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Did Alcohol Policy Really Cause the Postsocialist Mortality Crisis? Revisiting the Rebound and Affordability Hypotheses

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Did alcohol policy really cause the postsocialist mortality crisis? Revisiting the rebound and affordability hypotheses

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Abstract

This article reexamines the argument that alcohol policies were the major factor behind the mortality crisis in postsocialist Russia. We show that the correlation between the Gorbachev anti-alcohol campaign (rebound hypothesis), alcohol prices in the 1990s (affordability hypothesis), and mortality reported in previous analyses is not robust to splitting oblasts into Far-East and the rest of Russia. Our analysis conducted on a sample of 534 towns in the European part of Russia also finds no robust evidence supporting the two hypotheses. In contrast, findings linking privatization to mortality are robust to controlling for the anti-alcohol campaign and the affordability of alcohol.

Keywords

Alcohol; Alcohol policy; Russia; Mortality; Social Determinants; Transition

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I. Introduction

Several countries of postsocialist Eastern Europe were hit by an unprecedented mortality crisis in the 1990s, representing one of the most significant demographic shocks after the Second World War outside war or famine. According to UNICEF, total excess mortality reached 3.26 million in 1990–1999 in Eastern Europe (UNICEF 2001, 47). Russia and some other former members of the Soviet Union experienced the most severe wave of excess deaths; life expectancy in Russia fell by nearly five years between 1989 and 1994 alone.

Researchers agree that the postsocialist mortality crisis is not a statistical artifact (Leon et al. 1997). While infant mortality declined, the mortality for men and women aged 35–44 almost doubled between 1990 and 2005 in Russia. The crude death rate reached 15.7 per 1,000 in 1994, up from 10.4 in 1986; after declining between 1994-1998, it reached 16.4 per 1,000 by 2003 (WHO 2020). Alcohol and circulatory system-related deaths rose sharply, while neoplasm-related deaths remained stable or even declined (Brainerd and Cutler 2005). Health indicators related to environmental pollution also improved from the end of the 1980s following the collapse of socialist industries (Nell and Stewart 1994, 16-17). These trends make it unlikely that there would be a measurement error in the death registry behind the mortality increase, or that the quality of health care and environmental pollution played a significant role.

There is an agreement in the literature that hazardous alcohol consumption was a crucial proximal cause of the excess deaths in postsocialist Russia (Brainerd and Cutler 2005; Yakovlev 2018; Leon et al. 2007; Zaridze et al. 2009; Scheiring, Irdam, and King 2019). Deaths directly related to hazardous alcohol consumption — such as alcohol poisoning, heart disease, and cirrhosis — increased steeply, as did deaths indirectly related to alcohol, such as suicides, homicides, or accidents. Evidence suggests that the habit of heavy binge drinking (consuming large amounts of alcohol in a short amount of time) was implicated in the increase of male death rates (Malyutina et al. 2002). Other proximate health behavior factors, such as smoking, poor diets, and obesity are less likely to have played a significant role in the postsocialist mortality crisis; these indicators have not worsened significantly or even improved in parallel to rising death rates in the early 1990s (Shkolnikov, McKee, and Leon 2001; Brainerd and Cutler 2005). Public health research also reached a consensus that psychosocial stress was a crucial mechanism linking economic dislocation, labor-market upheaval, and rapid institutional change to deaths

directly and through hazardous drinking (Cornia 2000; Walberg et al. 1998; Gavrilova et al. 2000).

However, disagreement persists concerning the distal or upstream factors — what Marmot called the "causes of causes" of ill health (Marmot 2018) — and the underlying causal mechanisms that link these upstream factors to downstream, proximal determinants of health. Several studies have argued that rapid and extensive privatization was a crucial economic policy factor driving the life expectancy decline (Stuckler, King, and McKee 2009; Irdam, Scheiring, and King 2015), and more specifically behind the increase of alcohol-related deaths and suicides in the former Soviet Union (King, Hamm, and Stuckler 2009). Some have questioned this association on methodological grounds (Gentile 2012; Earle and Gehlbach 2010; Gerry 2012). However, a later study using a quasi-experimental design with individuals nested in a matched set of towns with and without mass privatization in Russia confirmed the association (Azarova et al. 2017). Simultaneously, prolonged state ownership appears to have been health-protective compared to privatization in Hungary, according to another multilevel study (Scheiring et al. 2018). In contrast, some have argued that stress is not strongly correlated with adverse health behavior and ill health (Treisman 2010; Cockerham 1997), and proposed that mortality was driven primarily by adverse lifestyles that have little to do with stress caused by socio-economic change (Cockerham, Snead, and DeWaal 2002; Cockerham 2007).

Two contributions to this debate by Treisman (2010) and Bhattacharya, Gathmann, and Miller (2013) presented evidence related to alcohol policy to question the role of economic factors and psychosocial stress. Bhattacharya, Gathmann, and Miller (2013, 232) argued that the demise of the 1985-1988 Gorbachev Anti-Alcohol Campaign "explains a large share of the mortality crisis," implying that "Russia's transition to capitalism and democracy was not as lethal as commonly suggested." Treisman (2010, 312) presented evidence suggesting that "populist politics" in the early 1990s led to a reversal of the Gorbachev anti-alcohol campaign and a relative decline in the price of vodka: the leadership "had certainly learned from Gorbachev's anti-alcohol campaign in the mid-1980s that trying to take away a Russians' vodka bottle would elicit loud protest. Throughout the period from 1990, officials at different levels repeatedly tried to prevent the price of vodka from rising in a way they feared would be politically unpopular". Treisman concluded that the rise in hazardous drinking "resulted from a sharp drop in the price of vodka relative to those of other goods, including beer" (314).

However, based on the available public health literature, there are reasons that suspect that the price and rebound theories could be wrong. First, concerning the explanatory power of alcohol price, we need to consider that substitution for more dangerous alcohols — not just homemade "moonshine", but also the fake alcohol sold as mouthwash or cologne — was widespread in Russia in response to the increase of the price of vodka. Research using individual-level data from the Russian Longitudinal Monitoring Survey (RLMS) found that an the increase in the price of vodka leads to an increase in the consumption of home-made alcohol; as a result of the substitution, the price of vodka has no effect on the total ethanol consumption (Andrienko and Nemtsov 2005). Also analyzing RLMS data, Goryakin, Roberts, and McKee (2015, 185) came to a similar conclusion, arguing that "although alcohol prices do appear to influence consumption behavior in Russia, in most cases the size of effect is modest." Due to this substitution effect, it is plausible that raising the price of licit vodka will damage health, as people substitute illicit alcohol containing impurities that can result in death.

We also have reason to be suspicious of the rebound effect hypothesis. Mortality rates also increased in some countries outside the former Soviet Union where there was no Gorbachev-type anti-alcohol campaign. For example, male life expectancy in Hungary declined from 66.2 to 64.9 between 1998-1994. Like in Russia, middle-aged males were hit the hardest — the death rate of 35-39 year old Hungarians was 45% higher in 1994 than in 1988 (Human Mortality Database 2020). Because there was no anti-alcohol campaign in Hungary in the 1980s, the rebound effect cannot explain this increase that otherwise mirrors the Russian trends. In addition, there was also a marked variation in excess deaths in the early 1990s within the former members of the Soviet Union — countries that experienced similar changes in alcohol policy. The rebound effect cannot explain these intra-FSU variations that follow upstream economic determinants more closely than alcohol policy (Stuckler 2009, 308-310). Women's consumption of alcohol was very low compared to men's, so the rebound mechanism would hit men disproportionately. However, declines in life expectancy at birth between males and females were strongly correlated (r=0.8) between 1990 and 1994 (Walberg et al. 1998). Reviewing the long-term trends Cornia and Paniccià (2000) also concluded that the mortality in the early 1990s in transitional economies was a radical break from past trends, and cannot be explained by the anti-alcohol campaign of the 1980s.

In this paper, we revisit the arguments that alcohol policies influencing alcohol availability were the major factors behind the mortality crisis in postsocialist Russia. Specifically, we examine the two hypotheses presented by Treisman (2010) and Bhattacharya, Gathmann, and Miller (2013) (1) by replicating their analyses using the authors' datasets, splitting the sample into Far-East and the rest of Russia; (2) by testing it on a sample of 534 mid-sized towns in the European part of Russia; and (3) by re-running Azarova et al.'s (2017) study on privatization controlling for the size of the rebound effect and the affordability of alcohol. We show that the correlation between the Gorbachev anti-alcohol campaign (rebound hypothesis), alcohol prices in the 1990s (affordability hypothesis), and mortality is not robust to splitting Russian oblasts into the Far-East and the rest of Russia. Excluding the far Eastern regions, there is no evidence supporting the rebound or the affordability arguments in the rest of the Russian Federation, accounting for 79.6% of its population. However, our split-sample estimates suggest that there were 50 times more excess deaths in the 1990s than saved lives during the anti-alcohol campaign in the Russian Far East. Though statistically significant, in real terms the rebound-hypothesis seems only to explain a negligible part of the mortality crisis even in the Far Eastern part of Russia. We also show that the two alcohol policy hypotheses are not confirmed on the sample of Russian towns. Finally, we show that the privatization-mortality link is robust to measures of the size of the anti-alcohol campaign and the affordability of alcohol.

We proceed as follows. The next section revisits the methodological details of the original studies by Treisman (2010) and Bhattacharya, Gathmann, and Miller (2013), describing the reason and method for splitting the sample and presenting the details of the additional dataset we use to test their hypotheses. The subsequent section presents the results. We first replicate the models using the original datasets, then describe the split-sample results, the results of the additional town-level models, and finally check the explanatory power of privatization against the rebound and affordability hypotheses. We conclude by discussing the implications in the context of the literature on the role of alcohol and psychosocial stress induced by socio-economic dislocation.

II. Methods

A. Data

The analysis is based on four sets of data. The first is a replication dataset compiled for "The Gorbachev Anti-Alcohol Campaign and Russia's Mortality Crisis" article by Bhattacharya et al.[1] It contains the Russian Federation regional data on death rates, alcohol consumption, and some other indicators going back to 1980. The second dataset was obtained from Daniel Treisman, which contains data on male death rates and affordability of alcohol at the regional level.

Bhattacharya et al. used archival sources to create a new panel dataset for 1980-2000 to uncover the link between the Anti-Alcohol Campaign and both mortality during campaign years and mortality after the campaign, which coincided with the transition years. Their main analysis focused on estimating the association between region-year death rates and interactions of region-level mean alcohol consumption prior to the campaign (1980-1984) with year dummies. They showed that during campaign years, regions with higher pre-campaign alcohol consumption are disproportionately positively affected by the campaign, exposing a greater drop in mortality rates during the campaign. However, the regions with larger reductions in mortality during the campaign experience larger increases in subsequent mortality during transition years. They interpret this as indicating that people who were going to die from alcohol consumption were temporarily saved from this fate during the campaign, but then died once the campaign ended and they had easy access to alcohol again (the "rebound effect").

The second set is a panel dataset for years 1995-2006, assembled by Treisman for the "Death and Prices" article. The set includes data on male working age mortality rate, vodka affordability measured as number of liters of vodka that average monthly income would buy, and proportion of the region's population that was Muslim. Other controls include log deflated average income in 1992 rubles, log of vodka price in 1992 rubles, proportion of population above working age, proportion of the employed population with higher education, the proportion

[1] Replication data for The Gorbachev Anti-Alcohol Campaign and Russia's Mortality Crisis was downloaded from https://www.openicpsr.org/openicpsr/project/113851/version/V1/view;jsessionid=330923EB2DF1DC3BB737FF667DC07A2F?path=/openicpsr/113851/fcr:versions/V1/AEJ_App2011-0367_Data/AEJ-App2011-0367_Framingham.dta&type=file

of economically active population unemployed, inflation rate, the proportion of the urban population, poverty rate (measured as share of population with income below minimum subsistence level), and lagged log regional budget health spending, in 1992 rubles.[2] Table A1 and A2 in the Appendix presents descriptive statistics for variables in the Bhattacharya et al. and Treisman data sets and provides more detail about each variable.

