	0.008
Number of individuals	2,993	2,993	2,993	2,986	2,991	2,725	2,990
individual FE	YES	YES	YES	YES	YES	YES	YES

Figure 24: Placebo: shortening interval around kink. RKD coefficients (males-females)

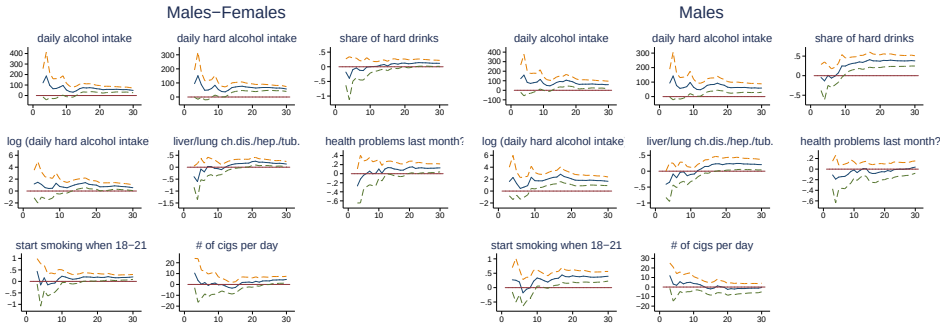


Table 6. Bootstrapped standard errors estimates

	alcohol intake	hard alcohol	log(hard alcohol)	share of hard alcohol
RKD, males-females	48.24***	55.45***	0.493**	0.105**
	[10.66]	[7.72]	[0.227]	[0.047]
RKD, males	65.24***	60.63***	1.659***	0.339***
	[18.76]	[12.95]	[0.347]	[0.075]

	hep., tub., chronic lung or liver diseases	Health problems
RKD, males-females	0.131**	0.132***
	[0.054]	[0.046]
RKD, males	0.176**	0.034
	[0.078]	[0.056]

	Start smoking when 18-21	# of cigs per day	I(smokes)
RKD, males-females	0.202***	4.984***	0.110
	[0.060]	[1.488]	[0.078]
RKD, males	0.401***	1.110	0.071
	[0.082]	[2.150]	[0.088]