The third data set is a unique set of data on towns in the European part of Russia, collected under the Privatization and Mortality project's auspices (Irdam et al. 2016). This includes data on 534 mid-sized towns in the European part of Russia where the population exceeded 3,000, but was smaller than 200,000 in 1989, over the period 1991-2006. These towns are located in the 49 most populous regions of Russia. The total population in the sample towns was 21.5 million in 1991, or 14.51% of Russia's total population. As these towns are all mid-sized towns in Russia's most populous regions, and as these 49 home regions represent the greater part of the country both in numbers and in population share, we can justifiably extrapolate this finding to the European part of Russia. The information on death rates, income, and social provision was obtained from the Federal Statistics Service (Rosstat) year books.

To judge whether the quality of the data regarding mortality in the sample of 534 towns was acceptable and following average trends in the Russian Federation, we calculated mean crude death rates across the towns in each year between 1991 and 2000 and compared them with the respective national-level statistics. Figure A1 in the Appendix presents the crude mortality rates in our town sample between 1991 and 1999. The grey solid line represent the sample Crude Death Rate (CDRs); the black line represents national CDR in Russia. While being higher in levels, the line for the sample of towns generally tracks the official statistics. The lower values are not unexpected, as the sample is confined to the urban population with a relatively lower overall mortality than the rural and overall population.

The fourth data set consists of an indirect demographic survey of individuals from 20 matched towns in the European part of Russia collected as part of the PrivMort project (Azarova et al. 2017; Irdam et al. 2016). The cohort used for the present analysis comprised 12,086 males, residing in twenty towns with nearly identical pre-transition levels of demographic and socio-economic conditions and all-cause and alcohol-related mortality, but with substantial differences

[2] The dataset and Stata do file was requested and received from the author.

in the speed of privatization. We combine this with the Treisman and Bhattacharya et al.'s data. Table A7 in the Appendix presents descriptive statistics for variables in this individual-level dataset, including a note with further detail about the data collection procedure.

B. Modeling

Our empirical strategy is as follows. First, in a pooled sample of 1985-2000 years, we estimate the association between region-year CDRs and interactions of region-level mean alcohol consumption of official alcohol and *samogon* (moonshine) prior to the anti-alcohol campaign with year dummy variables. In Bhattacharya et al.'s (2013, 243) description, the "advantage of this approach is that it effectively provides a summary measure of campaign intensity (given that the campaign is highly multifaceted and that data on its individual components is generally unavailable)." These interaction coefficients provide estimates of differential time path of mortality in harder-drinking oblasts relative to more temperate ones during campaign and transition periods. The equation can be written as follows,

$$(1)\quad mortality_{oy} = \alpha + \sum_t \beta_t [\,(mean\ pre\text{-}campaign\ alcohol\ consumption\,)_o \times (\,year\,)_{yt}\,] + \delta_o + \delta_y + \varepsilon_{oy}\,,$$

This equation for region *o* and years *y* represents one-to-one replication of models employed by Bhattacharya et al. (2013): where *mortality* is a CDR per 1,000 population, *mean pre-campaign alcohol consumption* is the mean of region *o*'s total alcohol consumption during sample years prior to the campaign (1980–1984), and δ_o and δ_t represent region and year fixed effects. In addition to fixed regional effects and a flexible national trend, the coefficient β expresses how mortality responds differently over time in regions that have lower or higher pre-campaign alcohol consumption. We also estimate variants of equation (1) that include oblast-specific linear time trends.

C. Selection of regions

We apply the method used by Bhattacharya et al. to two separate groups of regions, seventeen regions of the Far-East, and the rest of the Russian Federation. These regions were

selected using a combined approach of geographical proximity and jack-knife resampling. We repeatedly calculated the betas of model (1), each time omitting one of the regions. Overly influential observations and a few other regions close to them geographically formed a group of nineteen regions in the Far East part of Russia. These sparsely populated regions in many cases were economically stagnant, with a low industrial base and small gross regional product per capita, and therefore heavily dependent of federal transfers.

Second, we apply the same strategy, namely running the models on two unequal parts of Russian regions, to test the robustness of Treisman's (2010) alcohol affordability hypothesis.

The panel OLS regressions were estimated with panel corrected standard errors that correct for contemporaneous correlation and panel heteroskedasticity (Beck and Katz, 1995), defined as:

$$(2)\quad mortality_{oy} = \beta_1\,(log\ vodka\ affordability)_o \times \sum_j \beta_k\,(covariate)_{ko} + O_o + T_y + \varepsilon_{oy}$$

This equation for region *o* and year *y* represents one-to-one replication of models employed by Treisman (2010): where *mortality* is logs of regional working age male mortality rates, *log vodka affordability* is the logged number of liters of vodka that could be bought with the average monthly income, $j = 2 \ldots k$, *covariate* include the proportion of population above working age, the proportion of Muslim population, log of average income, proportion of the employed population with higher education, the proportion of economically active population unemployed, inflation rate, the proportion of the urban population, poverty rate, one year lag of log of regional budget health spending per capita, and job turnover, and O_o and T_y represent vectors of dummy variables for region and year, respectively.

Following this, we test these two alcohol-related models on our own data set of over 534 towns in the European part of Russia.

Test of Bhattacharya et al. (2013) models:

$$(3)\quad mortality_{iy} = \alpha + \sum_t \beta_t [\,(mean\ change\ in\ alcohol\ consumption\ during\ campaign)_i \times (\,year\,)_{yt}\,] + \delta_i + \delta_y + \varepsilon_{iy}$$

Equation (3) is a panel regression where *mortality* is defined as town-level all-cause crude death rates per 1,000 population; *mean change in alcohol consumption* is the mean drop of respective region total alcohol consumption during Gorbachev's campaign (1985-1989); covariates include the number of physicians per 100,000 and number of hospital beds per 10,000 and $\delta_{i,}$ and δ_y are town and year fixed effects. We also estimate variants of equation (3) that include oblast-specific linear time trends.

Test of Treisman's models:

$$(4)\ mortality_{iy} = \alpha + \beta_1(\ log\ vodka\ affordability\ )_i \times \sum_j \beta_k\ (covariate)_{ki} + \delta_i + \delta_y + \varepsilon_{iy}\ ,$$

where *mortality* is logs of town-level all-cause both genders mortality rates, *log vodka affordability* is the number of liters of vodka that could be bought with the average monthly income in regional capital, $j = 2 \ldots k$, *covariate* include alcohol consumption in liters per capita, log of floor area per capita, log of number of physicians per 100,000, and δ_i and δ_y are represent town and year fixed effects.

Finally, we replicate the analysis of Azarova et al. (2017) to estimate the impact of privatization on mortality controlling for individual level variables, the affordability of alcohol and the size of the Gorbachev anti-alcohol campaign, as shown in equation (5):

$$(5)\quad \log \mu_i = + \beta_1(privatization)_i + \beta_k X_i + \log E_i + \varepsilon_i.$$

where μ_i is the value of the death indicator for male subject, *(privatization)* is 1 if male subject resided in any of ten towns that experienced fast privatisation and 0 if he resided in any of ten town that experienced gradual privatisation, and X_i is a vector of time-constant variables. These variables include the respective region's mean drop in total alcohol consumption during Gorbachev's campaign (1985-1989), the number of liters of vodka that could be bought with the average monthly income in the respective regions, and subject's education, marital status, professional occupation, material deprivation, alcohol drinking and smoking habits. *Eit* is the

exposure duration of subject *i* (log *Ei* being the offset). This analysis focuses on the effect of the speed of privatisation on mortality of subjects of working age, thus male relatives younger than 20 or older than 69 in 1992, and those who died before the beginning of the reforms (in 1991 or earlier), were excluded.

III. Test of the alcohol policy hypotheses on Russia's post-communist mortality crisis on regional data

A. Analysis of the Bhattacharya et al. hypothesis on their own data set

Bhattacharya et al. found that the levels of pre-campaign alcohol consumption predict the 1990s surge in mortality and surmise – without observation – that alcohol consumption returned to pre-campaign levels, with a concomitant rebound in mortality, when the campaign ended. Their principal findings, displayed in Table 3 of their article, are the regression coefficients for the interaction of region-level mean alcohol consumption of official alcohol and *samogon* prior to anti-alcohol campaign with year dummy variables. The year-specific coefficients trace differential mortality paths of regions based on differing levels of pre-campaign alcohol consumption.

Higher pre-campaign alcohol consumption is associated with more averted deaths during the campaign period. The claim is that these deaths were merely "delayed" by the campaign; once unrestricted availability of alcohol resumed after the transition, these delayed deaths became actual deaths, a "rebound" effect from Gorbachev's campaign. Bhattacharya and colleagues estimate 2.15 million in the first four years after transition. They conclude that Russia's transition to capitalism was not the primary lethal agent, as a large proportion of deaths would have occurred even if there had been no transition.

[Insert Table 1 here]

The coefficients in Table 1 display different mortality time paths for regions with varying levels of success in their anti-alcohol campaigns, measured as mean per capita total alcohol consumption before the campaign (1980-1984). The original Table 3 (Bhattacharya et al. 2013, 246) is provided in the Appendix of this article (Table A4) and shows that our results are one-to-one replications of columns one and two. We observe a significant decrease in crude death rates

in 1985-1989 in regions that had a greater consumption before the campaign, as all year-specific betas for the 1980s are negative and significant. For example, the first coefficient in column one in Table 1 (-0.199) means that in regions with an additional liter of alcohol consumed per person per year prior to the campaign (1980-1984) had a mortality rate 0.199 per 1,000 lower compared to other regions in 1985. The coefficient in column two indicates that this drops to 0.144 per 1,000 when region specific times trends are added. This trend is reversed in the 90s, after the campaign's demise, with a surge in "delayed" deaths. It is important to note that the rebound hypothesis is only supported in the model with region-specific time trends (model 2), while the findings without the regional time trends actually yield lower mortality in 1990 and 1991, and in only one of the subsequent years (1995) do death rates increase.

As a further test for the "rebound" hypothesis, we examined the rebound theory separately for two subsamples: 18 regions of the Far East, and the rest of the federation.[3] Figure 1 is a replication of Figure 2 in Bhattacharya et al.'s paper. Crude death rates differ substantially between the top and bottom quartiles (whole sample of Russian regions) of the distribution of pre-campaign alcohol consumption. Gray and black lines represent the top and bottom quartiles, based on alcohol consumption before the Gorbachev reform. As seen from the crossed lines, the regions in the top quartile experienced a larger reduction in death rates in the late 1980s during the Gorbachev campaign and larger crude death increases in the early transition years.

[Insert Figure 1 here]

We then split the sample and draw the figures separately for the sample of Far Eastern regions and the rest of the regions, as presented in Figure 2. The Far East regions fit with the rebound theory better than the rest of Russia, as the death rates in regions with higher alcohol consumption were much lower than in the regions with relatively less alcohol consumption before the campaign, and increased faster with the transition than the other group of regions. In the regions that benefited most from the anti-alcohol campaign, death rates surged: 6.5 more extra-deaths per 1,000 of population, whereas in the bottom quartile, we observe only five more

[3] This group include following regions: Altaiskii Kraj, Krasnoyarskii Kraj, Khabarovskii Kraj, and Primorskii Kraj, Sakha Republic, Khakassia, Tyva, Buryatia, Kamchatskaya, Kemerovskaya, Amurskaya, Chitinskaya, Magadanskaya, Novosibirskaya, Omskaya, Irkutskaya, Tomskaya, Sakhalinskaya oblasts and Jewish AO, accounting for 20.4% of the total population in 1989; and the remaining 62 oblasts of the Russian Federation. Information for six small sub-regional units, such as the Jewish AO, Chukotskaya AO, Aginsky AO, Koryakskii AO, Khanty-Mansiiskii AO, and Yamalo-Nenetsky were not available; however, they account for only 0.5% of the total population of Russian Federation

extra deaths per 1,000. It is important to note that Far Eastern regions, as a group, follow the rebound hypothesis and largely drive the result: on average, this group experienced a drop in mortality of 3.3 persons per 1,000 during the campaign, whereas, for the rest of the regions, it is only 2.4 per 1,000.

[Insert Figure 2 here]

However, for the rest of the Russian Federation, accounting for over three quarters of its population, there is no evidence for the rebound theory, as the figure in the right panel shows. There is no difference in death rates between the top and bottom quartile of the distribution of pre-campaign alcohol consumption during the anti-alcohol campaign. The regions with higher alcohol consumption did worse later in the 1990s, but we can no longer claim that these were "delayed" deaths from Gorbachev's government's actions. The "rebound" effect appears only in the Far Eastern regions: first, the drop in mortality during the campaign in this group as a whole is higher than the rest of the Russian Federation, and second, the top and bottom quartile within this group have different trajectories, consistent with the rebound hypothesis.

Our models also support the heavy reliance of rebound theory on the experience of Far Eastern regions. We repeat the estimation of the changes in death rates using equation (1) separately for the Far East and the rest of Russia. Results are presented in Table 2, where column 1 represents the Far-Eastern group, and column 2 the rest of the regions.

[Insert Table 2 here]

We would expect the results in both groups to be similar to those reported in the original paper. However, the results are supported only in some regions in the Far-Eastern part of Russia, accounting for about 20.4 % of the total national population. Moreover, these results are different enough to cast serious doubt on the rebound hypothesis. We will confine ourselves to discussion of the models with region-specific effects, as these are the only models that support the rebound hypothesis in the original paper. In column 1, with oblast-specific time trends, results are significant and positive for 1991 and 1994 to 2000. This means those regions that benefited most from the Gorbachev campaign (in Bhattacharya et al.'s definition) were those that fared worse during the transition years within this group. This is in line with the rebound hypothesis, and is indeed substantially stronger than in the original paper. As model 1 implies, one additional liter

of alcohol consumption before the campaign is associated with an increase of 0.157 to 0.646 deaths per 1,000 population during the transition years.

However, the coefficients for consumption during the campaign (from 1985-1989), while in the right direction, are extremely small and statistically insignificant. So, if very few lives were saved during the campaign, it would be difficult to attribute increased mortality after the campaign to the rebound effect. We used the same method for estimating averted and excess deaths, as in the original paper, by multiplying coefficient estimates for interactions between pre-campaign mean alcohol consumption and year dummies with median pre-campaign consumption. Death rates implied by these estimates for median pre-campaign alcohol consumption, 14.43 liters per capita, would be -0.446 per 1,000 of population[4]. Scaling this by the population of these 18 regions, 30,069 thousand inhabitants, total averted deaths are 13,411 deaths. During mortality crisis (1991-1995), excess deaths implied by model 1 were 22.45 per 1,000[5]. Scaling these estimates by the population, implies 675,063 excess deaths between 1992 and 1995, or 50.3 times more excess deaths than saved lives.

Things get even worse for the rebound hypothesis when we move to the rest of Russia, as shown in column 2. Model 2 has significant interaction terms for years 1985 to 1989, where the effect is significant and negative, signaling that those regions that were harder drinking before the anti-alcohol campaign benefited more than other lesser-drinking regions during the campaign. However, the first two years after the campaign show statistically significant coefficients that indicate lower mortality rates. Only in 1994 and 1995 do we see positive coefficients that are consistent with the rebound effect. Thus, the intensity of the Gorbachev anti-alcohol campaign does not seem to explain the extra deaths during the transition years.

This analysis suggests that Bhattacharya et al.'s results were driven by the dynamics of alcohol consumption and mortality in regions of the Far East of the country. However, even in the Far East, the fact that the campaign did not appear to save many lives during the campaign itself would seem to refute the idea that the increase in deaths was due to a rebound effect. A much more straightforward interpretation is that those regions with higher consumption before

[4] For 1985 and 1986 this is: −0.021 × 14.38 = −0.302, −0.01 × 14.38 = −0.144, respectively, summing up to -0.446. The coefficient estimates for 1988 and 1989 are positive, thus they were not included in the calculation of averted deaths.

[5] For 1992, 1993, 1994, and 1995, this is: 0.248 × 14.38 = 3.57, 0.323 × 14.38 = 4.64, 0.346 × 14.38 = 4.98, and 0.646 × 14.38 = 9.29 (respectively).

the campaign were regions with a culture of heavy drinking. Thus, once alcohol became readily available people in these regions simply resumed their hard drinking ways, resulting in greater mortality.

In the original paper, heavy drinking before the campaign is linked to a more considerable consumption drop during the campaign. The authors claim to prove this by showing a positive relation between pre-campaign exposure to the disease-causing agent (alcohol) and reducing alcohol consumption during the campaign. According to Table 2 in the original paper, each additional liter of alcohol consumed per person per year before the Gorbachev campaign is associated with a 28-69% decline in alcohol consumption during the campaign. The actual drop in consumption during the campaign offers, in our view, a more accurate measure of the intensity of the campaign. Bhattacharya, Gathmann, and Miller (2013, 244) recognize this: "We assume that oblasts with higher pre-campaign alcohol consumption … benefited relatively more from the population-wide campaign though a *larger reduction* in alcohol consumption" (emphasis added). It turns out that the reduction in alcohol consumption (which the authors are trying to proxy) is actually a direct measure that can be derived from the dataset.[6]

Table A5 in the Appendix to this paper reports year-specific regression coefficients that show a gain or loss in mortality for ten percent change in alcohol consumption between 1985 and 1989, in addition to national year effects. These models are identical to Bhattacharya et al.'s with only one exception: the dependent variable is drop in alcohol consumption during the campaign, in 10%, rather than the level of consumption before the campaign. Models 2 and 4 include oblast-year trends and models three and four additionally adjust for region-level number of physicians per 100,000 and hospital beds per 10,000 population. Results show statistically significant support for the first part of the rebound hypothesis; namely, less exposure to alcohol consumption between 1985-1989 led to greater longevity during the campaign. However, the results show no support for the second part of the rebound hypothesis: while the Gorbachev campaign's beneficial effect gradually tailed off, greater campaign-era decreases were not associated with increased mortality at the peak of the crisis in 1994-1995. We observe that the coefficients for interaction with the years 1990 and 1991 are still significant but they are negative

[6] In fact, the authors did themselves produce this measure, as seen from the Stata do file: "% Change in Official Pure Alcohol Consumption Relative to Pre-Campaign Mean" and "% Change in Official Alcohol Consumption + Samogon Est Relative to Pre-Campaign Mean." However, we found no report on models using these variables in the manuscript. The corresponding author stated that he did not know why this methodological choice was made when asked by email.

in model 3, meaning that those regions that had a larger drop in consumption also had lower mortality after the campaign. None of the models show a substantively or statistically significant effect for the transition years from 1992 to 2000.

To explore the implication of the effect of the Far-Eastern regions, Table A6 in the Appendix replicates the same model in two subsamples: the sub-sample of 18 Far-Eastern regions and the rest of Russia. Model 1, for the Far East, shows that those regions which reduced alcohol consumption during the campaign also fared better during the campaign itself. Bhattacharya et al. predicted that Gorbachev's beneficial effect would be reversed during the transition years. We see the evidence for that in this subsample: year-specific betas in model 2 vary from 0.086 to 0.10 between 1995 and 2000 meaning that each ten percent in eduction of alcohol consumption between 1985 and 1989 was associated with 0.086 to 0.10 more deaths per 1,000 population. However, it seems very unlikely that such a rebound effect would become manifest only a full five years after the anti-alcohol campaign ended.

Year-specific beta estimates for the rest of Russian regions are presented in columns 3 and 4 of Table A5, with and without region-specific time trends, respectively. βs in model 4 for the interaction of drop in consumption of alcohol with year dummies, are significant for years 1985-1991 (with expected sign) and 1992 and 1993 but with the sign opposite to one that would be expected if Bhattacharya et al.'s hypothesis was accurate: each ten percent reduction in alcohol consumption during the campaign is associated with 0.06 and 0.07 *fewer* deaths per 1,000 respectively. These results make Bhattacharya et al.'s claim of excess deaths questionable, as campaign-induced alcohol reductions are associated with fewer subsequent deaths, not more. The rest of the year-specific beta estimates are statistically nonsignificant at $p<0.1$. While they are not statistically significant, all of the point estimates are in the wrong direction for Bhattacharya's hypothesis. That means that their models, based on the change in total alcohol consumption as the main predictor, only predict correctly the mortality levels during and after the program's demise in a handful of regions in the East of Russia.

B. Analysis of Treisman's hypothesis on his own data set

With the same regional data that was assembled by Treisman (2010), we replicate the author's models. To this end, we divided the sample into two groups, nineteen Far Eastern

regions and the rest of Russia, as in the previous section.[7] Table 3 shows how the price of alcohol behaves in the full sample Russian regions and two different parts of the Russian Federation, using Treisman's dataset and code.

Table 3 displays regression coefficients for the log of death rate for working-age men on the log of number of liters of vodka that could be afforded with the mean monthly income for the period between 1996 and 2006, with vodka's price fixed at the level recorded in the capital of the region. All models also include regional and year fixed effects.

[Insert Table 3 here]

The association between mortality and alcohol affordability for Russia as a whole is positive and robust, model 1 predicting a 0.103% increase in male mortality with every percent increase in the quantity of spirits one could buy on an average wage ($p<0.01$).

We then replicated the same model for the two groups separately. In the Eastern group (column 3) of 19 regions, the variable of affordability remains significant ($b=0.053$, $p<0.05$), yet it fails to be so for the majority of Russian regions, as indicated in column 2 of Table 3. The p-value is 0.137, showing this is not simply a problem of reduced statistical power. In contrast, in the non-Eastern regions, the poverty rate and unemployment rate have large and statistically significant effects on mortality. Thus, Treisman's own data and model supports the interpretation that the Russian mortality crisis is due to economic dislocation.

IV. Test of the alcohol policy hypotheses on Russia's post-communist mortality crisis on town-level data

A. Analysis of Bhattacharya et al.'s hypothesis on town-level data

We ran the models, specified in formula (3) above on our dataset with town-level death rates and town fixed effects to test the rebound hypothesis proposed by Bhattacharya, Gathmann, and Miller (2013).

[Insert Table 4 here]

[7] The size of the Far Eastern group contains one less region in the analysis on Bhattacharya et al's data, reported in Table 2. This happened because the data on pre-campaign alcohol consumption for Jewish AO, one of the 19 regions, was missing in their datset.

The results are presented in columns 1-4 of Table 4: βs in column 1 are significant for 1992, 1993, 1994, 1996, 1998, 1999, and 2000, but with the opposite sign to what would be expected if the rebound hypothesis were correct. With the addition of linear region-year trends (model 2) or two town-level controls (model 3), the βs and their significance levels are almost the same. With the inclusion of both region-year trends and controls (model 4), the estimates for regression coefficients are significant throughout the decade, with only one exception, for year 1993, and tend to rise gradually in absolute size.

This can plausibly be interpreted as evidence that towns experiencing a larger drop in alcohol consumption between 1985 and 1989 were subsequently *protected* from excess mortality as a consequence of the anti-alcohol campaign, which runs contrary to the rebound hypothesis. These estimates have to be taken with caution, as the drop in alcohol consumption is calculated at the level of regions, while the rest of the variables are at the town level, which may introduce a source of error.

B. Analysis of Treisman's hypothesis on the town-level data set

Next, we use the town-level data to test Treisman's hypothesis. We ran this analysis on our town-level data while plugging in Treisman's primary explanatory variable, log liters of vodka one can purchase with the average monthly income. The variation in alcohol affordability across regions was remarkable, with a mean of 30 liters and a standard deviation of 12.8.[8]

[Insert Table 5 here]

All models in Table 5 show that the price affordability of alcohol and all-cause mortality are not related in the way Treisman's hypothesis predicted. On the contrary, towns with more affordable alcohol were, in fact, those that experienced lower mortality. According to models 1 and 2, every 10 percent increase in affordability corresponded to a 0.66 or 1.53 percent decline in town-level death rates. Greater affordability means a lower price in nominal terms or, alternatively, higher income relative to other regions and the average price on vodka. Less affordability could have been associated with higher prices on officially sold vodka and thus more widespread consumption of dangerous alcoholic substitute beverages. Thus, more

[8] While the standard deviation of wage was 160 roubles per month, the price of one litre of vodka varied with the standard deviation of 254 rub, 1.5 times larger.

expensive alcohol is associated with more deaths could be a result of substitution. Alternatively, this may be a confounding protective effect of higher incomes. Greater affordability could be due to higher wages, where the population could afford more liters of alcohol but did not necessarily increase their alcohol consumption, pursuing a healthier lifestyle instead.

To remove this potential effect of higher incomes on affordability, in models 3 and 4, we used the price of alcohol, measured in the capital city of region, deflated to 1991, instead of alcohol affordability. The effect of alcohol price is not significant in both of the models, while effect of consumption is large and strongly significant ($p<0.001$). These four models demonstrate that price and deaths are not likely to be associated in the ways hypothesized by Treisman (2010). As mentioned above, the regression coefficients for the effects of alcohol affordability on mortality should be taken with caution, as these two variables are recorded at different levels due to the lack of town-level data on alcohol-related variables.

V. Privatization vs. the rebound and availability hypotheses

As we discussed earlier, the rebound and availability hypotheses are framed as alternatives to the psychosocial stress approach and are used to question to the explanatory power of variables related to the economic transition from socialism to capitalism. To check the explanatory power of the rebound and availability hypotheses against the explanatory power of privatization, we ran separate regressions using data from a retrospective cohort from matched mono-industrial towns in Russia collected for the Privatization and Mortality project (Irdam et al. 2016). This analysis showed that fast privatizing towns compared to slow privatizing towns had approximately 13% higher male mortality after adjusting for individual-level characteristics (Azarova et al. 2017).

We estimated Poisson proportional incidence rate ratios to map the association of individual subjects' characteristics, alcohol affordability, intensity of Gorbachev's campaign, and speed of privatisation with the risk of death from all causes. The dummy for privatization was 0 for slow privatized towns and 1 for fast privatized towns. The drop in alcohol consumption during the campaign varied between 13.3 and 23.5 percent on town level, with standard deviation of 3.02 percent. The affordability was also measured at town level. It varied between 2.39 and 3.38 litres per average per capita monthly income, on log scale, with standard deviation of 0.28. The multivariate analysis focuses on the effect of these variables on mortality of males

of working age (20 to 69) at the start of follow-up, as they experienced the greatest increase in mortality during the post-communist transition.

We tested the hypothesis that faster privatisation increases the risks of premature death above and beyond the effect of alcohol affordability or rebound effect of the Gorbachev campaign. The IRR for fast privatisation and for mean drop in alcohol consumption during the Gorbachev campaign, shown in model 1 Table 6, is adjusted for individual level controls. The IRR in fast privatizing towns versus the slow group is 1.122 times higher than for the slow group for male relatives.

The coefficient for drop in alcohol consumption is significant at 0.724, suggesting that those who lived in towns that benefited more form anti-alcohol campaign were subsequently protected from higher mortality. Each 10 percent in drop of alcohol consumption during the campaign, about 3 standard deviations change, was associated with 27.6 percent less mortality. In model 2 with the variable for privatization and alcohol affordability and the same set of individual controls, the IRR is 1.145 for fast-privatised settlements meaning that fast privatisation was associated with an increase in male working-age mortality of 14.5 %. The association with alcohol affordability is 0.848 (p=0.06), meaning that each additional litre of alcohol per average monthly income on log scale, amounting for a change of about three standard deviations, was associated with a 15.2 percent decrease in mortality. Again, this is consistent with the substitution effect, whereby people switched to more health-damaging illicit alcohol in response to the vodka price increase. Since these are small and medium sized towns outside of regional capitals where the price of alcohol was measured, this seems entirely plausible.

[Insert Table 6 here]

VI. Concluding discussion

The upstream causes of the Russian mortality crisis have been hotly debated, with most public health scholars emphasizing psychosocial stress and alcohol consumption (Bobak and Marmot 1996; Leon and Shkolnikov 1998; Gavrilova et al. 2001) driven by dramatic changes in the economy, such as labor market turnover (Walberg et al. 1998) or rapid privatization (Stuckler, King, and McKee 2009; Azarova et al. 2017; Scheiring et al. 2018). Two important

criticisms of this interpretation argue that this crisis resulted from the increased relative affordability of vodka (Treisman 2010), and a surge in delayed deaths after the repeal of the anti-alcohol campaign of 1985-1988 (Bhattacharya, Gathmann, and Miller 2013).

In this paper, we revisited the last two hypotheses. First, we replicated the rebound and affordability analyses using the authors' own datasets. Next, we split the sample in two parts (19 or 18 oblasts of Far East and the rest of Russian Federation), showing that their models might work for the former sample but not for the European part of Russia. But even in the Eastern regions, there was no evidence of substantial numbers of lives saved during the campaign, casting serious doubt that increases in mortality in the 1990s could have due to any rebound. We also ran the rebound model on an alternative – and what we believe is a superior – measurement of "intensity" of Gorbachev's campaign, namely the percentage drop in total (official and *samogon*) alcohol consumption. We found either the opposite effect to the one hypothesized or no effect in Russia as a whole. When we split the sample into European Russia and the Far East, we once again found partial support for the rebound hypothesis only in the latter, but even in this region there was no effect for 1992 to 1994 – the most devastating years of the mortality crisis. It seems very unlikely that the delayed deaths only started a full four years after the transition. We found that protective effect of Gorbachev's anti-alcohol policy during the campaign itself (1985-1989) was larger in regions of Russian Federation outside the Eastern group, where inhabitants that consumed more alcohol per capita prior to campaign experienced greater improvements in longevity during the second half of the 1980s, but this was not translated to more deaths during transition years.

We also tested the hypotheses on a sample of 534 mid-sized towns in the European part of Russia, using the drop in consumption during the anti-alcohol campaign as the independent variable. The analysis of the town-level dataset shows the opposite pattern to what would be expected based on Bhattacharya et al.'s hypothesis: the towns located in regions that had a greater drop in alcohol consumption during the Gorbachev campaign appear to have been subsequently protected from the higher mortality during transition years. Crucially we observe no delayed deaths in this sample. The town-level data set analysis also does not support Treisman's hypothesis that the sharp increase in vodka's affordability was a leading cause of the mortality crisis. In all model specifications with the inclusion of time trends, greater alcohol affordability is either not significant or negatively associated with death rates.

Finally, we re-ran the analysis of Azarova et al. (2107) that showed the negative effects of rapid privatization on mortality, only this time controlling for the rebound effect and the affordability of alcohol. The results showed that mass privatization is a robust explanatory variable of increased mortality. The drop in alcohol consumption during the Gorbachev campaign was associated with a reduction, not an increase, in mortality, while the affordability of alcohol had no significant effect. Thus it appears that the hypotheses proposed by Treisman (2010) and Bhattacharya, Gathmann, and Miller (2013) cannot explain away the negative effect of the rapid privatization (and by extension other forms of economic dislocation) on people's health. While health behavior is certainly a crucial proximal cause, it does not seem to attenuate the effect of upstream economic dislocations.

As Ellman (1994, 338) already noted, the postsocialist mortality crisis "was the result of a complex process of interaction between a variety of factors pointing in different directions." Hazardous drinking was one of the most crucial proximate factors, and alcohol policies likely influenced drinking patterns. The Gorbachev anti-alcohol campaign was successful in reducing hazardous drinking and mortality at the end of the 1980s. Depressed prices and the concomitant increased relative availability of vodka could have played a role in increasing hazardous drinking in the early 1990s in the Far East. There appears to be a role for alcohol policy; it can minimize the harm stemming from hazardous drinking. Price regulation and taxation can contribute to this aim (Yakovlev 2018; Andrienko and Nemtsov 2005).

However, our results suggest that the rebound (Bhattacharya, Gathmann, and Miller 2013) and affordability (Treisman 2010) effects did not play a major role in the mortality crisis in the European part of Russia. This finding is in line with the large body of quantitative and qualitative literature finding psychosocial stress generated by socio-economic dislocation to be an important factor behind the abuse of alcohol and the elevated death rates in the 1990s in Russia (Murphy et al. 2012, Gugushvili et al. 2018, Tomkins, Saburova et al. 2007, Saburova et al. 201, Parsons 2014, Perlman and Bobak 2009). Given all that we know about the negative health effects of economic decline and dislocation in the West (Case and Deaton 2020; Shanahan et al. 2019; Venkataramani et al. 2020) it would be remarkable if the much more dramatic economic transformation in Russia were not a major cause of the post-communist mortality crisis.

Finally, while some of our results are consistent with the rebound effect and the affordability hypothesis in the Far East, we remain far from convinced that these hypotheses are actually correct in this region. The best evidence for the rebound effect in the Far East were found in model 2 in table 2. However, this model showed very small numbers of lives saved in the 1980s and fifty times more excess deaths in the 1990s, so it seems implausible that the increase in deaths were due to a rebound effect. We do show an affordability effect in the Far East, but we find it very unlikely that this process would be operative in the East but not in the European part of Russia. All we have are some associations with no way to account for potential endogeneity or confounding variables.

Tables and Figures

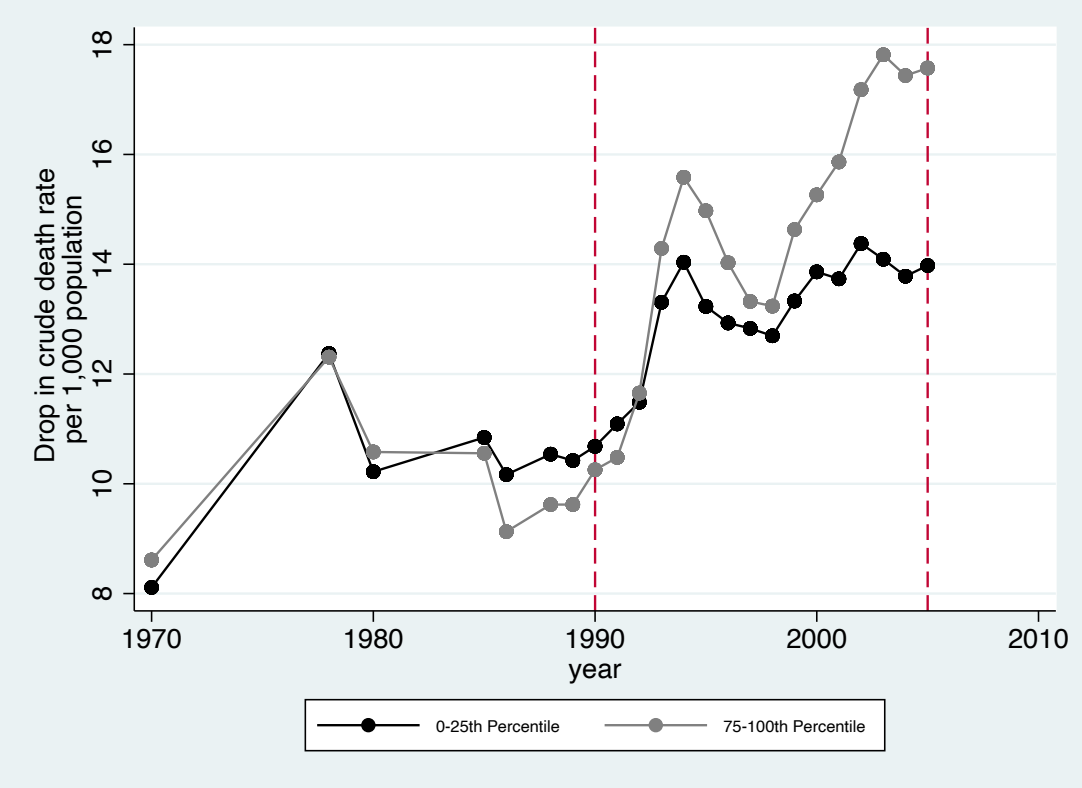
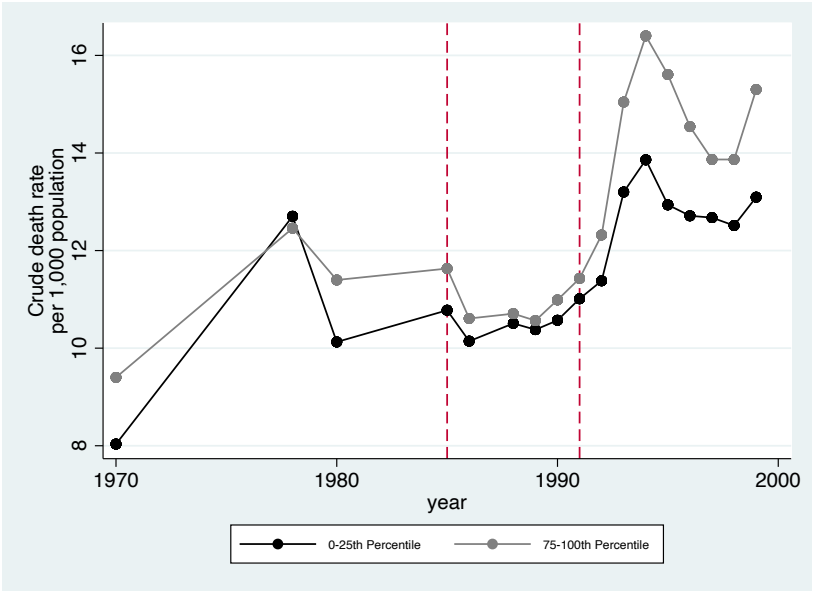


FIGURE 1. CRUDE DEATH RATES BY QUARTILE OF PRE-CAMPAIGN TOTAL ALCOHOL CONSUMPTION, 1970-2000

Note: Replication of Figure 2 in Bhattacharya, Gathmann, and Miller (2013, 244). Crude death rates (per 1,000 population) plotted for oblasts in the top and bottom quartile of alcohol consumption prior to Gorbachev Campaign. Estimates of total alcohol consumption use data on official alcohol sales and estimates of illegal alcohol production. Data on official alcohol sales are available in annual statistical yearbooks compiled by Goskomstat and Rosstat; illegal alcohol production estimated by extending the work of Nemtsov (2000).
Source: Dataset from Bhattacharya, Gathmann, and Miller (2013)

PANEL A. 18 REGIONS OF FAR EAST



PANEL B. THE REST OF REGIONS IN RUSSIAN FEDERATION, 62.

FIGURE 2. CRUDE DEATH RATES BY QUARTILE OF PRE-CAMPAIGN TOTAL ALCOHOL CONSUMPTION IN TWO GROUPS OF REGIONS, 1970-1999

Notes: The figure illustrates the crude death rates (per 1,000 population) for oblasts in the top and bottom quartile of alcohol consumption prior to Gorbachev Campaign. Estimates of total alcohol consumption use data on official alcohol sales and estimates of illegal alcohol production. Figures on official alcohol were taken from in annual statistical yearbooks compiled by Goskomstat and Rosstat; illegal alcohol production estimated by extending the work of Nemtsov (2000). The sample on panel A covers 18 regions: Buryatia, Chelyabinskaya oblast, Kemerovskaya oblast', Krasnoyarskii krai, Kamchatskaya oblast, Omskaya oblast, Tomskaya oblast, Altaiiski krai, Amurskaya oblast, Chtitinskaya oblast, Irkutskaya oblast, Sakha republic, Khabarovskii krai, Magadanskaya oblast', Khakkasiya, Novosibirskaya oblast, Sakhalinskay oblast, Primorskii krai. Panel B cover the rest of 62 Russian regions. Information for six small sub-regional units, such as the Jewish AO, Chukotskaya AO, Aginsky AO, Koryakskii AO, Khanty-Mansiiskii AO, and Yamalo-Nenetsky were not available; however, they account for only 0.5% of the total population of Russian Federation.
Sources: Dataset from Bhattacharya, Gathmann, and Miller (2013) and authors' calculations.

Table 1. Total Pre-Campaign Alcohol Consumption and Mortality

Dependent variable	Crude death rate	
	(1)	(2)
Campaign year interactions		
Consumption before campaign*1985	-0.199**	-0.144***
	(-0.06)	(-0.03)
Consumption before campaign*1986	-0.234***	-0.196**
	(-0.06)	(-0.06)
Consumption before campaign*1988	-0.306***	-0.241***
	(-0.05)	(-0.07)
Consumption before campaign*1989	-0.278***	-0.211*
	(-0.05)	(-0.09)
Crisis year interactions		
Consumption before campaign*1990	-0.213***	-0.144
	(-0.05)	(-0.08)
Consumption before campaign*1991	-0.167*	-0.093
	(-0.07)	(-0.07)
Consumption before campaign*1992	-0.034	0.047
	(-0.07)	(-0.08)
Consumption before campaign*1993	0.131	0.221*
	(-0.1)	(-0.09)
Consumption before campaign*1994	0.243	0.340***
	(-0.12)	(-0.08)
Consumption before campaign*1995	0.324**	0.407***
	(-0.12)	(-0.11)
Consumption before campaign*1996	0.159	0.245*
	(-0.09)	(-0.1)
Consumption before campaign*1997	0.028	0.116
	(-0.09)	(-0.11)
Consumption before campaign*1998	0.028	0.119
	(-0.09)	(-0.11)
Consumption before campaign*1999	0.129	0.222
	(-0.14)	(-0.12)
Consumption before campaign*2000	0.156	0.252
	(-0.16)	(-0.13)
Year fixed effects	Yes	Yes
Region-specific time trends	No	Yes
Observations	1371	1371
R^2	0.948	0.975

* p<0.05, ** p<0.01, *** p<0.001

Note: Replication of Table 3, columns 1 and 2 in Bhattacharya, Gathmann, and Miller (2013, 244). Each column represents the results from a separate OLS regression. The dependent variable is equal to crude death rate in region *i* and year *t*. Controls include region fixed effects, year fixed effects and region-specific linear trends (model 2 only). Standard errors, corrected for clustering at the region level, are shown in parentheses.
Sources: Dataset and code from Bhattacharya, Gathmann, and Miller (2013)

Table 2. Total Pre-Campaign Alcohol Consumption and Mortality

Groups of regions	18 Far East regions	The rest of the regions
Dependent variable	Crude death rate	
	(1)	(2)
Campaign year interactions		
Consumption before campaign*1985	-0.021	-0.150*
	(0.03)	(0.06)
Consumption before campaign*1986	-0.01	-0.250*
	(0.04)	(0.11)
Consumption before campaign*1988	0.037	-0.351***
	(0.07)	(0.09)
Consumption before campaign*1989	0.061	-0.377***
	(0.08)	(0.1)
Crisis year interactions		
Consumption before campaign*1990	0.151	-0.287**
	(0.09)	(0.09)
Consumption before campaign*1991	0.157*	-0.206*
	(0.06)	(0.1)
Consumption before campaign*1992	0.248	-0.074
	(0.14)	(0.11)
Consumption before campaign*1993	0.323	0.198
	(0.16)	(0.13)
Consumption before campaign*1994	0.346**	0.410*
	(0.09)	(0.14)
Consumption before campaign*1995	0.646***	0.286
	(0.12)	(0.14)
Consumption before campaign*1996	0.422**	0.072
	(0.13)	(0.14)
Consumption before campaign*1997	0.337**	-0.066
	(0.11)	(0.15)
Consumption before campaign*1998	0.409**	-0.063
	(0.14)	(0.15)
Consumption before campaign*1999	0.355	0.157
	(0.15)	(0.19)
Consumption before campaign*2000	0.387*	0.214
	(0.17)	(0.21)
Year fixed effects	Yes	Yes
Region-specific time trends	Yes	Yes
Observations	320	1061
Regions	18	62
R^2	0.98	0.98

* p<0.05, ** p<0.01, *** p<0.001

Note: Based on data Bhattacharya et al.'s data and model specification, published in Bhattacharya, Gathmann, and Miller (2013). Each column represents the results of OLS regressions referring to a different sample: model 1 represents coefficients and standard error from a sample of 18 regions of Far East: Buryatia, Chelyabinskaya oblast, Kemerovskaya oblast', Krasnoyarskii krai, Kamchatskaya oblast, Omskaya oblast, Tomskaya oblast, Altaiiski krai, Amurskaya oblast, Chtitinskaya oblast, Irkutskaya oblast, Sakha republic, Khabarovskii krai, Magadanskaya oblast', Khakkasiya, Novosibirskaya oblast, Sakhalinskay oblast, Primorskii krai. Model 2 is for the sample of the rest of 57 Russian regions. The dependent variable is equal to crude death rate in region i and year t. Controls include region fixed effects, year fixed effects and region-specific linear trends. Standard errors, corrected for clustering at the region level, are shown in parentheses.

Sources: Dataset and code from Bhattacharya, Gathmann, and Miller (2013)

Table 3. Affordability of Vodka and Male Mortality in Russia's Regions, 1995-2005

	All 77 regions	Without Eastern regions	19 Far Eastern regions
Dependent variable	Log of male deaths per 1000 population, town level		
	(1)	(2)	(3)
Log liters of vodka per avg. monthly income	0.103***	0.063	0.053*
	(-0.03)	(-0.04)	(-0.02)
Percent of old population	1.491***	2.577***	0.548
	(-0.24)	(-0.58)	(-0.29)
Percent of employed population with higher education %	0.065	0.124	-0.062
	(-0.06)	(-0.07)	(-0.09)
Percent of urban population	0.553***	0.388**	-0.296*
	(-0.1)	(-0.14)	(-0.13)
Percent of Muslim population, %	-1.726***	-1.769***	-0.758
	(-0.32)	(-0.35)	(-0.53)
Log average income	0.124**	-0.006	0.111
	(-0.04)	(-0.06)	(-0.07)
Unemployment (as % of econ. active pop)	-0.054	0.172*	-0.521***
	(-0.06)	(-0.08)	(-0.15)
Job turnover	0.106**	0.051	-0.027
	(-0.03)	(-0.04)	(-0.04)
Poverty rate	0.144***	0.113**	0.01
	(-0.04)	(-0.04)	(-0.03)
Regional budget health spending per capita in 1995 (one lag of log)	0.028**	0.087**	0.014**
	(-0.01)	(-0.03)	(-0.01)
Inflation rate	0.041	0.054	-0.019
	(-0.03)	(-0.06)	(-0.05)
Region dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Observations	838	623	193
R^2	0.99	0.99	1.00
Number of regions	77	58	19

* p<0.05, ** p<0.01, *** p<0.001

Note: Figures are taken from dataset for Treisman, Daniel. 2010. "Death and prices: The political economy of Russia's alcohol crisis." *Economics of Transition* 18 (2): 281-33. Each column represents the results of OLS regressions referring to a different sample. Column 1 reports effect size and standard errors for a model covering all 77 Russian regions, for which data was available, column 2 reports effect size and standard errors for model for 58 regions outside Far East, and column 3 reports effect size and standard errors for 19 regions: Buryatia, Chelyabinskaya oblast, Kemerovskaya oblast', Krasnoyarskii krai, Kamchatskaya oblast, Omskaya oblast, Tomskaya oblast, Altaiiski krai, Amurskaya oblast, Chtitinskaya oblast, Irkutskaya oblast, Sakha republic, Khabarovskii krai, Magadanskaya oblast', Khakkasiya, Novosibirskaya oblast, Sakhalinskay oblast,

Primorskii krai and Jewish AO. The dependent variable is equal to log of male crude death rate in region i and year t. Controls include region fixed effects and year fixed effects. Panel corrected standard errors are shown in parentheses.
Sources: dataset and code, received from the author and uploaded 10 June 2019 from:
http://www.sscnet.ucla.edu/polisci/faculty/treisman/Papers/mortality%20analysis.pdf, and authors' calculations.

Table 4. Drop in Total Alcohol Consumption During Campaign and Mortality, town-level data, 1992-2000

Dependent variable	Deaths per 1,000 population, town level			
	(1)	(2)	(3)	(4)
Drop in consumption during campaign*1992	-0.034*	-0.035*	-0.032	-0.041*
	(-0.02)	(-0.02)	(-0.02)	(-0.02)
Drop in consumption during campaign*1993	-0.037*	-0.039*	-0.027	-0.036
	(-0.02)	(-0.02)	(-0.02)	(-0.02)
Drop in consumption during campaign*1994	-0.067**	-0.070**	-0.059*	-0.080**
	(-0.02)	(-0.02)	(-0.03)	(-0.03)
Drop in consumption during campaign*1995	-0.04	-0.044	-0.037	-0.070*
	(-0.02)	(-0.03)	(-0.03)	(-0.03)
Drop in consumption during campaign*1996	-0.043*	-0.049	-0.064*	-0.109***
	(-0.02)	(-0.03)	(-0.03)	(-0.03)
Drop in consumption during campaign*1997	-0.034	-0.041	-0.051*	-0.119***
	(-0.02)	(-0.03)	(-0.02)	(-0.02)
Drop in consumption during campaign*1998	-0.071***	-0.079*	-0.086***	-0.158***
	(-0.02)	(-0.03)	(-0.02)	(-0.03)
Drop in consumption during campaign*1999	-0.106***	-0.115***	-0.122***	-0.198***
	(-0.02)	(-0.03)	(-0.03)	(-0.03)
Drop in consumption during campaign*2000	-0.099***	-0.108**	-0.110***	-0.190***
	(-0.02)	(-0.04)	(-0.03)	(-0.03)
Number of physicians per 100,000			-0.044***	-0.044***
			(-0.01)	(-0.01)
Number of hospital beds, per 10,000			0.015***	0.015***
			(0.00)	(0.00)
Year fixed effects	Yes	Yes	Yes	Yes
Town fixed effects	Yes	Yes	Yes	Yes
Region-specific time trends	No	Yes	No	Yes
Number of observations	5,285	5,285	5,021	5,021
Number of towns	534	534	531	531
R^2	0.44	0.45	0.48	0.49

* p<0.05, ** p<0.01, *** p<0.001

Notes: Deaths per 1,000 population, number of physicians per 100,000 and number of hospital beds per 10,000 are retrieved from database "Economics of Russian cities" provided by Main Interregional Center of the Processing and Dissemination of Statistical information at the Federal State Statistics Service (GMC Rosstat); figures for mean drop in alcohol consumption per person during the Anti-Alcohol campaign (1985-1989) are taken from Bhattacharya, Gathmann, and Miller (2013). Each column represents the results from a separate OLS regression. The dependent variable is equal to crude death rate in town i and year t. Controls include town fixed effects, year fixed effects and region-specific linear trends (only in models 2 and 4). Standard errors, corrected for clustering at the town level, are shown in parentheses. Number of clusters equals the number of towns.

Table 5. Affordability of Vodka and Mortality in Russia's town-level data, 1991-2000

Dependent variable	Log of deaths per 1,000 population, town level			
	(1)	(2)	(3)	(4)
Alcohol consumption, liters per capita	0.007***	0.002	0.038***	0.009***
	(0.001)	(0.002)	(0.001)	(0.002)
Liters of vodka per avg. monthly income, log	-0.066***	-0.153***		
	(-0.01)	(-0.02)		
Alcohol Price, deflated			-1.7e-06	4.1e-06
			(7e-06)	(5e-06)
Floor area in per person, log	0.03	0.008	0.253***	0.023
	(-0.02)	(-0.01)	(-0.02)	(-0.01)
Number of physicians per 100,000 population, log	0.006	0.014	0.006	-0.011
	(-0.01)	(-0.01)	(-0.01)	(-0.01)
Town fixed effects	Yes	Yes	Yes	Yes
Year dummies	No	Yes	No	Yes
N of towns	529	529	531	531
Observations	4076	4076	4967	4967
R^2	0.04	0.07	0.10	0.19

* p<0.05, ** p<0.01, *** p<0.001

Notes: Deaths per 1,000 population, number of physicians per 100,000 and floor area per person are retrieved from the database "Economics of Russian cities" provided by Main Interregional Center of the Processing and Dissemination of Statistical information at the Federal State Statistics Service (GMC Rosstat); figures for mean drop in alcohol consumption per person during the Anti-Alcohol campaign (1985-1989) are taken from Bhattacharya, Gathmann, and Miller (2013), figures on alcohol price in the region's capital city are taken from Goskolstat 'Tseny v Rossii' 1995, 1996, 1998, 2000, and 2002 year editions; figures for alcohol affordability, i.e. liters of vodka per average monthly income are taken from the dataset for Treisman, Daniel. 2010. "Death and prices: The political economy of Russia's alcohol crisis." *Economics of Transition* 18 (2): 281-33. Each column represents the results from a separate OLS regression. Columns 1 and 2 report effect size and standard errors for models with alcohol affordability as the main independent variable of interest. Columns 3 and 4 report effect size and standard errors for models with alcohol price, deflated to 1991 year as the main independent variable of interest. The dependent variable is equal to log of crude death rate in town i and year t. Controls include town fixed effects and year fixed effects. Standard errors clustered at the town level shown in parentheses.

Table 6. Age-adjusted incidence rate ratios from Poisson models in men aged 20–69 years between 1992 and 1998

	IRR	
	(1)	(2)
Speed of privatisation (ref: slow speed)	1.122*	1.145*
	(0.56)	(0.49)
Drop in alcohol consumption, 10%	0.724**	
	(0.22)	
Litres of alcohol per average salary, log		0.848
		(0.45)
Education (ref: elementary)		
Complete academic and vocational secondary	1.057	1.044
	(1.34)	(1.68)
Vocational higher education or incomplete higher	0.946	0.931
	(1.5)	(1.12)
Complete academic higher education	0.840	0.834
	(0.71)	(0.67)
Marital status (ref: partnered)		
Single	0.890	0.891
	(2.4)	(2.4)
Separated	1.181	1.189
	(0.67)	(0.66)
Alcohol consumption (ref: a couple of times a year)		
Almost every day or several times a week	1.611***	1.579***
	(0.45)	(0.46)
About 2–4 times a month or up to once a month	1.213	1.197
	(0.77)	(0.81)
Used to drink but quit	0.626***	0.614***
	(0.22)	(0.21)
Never	1.232	1.237
	(0.88)	(0.87)
Observations	12,086	12,086
Pseudo-R^2	0.11	0.11

* p<0.05, ** p<0.01, *** p<0.001

Notes: Each column represents the results from a separate Poisson survival analysis for 12,086 males (1,190 events) aged between 20 and 69 years in 1992, individual characteristics for which (age, education, marital status, alcohol consumption, occupation, smoking and material deprivation) were collected under the auspices of the PrivMort project. *Speed of privatization* of the major industry in the mono-town where participants resided during the follow-up (1992-1998) was estimated from data collected in the Privmort project. *Drop in alcohol consumption* is a mean drop in alcohol consumption per person during the Anti-Alcohol campaign (1985-1989) from Bhattacharya, Gathmann, and Miller (2013). Figures for *Log of litres*

of alcohol per average salary, are log of liters of vodka per average monthly regional income are taken from the dataset for Treisman, Daniel. 2010. "Death and prices: The political economy of Russia's alcohol crisis." *Economics of Transition* 18 (2): 281-33. Column 1 reports Incidence Rate Ratios (IRRs) and heteroscedasticity robust standard errors for model with drop in alcohol consumption as main independent variable of interest. Column 2 reports IRRs) and heteroscedasticity robust standard errors for model with alcohol affordability as main independent variable of interest. IRRs are additionally adjusted for age at baseline, occupation, smoking and material deprivation. Robust standard errors in parentheses.
Sources: Privmort data (Irdam, 2016), authors' calculations.

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Online Appendix to:

Did alcohol policy really cause the postsocialist mortality crisis? Revisiting the rebound and affordability hypotheses

By AYTALINA AZAROVA, GABOR SCHEIRING, MICHAEL ASH, LAWRENCE KING

FIGURE A1. CRUDE DEATH RATES CRUDE DEATH RATES IN THE RUSSIAN FEDERATION AND A SAMPLE OF 534 TOWNS, 1991-1999

Note: The Figure shows the crude mortality rates in our town sample of 534 mid-sized towns in European part of Russian Federation between 1991 and 2000 as compared to the national average. The grey solid line represents the sample's Crude Death Rate (CDRs); the black line represents national CDR in Russian Federation.
Source: database "Economics of Russian cities" provided by Main Interregional Center of the Processing and Dissemination of Statistical information at the Federal State Statistics Service (GMC Rosstat); annual statistical yearbooks, compiled by Goskomstat and Rosstat (1991-2001)

Table A1. Descriptive Statistics for Bhattacharya et al' data

	Pre-campaign years (Prior to 1985)		Campaign years (1985–1989)		Transition period (1990–2000)		All years	
Years	Obs.	Mean	Obs.	Mean	Obs.	Mean	Obs.	Mean
Crude death rate	219	10.27 (0.16)	306	10.42 (0.14)	955	13.04 (0.10)	1,480	12.09 (0.08)
Official alcohol sales	454	9.97 (0.11)	376	5.28 (0.16)	549	5.92 (0.08)	1,379	7.08 (0.08)
Total alcohol consumption	376	14.56 (0.11)	376	11.46 (0.09)	234	12.96 (0.07)	986	12.99 (0.07)
Alcohol poisoning death rate	73	29.46 (2.14)	151	9.91 (0.48)	864	26.43 (0.67)	1,088	24.34 (0.58)
Alcohol poisoning death rate (male)	73	46.54 (3.21)	151	15.92 (0.76)	864	41.47 (1.01)	1,088	38.26 (0.88)
Alcohol poisoning death rate (female)	73	12.38 (1.28)	151	3.89 (0.25)	864	11.39 (0.38)	1,088	10.41 (0.33)
Circulatory disease death rate	77	509.63 (20.22)	78	555.92 (23.59)	959	675.92 (7.71)	1,114	656.02 (7.13)
Accident/violent (and other external cause) death rate	77	166.96 (5.54)	78	116.76 (3.08)	959	210.08 (2.28)	1,114	200.57 (2.15)
Respiratory disease death rate	77	97.19 (4.08)	78	66.31 (3.30)	959	68.03 (0.82)	1,114	69.93 (0.83)
Digestive disease death rate	77	28.42 (1.46)	78	28.69 (1.55)	959	37.40 (0.37)	1,114	36.17 (0.36)
Cancer death rate	77	142.76 (4.87)	78	167.93 (5.73)	959	181.14 (1.57)	1,114	177.56 (1.47)
Doctors per capita	258	3.03 (0.06)	423	4.39 (0.14)	959	5.38 (0.22)	1,640	4.75 (0.14)
Hospital beds per capita	258	12.80 (0.18)	423	14.25 (0.12)	956	13.21 (0.09)	1,637	13.41 (0.07)
Emigration (in 1,000s)	—	—	—	—	800	38.64 (0.93)	800	38.64 (0.93)
Immigration (in 1,000s)	—	—	—	—	800	38.64 (0.99)	800	38.64 (0.99)
Privatized manufacturing employment rate	—	—	—	—	894	0.53 (0.01)	894	0.53 (0.01)
Average monthly income per capita (deflated, in rubles)	—	—	—	—	753	266.73 (5.50)	753	266.73 (5.50)
Employment per 1,000 population	—	—	71	68.09 (9.90)	888	49.04 (0.80)	959	50.45 (1.05)

Notes: Data on death rates, official alcohol sales, doctors, hospital beds, internal immigration and emigration, income, and employment are available in annual statistical yearbooks compiled by *Goskomstat* and *Rosstat*. We obtained this statistical yearbook data through East View Information Services and the Hoover Institution's "Russian/Soviet/Commonwealth of Independent States Collection" print archives with supplementation from New World Demographics (1992), Treml and Alexeev (1993), Vassin and Costello (1997), Vallin et al. (2005), and Heleniak (2006) as well as from Vladimir Shkolnikov and colleagues at the Max Planck Institute for Demographic Research. Data on employment in private manufacturing are from Brown, Earle, and Gehlbach (2009) and Earle and Gehlbach (2010); data on emigration and immigration is from Andrienko and Guriev (2004). We constructed estimates of total alcohol consumption by extending the work of Nemtsov (2000) for estimating illegal alcohol production. See online Appendices 1 and 2 for details. Crude death rate is per 1,000 population. Alcohol sales and consumption is liters per capita. Cause-specific death rates are per 100,000 population.

Notes: This panel data set contains 77 Russian oblasts, *krais* and autonomous republics. For simplicity, they refer to all of these regions as oblasts. They exclude autonomous *okrugs* from their analysis because information about them is not available for a number of years. They also exclude Chechnya and Ingushetia because of war. *Alcohol sales*. Sales data was reported in liters of pure alcohol, following Andrienko and Nemtsov (2006), by assuming each type to have the following alcohol content: vodka, 40 percent; wine, 14.4 percent; cognac, 18 percent; champagne, 22.8 percent; beer before 1995, 2.85 percent; beer between 1995 and 1999, 3.37 percent. For each oblast-year, they divide liters of pure alcohol by

population estimate, yielding rates of pure alcohol consumption per person for years 1970, 1980–1992, and 1996–2002. *Alcohol Production and Prices*. The Soviet government controlled alcohol production and set prices until price liberalization in 1992. Government production data are available for vodka covering years 1970, 1979, 1980, 1985, and 1990–2000 and for pure alcohol production covering years 1989–1992, 1994, 1995, 1997, and 1999–2000. Oblast-level alcohol prices are only available for post-transition years. Annual vodka price data covers years 1992 forward. For earlier years (1980, 1985, and 1989) the implied annual price of pure alcohol, from total sales, divided by the total quantity sold, was calculated. *Samogon Consumption*- data published in Nemtsov (2000), where the estimates of samogon consumption are derived from autopsy-based blood alcohol concentrations. From the data on alcohol blood concentration and total alcohol consumption, Nemtsov recovered implied *samogon* consumption. Bhattacharya et al. recovered underlying parametric relationships and then used these parameters to predict oblast-year *samogon* consumption. The total alcohol consumption was thus the sum of official sales and *samogon consumption* for years 1980–1992. *Other Covariates*. Oblast-year data on health care infrastructure and workforce (the number of hospitals and the number of doctors per capita) and crude birth rates using *Goskomstat* and *Rosstat* yearbooks. Data on employment rates and employment rates in private was collected from manufacturing from Brown, Earle, and Gehlbach (2009).
Source: Bhattacharya, Gathmann, and Miller (2013)

Table A2. Descriptive Statistics for Treisman's data

Variable	Definition	Sources
Death rate, working age males	male working age (16-59) deaths per 1000 working age males	Goskomstat RF, *Demograficheskiy yezhegodnik* RF, various years.
Death rate, working age females	female working age (16-54) deaths per 1000 working age females	" " "
Death rates, working age males, particular causes:	deaths per 100,000 working age males, from Russian health classifications: 1. diseases of circulatory system; 2. external causes; 3. certain infectious and parasitic diseases; 4. neoplasms.	" " "
Log vodka price	Log10 of 1 + average price of a liter of ordinary vodka, (such as Russkaya, Moskovskaya), end year in regional capital, 1992 Rs, deflated by the CPI.	Goskomstat RF, *Tseny v Rossii* 1996, pp.102-4; *Srochnoe Soobshchenie ob izmenenii tsen na prodovolstvennie tovari po sostoyaniyu na 30 dek* 1996, 1996; *Srednie tseny na prodovolstvennie tovary v dekabrya,* various years. Because of missing data, Dec 2000 = Feb 2001; Dec 2002 = Jan 2003; Dec 2003 = Jan 2004. Goskomstat RF downloads.
Log average income	Log10 of average monthly money income of the population, thousand 1992 Rs, deflated by CPI.	Goskomstat RF, *Regiony Rossii* 1999, 2006, 2007.
Log liters of vodka per avge. monthly income	Log10 of (average income divided by vodka price).	
Log retail sales of vodka	Log10 of retail sales of vodka and liquors in liters per capita	Goskomstat RF, *Torgovlia v Rossii* 1999, 2001, 2005
Log retail sales of domestic beer	Log10 of retail sales of beer in liters per capita	Goskomstat RF, *Torgovlia v Rossii* 2001, 2005, *Regiony Rossii* various years.
Log average price of domestic beer	Log10 of average price of a liter of domestic beer, end year in regional capital, 1992 Rs, deflated by the CPI.	Downloaded from Goskomstat RR web site and reports on prices.
Percent of population Muslim	Proportion of population of predominantly Muslim ethnic groups, as classified by Heleniak (2006), based on 2002 and 1989 censuses; proportion is linearly interpolated from the proportions given in the 1989 and 2002 censuses ; scaled 0-1.	Heleniak (2006),
Unemployment	Unemployment rate as percent of economically active population, from household surveys	Goskomstat RF, *Regiony Rossii*, various years.
Job turnover	sum of job gains and losses per 100 workers in large and medium enterprises	Goskomstat RF, *Rossiiskiy statisticheskiy yezhegodnik,* 1995, 1994, *Trud i Zaniatost v Rossii,* various years
Crime rate	crimes registered per 100 inhabitants	Goskomstat RR, *Regiony Rossii*, various years.
Poverty rate	Share of population with income below the minimum subsistence income (scaled 0-1).	Goskomstat RF, *Regiony Rossii 2006*, *Rossiiskiy statisticheskiy yezhegodnik*, 2000.
Inflation rate squared	squared inflation rate of CPI	Goskomstat RF, *Regiony Rossii*, various years.
Regional budget health and sports spending	regional budget health and sports spending per capita, in 1995 rubles, deflated by non-food CPI.	regional budget spending from Ministry of Finance reports on execution of regional budgets, various years, (some downloaded from budgetrf.ru), CPI non-food from *Regiony Rossii*, various years. non-food from *Regiony Rossii* various years.

Source: dataset for Treisman, Daniel. 2010. "Death and prices: The political economy of Russia's alcohol crisis." *Economics of Transition* 18 (2): 281-33

Table A3. Descriptive statistics for town-level data, 534 mid-size towns in Russian Federation, years 1991-1998

	Mean	Std. Dev.	Min	Max	N
Population	40377.67	29503.62	4000	195700	5,323
Deaths per 1,000	15.103	3.628	3.000	32.800	5,285
Average monthly wage, USD	75.720	50.316	2.123	961.404	5,121
Number of physicians per 100,000	35.214	11.260	3.000	114.000	5,035
Number of hospital beds per 10,000	142.790	57.072	3.1	632.1	5,030
Floor area in accommodation, pc	18.56	3.187	8.9	46.3	5,232
Alcohol consumption, liters pc	6.726	1.962	2.21	16.16	5,370
Alcohol price, deflated to 1991, rubles	19.845	254.858	1.619	18622.8	5,333
Mean regional alcohol consumption prior to alcohol campaign	14.417	1.145	12.135	17.448	5,370
Mean regional drop in alcohol consumption during campaign	0.191	0.043	0.090	0.339	5,370
Mean liters of vodka per average income	24.972	8.704	11.447	78.919	4,296

Source: database “Economics of Russian cities” provided by Main Interregional Center of the Processing and Dissemination of Statistical information at the Federal State Statistics Service (GMC Rosstat); annual statistical yearbooks, compiled by Goskomstat and Rosstat (1991-2006); dataset for Bhattacharya, Gathmann, and Miller (2013); dataset for Treisman, Daniel. 2010. "Death and prices: The political economy of Russia’s alcohol crisis." *Economics of Transition* 18 (2): 281-33.

Table A4. Pre-Campaign Consumption and Mortality in Russian Regions

Alcohol measure	Total alcohol consumption				Official alcohol sales			
Dependent variable	Crude death rate				Crude death rate			
Campaign year interactions								
Pre-campaign alcohol consumption × 1985	−0.199*** (0.058)	−0.144*** (0.033)	−0.226** (0.086)	−0.064 (0.044)	−0.193*** (0.056)	−0.138*** (0.032)	−0.219** (0.084)	−0.064 (0.043)
Pre-campaign alcohol consumption × 1986	−0.234*** (0.057)	−0.196*** (0.065)	−0.225*** (0.057)	−0.123** (0.061)	−0.227*** (0.056)	−0.184*** (0.062)	−0.219*** (0.055)	−0.121** (0.059)
Pre-campaign alcohol consumption × 1988	−0.306*** (0.052)	−0.241*** (0.069)	−0.322*** (0.086)	−0.150** (0.063)	−0.293*** (0.051)	−0.225*** (0.065)	−0.315*** (0.084)	−0.149** (0.061)
Pre-campaign alcohol consumption × 1989	−0.278*** (0.054)	−0.211** (0.085)	−0.292*** (0.090)	−0.119 (0.078)	−0.265*** (0.053)	−0.194** (0.080)	−0.282*** (0.088)	−0.117 (0.075)
Crisis year interactions								
Pre-campaign alcohol consumption × 1990	−0.213*** (0.055)	−0.144* (0.080)	−0.234** (0.093)	−0.060 (0.083)	−0.204*** (0.053)	−0.133* (0.076)	−0.226** (0.091)	−0.061 (0.080)
Pre-campaign alcohol consumption × 1991	−0.167** (0.072)	−0.093 (0.072)	−0.174** (0.083)	−0.027 (0.080)	−0.156** (0.071)	−0.078 (0.069)	−0.163** (0.081)	−0.025 (0.078)
Pre-campaign alcohol consumption × 1992	−0.034 (0.065)	0.047 (0.084)	−0.040 (0.075)	0.116 (0.103)	−0.032 (0.064)	0.052 (0.079)	−0.039 (0.073)	0.109 (0.098)
Pre-campaign alcohol consumption × 1993	0.131 (0.099)	0.221** (0.093)	0.123 (0.110)	0.299*** (0.106)	0.125 (0.095)	0.218** (0.087)	0.115 (0.106)	0.281*** (0.100)
Pre-campaign alcohol consumption × 1994	0.243* (0.123)	0.340*** (0.085)	0.237* (0.136)	0.425*** (0.093)	0.227* (0.118)	0.328*** (0.079)	0.220* (0.131)	0.397*** (0.087)
Pre-campaign alcohol consumption × 1995	0.324*** (0.118)	0.407*** (0.107)	0.306** (0.124)	0.496*** (0.100)	0.306*** (0.113)	0.394*** (0.100)	0.287** (0.119)	0.466*** (0.097)
Pre-campaign alcohol consumption × 1996	0.159* (0.087)	0.245** (0.103)	0.141 (0.093)	0.332*** (0.117)	0.145* (0.084)	0.236** (0.096)	0.126 (0.091)	0.307*** (0.112)
Pre-campaign alcohol consumption × 1997	0.028 (0.095)	0.116 (0.105)	0.010 (0.100)	0.203* (0.116)	0.018 (0.092)	0.113 (0.098)	−0.000 (0.097)	0.181 (0.112)
Pre-campaign alcohol consumption × 1998	0.028 (0.090)	0.119 (0.113)	0.010 (0.097)	0.204 (0.130)	0.019 (0.087)	0.117 (0.105)	0.001 (0.095)	0.183 (0.125)
Pre-campaign alcohol consumption × 1999	0.129 (0.137)	0.222* (0.121)	0.118 (0.145)	0.310** (0.127)	0.112 (0.133)	0.211* (0.113)	0.096 (0.140)	0.278** (0.122)
Pre-campaign alcohol consumption × 2000	0.156 (0.155)	0.252* (0.131)	0.148 (0.162)	0.344** (0.134)	0.138 (0.151)	0.241* (0.123)	0.125 (0.156)	0.311** (0.128)
Additional controls								
Per capita number of doctors			−0.006 (0.013)	0.006 (0.010)			−0.006 (0.013)	0.005 (0.009)
Per capita number of hospital beds			0.014 (0.073)	−0.042 (0.036)			0.012 (0.074)	−0.043 (0.036)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Oblast fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Oblast-specific time trends	No	Yes	No	Yes	No	Yes	No	Yes
Observations	1,371	1,371	1,293	1,293	1,371	1,371	1,293	1,293
R^2	0.947	0.975	0.952	0.977	0.947	0.974	0.951	0.977

Notes: Data on death rates and official alcohol sales were obtained from annual statistical yearbooks compiled by *Goskomstat* and *Rosstat* through East View Information Services and the Hoover Institution's "Russian/Soviet/Commonwealth of Independent States Collection" print archives with supplementation from New World Demographics (1992), Treml and Alexeev (1993), Vassin and Costello (1997), Vallin et al. (2005) as well as from Vladimir Shkolnikov and colleagues at the Max Planck Institute for Demographic Research; estimates of total alcohol consumption by extending the work of Nemtsov (2000) for estimating illegal alcohol production (see online Appendices 1 and 2 for details). Data sources for additional control variables available in online Appendix 1. Table cells report OLS estimates obtained from equation (1) for interactions between oblast-level mean pre-campaign alcohol consumption and campaign year dummy variables. All specifications include oblast and year fixed effects. Crude death rates are per 1,000 population. All oblast-year samples are restricted to years prior to 2000 (1970, 1978, 1980, 1985, 1986, 1988, and 1989–2000) and exclude Tuva, Dagastan Republic, Ingushitya Republic, Chechen Republic, Kabardino-Balkarskaya Republic, Karachaevo-Cherkesskaya Republic, North Osetiya-Alaniya Republic, Krasnodarskiy Krai, and Stavropolski Krai. Standard errors clustered at the oblast level shown in parentheses.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

Table A5. Drop in Total Alcohol Consumption during Campaign and Mortality

Dependent variables	Crude death rate			
	(1)	(2)	(3)	(4)
Campaign year interactions				
Drop in consumption during campaign*1985	-0.067	-0.046	-0.066	-0.024
	(-0.01)	(-0.01)	(-0.02)	(-0.01)
Drop in consumption during campaign*1986	-0.069	-0.055	-0.061	-0.036
	(-0.01)	(-0.02)	(-0.02)	(-0.02)
Drop in consumption during campaign*1988	-0.071	-0.051	-0.069	-0.03
	(-0.01)	(-0.02)	(-0.02)	(-0.02)
Drop in consumption during campaign*1989	-0.060	-0.038	-0.055	-0.015
	(-0.01)	(-0.02)	(-0.02)	(-0.02)
Crisis year interactions				
Drop in consumption during campaign*1990	-0.062	-0.035	-0.057	-0.016
	(-0.01)	(-0.02)	(-0.02)	(-0.02)
Drop in consumption during campaign*1991	-0.064	-0.038	-0.059	-0.018
	(-0.02)	(-0.02)	(-0.02)	(-0.03)
Drop in consumption during campaign*1992	-0.039	-0.01	-0.035	0.009
	(-0.02)	(-0.02)	(-0.02)	(-0.02)
Drop in consumption during campaign*1993	-0.04	-0.009	-0.035	0.011
	(-0.02)	(-0.03)	(-0.03)	(-0.03)
Drop in consumption during campaign*1994	-0.041	-0.008	-0.035	0.012
	(-0.03)	(-0.03)	(-0.03)	(-0.03)
Drop in consumption during campaign*1995	-0.011	0.021	-0.007	0.041
	(-0.03)	(-0.03)	(-0.03)	(-0.03)
Drop in consumption during campaign*1996	-0.007	0.025	-0.004	0.045
	(-0.02)	(-0.03)	(-0.02)	(-0.03)
Drop in consumption during campaign*1997	-0.022	0.011	-0.018	0.031
	(-0.02)	(-0.03)	(-0.02)	(-0.03)
Drop in consumption during campaign*1998	-0.027	0.008	-0.02	0.028
	(-0.02)	(-0.03)	(-0.02)	(-0.03)
Drop in consumption during campaign*1999	-0.019	0.016	-0.017	0.034
	(-0.03)	(-0.03)	(-0.03)	(-0.03)
Drop in consumption during campaign*2000	-0.026	0.01	-0.024	0.028
	(-0.03)	(-0.03)	(-0.03)	(-0.03)
Year fixed effects	Yes	Yes	Yes	Yes
Region-specific time trends	No	Yes	No	Yes
Region-level controls	No	No	Yes	Yes
Observations	1371	1371	1293	1293
R^2	0.939	0.968	0.943	0.971

Note: Figures for mean drop in alcohol consumption per person (in 10%) during the Anti-Alcohol campaign (1985-1989) and death rates per 1000 are taken from Bhattacharya, Gathmann, and Miller (2013). Each column represents the results from a separate OLS regression. The dependent variable is equal to crude death rate in region *i* and year *t*. Controls include region fixed effects, year fixed effects and region-specific linear trends (models 2 and 4 only). Standard errors, corrected for clustering at the region level, are shown in parentheses.
Sources: Dataset and code from Bhattacharya, Gathmann, and Miller (2013)

Table A6. Drop in Total Alcohol Consumption and Mortality, two sub-samples

Groups of regions	18 Far East regions		The rest of regions	
Dependent variable	Crude death rate			
	(1)	(2)	(3)	(4)
Campaign year interactions				
Drop in consumption during campaign*1985	-0.060	-0.008	-0.039	-0.056
	(-0.01)	(-0.01)	(-0.02)	(-0.02)
Drop in consumption during campaign *1986	-0.071	-0.013	-0.035	-0.071
	(-0.01)	(-0.01)	(-0.02)	(-0.03)
Drop in consumption during campaign *1988	-0.069	0.001	-0.032	-0.068
	(-0.01)	(-0.02)	(-0.03)	(-0.03)
Drop in consumption during campaign *1989	-0.060	0.017	-0.033	-0.072
	(-0.01)	(-0.02)	(-0.03)	(-0.03)
Crisis year interactions				
Drop in consumption during campaign *1990	-0.054	0.029	-0.041	-0.079
	(-0.01)	(-0.02)	(-0.03)	(-0.02)
Drop in consumption during campaign *1991	-0.061	0.027	-0.04	-0.083
	(-0.01)	(-0.02)	(-0.03)	(-0.04)
Drop in consumption during campaign *1992	-0.047	0.048	-0.018	-0.063
	(-0.02)	(-0.02)	(-0.03)	(-0.03)
Drop in consumption during campaign *1993	-0.047	0.054	-0.022	-0.070
	(-0.03)	(-0.03)	(-0.04)	(-0.03)
Drop in consumption during campaign *1994	-0.065	0.043	-0.012	-0.064
	(-0.03)	(-0.03)	(-0.05)	(-0.04)
Drop in consumption during campaign *1995	-0.011	0.103	-0.003	-0.061
	(-0.03)	(-0.03)	(-0.04)	(-0.04)
Drop in consumption during campaign *1996	-0.022	0.098	0.005	-0.058
	(-0.02)	(-0.02)	(-0.04)	(-0.03)
Drop in consumption during campaign *1997	-0.041	0.086	0.004	-0.063
	(-0.02)	(-0.02)	(-0.04)	(-0.04)
Drop in consumption during campaign *1998	-0.042	0.090	0.008	-0.063
	(-0.02)	(-0.03)	(-0.04)	(-0.04)
Drop in consumption during campaign *1999	-0.048	0.091	0.028	-0.048
	(-0.02)	(-0.03)	(-0.05)	(-0.04)
Drop in consumption during campaign *2000	-0.045	0.100	0.02	-0.06
	(-0.02)	(-0.03)	(-0.05)	(-0.05)
Year fixed effects	Yes	Yes	Yes	Yes

Region-specific time trends	No	Yes	No	Yes
Observations	320	320	1061	1061
Regions	18	18	62	62
R^2	0.955	0.974	0.934	0.966

Note: Figures for mean drop in alcohol consumption (in 10%) per person during the Anti-Alcohol campaign (1985-1989) and death rates per 1000 are taken from Bhattacharya, Gathmann, and Miller (2013). Each column represents the results from a separate OLS regression. Models 1 and 2 represent coefficients and standard error from a sample of 18 regions of Far East: Buryatia, Chelyabinskaya oblast, Kemerovskaya oblast, Krasnoyarskii krai, Kamchatskaya oblast, Omskaya oblast, Tomskaya oblast, Altaiiski krai, Amurskaya oblast, Chtitinskaya oblast, Irkutskaya oblast, Sakha republic, Khabarovskii krai, Magadanskaya oblast, Khakkasiya, Novosibirskaya oblast, Sakhalinskay oblast, Primorskii krai. Models 3 and 4 are for the sample of the rest of 57 Russian regions. The dependent variable is equal to crude death rate in region *i* and year *t*. Controls include region fixed effects, year fixed effects and region-specific linear trends (models 2 and 4 only). Standard errors, corrected for clustering at the region level, are shown in parentheses.

Sources: Dataset and code from Bhattacharya, Gathmann, and Miller (2013).