ANALYTICAL ESSAY

**Is there a relationship between the volume of alcohol consumption
and the level of crime in the subjects of the Russian Federation?**

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The research investigates the dependence between consumption of alcohol and crime commitment in regions of Russia. Regression is used as the method of analysis. Dependent variable is the number of crimes. Regressor is beer consumption. 21 control variables, among which 15 are socio-economic, 4 are connected with climate, 2 reflect cultural features. Model includes non-linear cross effects. The results show that there is a slightly positive influence of the regressor on the dependent variable. The effect differs for different types of urbanization.

INTRODUCTION

The connection between alcohol consumption and crime is a relevant topic for comparative social research. This issue has been studied in various countries, lots of studies examine the relationship between alcohol consumption and crime rates. Some have found that there is a strong correlation between alcohol consumption and crime. For example, a study conducted by the World Health Organization (2018) found that alcohol use was associated with higher rates of violent crime, including homicide, assault, and domestic violence. Other studies have found that alcohol use is also associated with property crime, such as theft and burglary.

However, the relationship between alcohol consumption and crime can vary depending on a number of factors, including cultural norms around drinking, availability and accessibility of alcohol, and socioeconomic factors. Therefore, a comparative study of alcohol consumption and crime across different countries and regions could provide valuable insights into the complex relationship between these two variables.

This research will investigate that connection in the context of the regions of the Russian Federation. Analyzed data is cross-section - for each variable the average was

calculated for the period from 2015 to 2019. Assessing the influence of control variables will help to correctly distribute the budget of the region in different spheres of society, which will ensure the operation of an effective program to reduce the level of crime, which, in turn, will ensure the growth of socially significant demographic and economic indicators.

LITERATURE REVIEW

In economic science, alcohol is traditionally referred to as addictive goods, the consumption of which is associated both with the possible irrationality of consumers and with various negative external effects, among which is the increase in crime. The increased likelihood of committing a crime while intoxicated may be due to the reduced ability of a person in this state to think critically. This assumption is supported by various studies.

Andrienko (Андриенко, 2001) believes that alcohol consumption and the proportion of single men have a significant short-term impact on crime. The example of this study shows the relationship of social "failure factors" - alcohol consumption, the number of single men and the level of crime. This justifies the consideration in the model of such variables as gross regional product per capita, the Gini index, the unemployment rate, and others. S.E. Panin (Панин, 2002) argues that the growth of alcohol consumption is always accompanied by an increase in crime, but does not deny the influence of other factors.

The study by Malykhina (Малыхина, 2019) introduces the concept of a background phenomenon, which in itself may not be a crime legally, but becomes a reason for committing illegal acts. Alcoholism, which is a prime example of such a background phenomenon, itself also has a number of background phenomena. These include factors of a socio-economic nature, such as: savings, working conditions, job availability, political instability and a number of cultural characteristics.

Researchers often point out that alcoholism is the main reason for the escalation of crime in the region. So G. M. Tambovtseva (Тамбовцева, 2016) argues that alcoholism, as one of the factors of the demographic and social crisis in Russia, is a national threat at the level of the individual, family, society, and the state. In the course of the work, the author studies the proportion of persons who were in a state of alcoholic intoxication in the total number of identified persons who committed crimes. Despite many reforms carried out

between 2010 and 2015, the increase in drunkenness crimes was 15%. The results of the article are the assertion that the criminal tension in the region is due to the alcoholization of the population, which in turn is a frequent cause of serious and especially serious crimes.

In the field of English-language literature, the "cost" of crimes committed while intoxicated is studied. Thus, Miller T.R. tries to estimate the costs and lost income (health care costs, property damage, public service costs, future income and standard of living) caused by crimes in this category. According to 1999 figures, 5.3 million violent crimes and 7.9 million serious property crimes were committed by persons under the influence of alcohol, with a combined "cost" of $205 billion for the United States, a significant government expense (Miller, 2006) . That is why the author comes to the conclusion that it is necessary to invest more money in programs that will prevent the escalation of crime. A 10% reduction in crime through effective programs is estimated to save approximately $5 billion.

In addition, the geographical and urban context of the area, which affects crime and alcohol consumption, is studied. Gorman D. M. in the article "Spatial dynamics of alcohol availability, neighborhood structure and violent crime" studies this issue using multivariate regression between the neighborhood structure variable and the density of alcohol sales. The density of alcohol outlets explained more unique variance than any of the area's socio-demographic variables (about 19%). The Moran's coefficient indicated that the effects associated with the density of sales of alcoholic beverages on violent crime existed without significant statistical artifacts associated with spatial autocorrelation. Thus, in areas with a high density of outlets, there were more violent crimes than in areas with a low density. In this study, the density of alcohol outlets explains almost a fifth of the variability in violent crime in the area - more than any socio-demographic variable.

METHODOLOGY

To assess the impact of alcohol consumption on the level of crime, it was necessary to find the most important variables that directly or indirectly affect the relationship under consideration. Already existing research on this topic, theory and research intuition served as a guide.

Sufficiently complete and correct data for all selected variables were found in available databases, statistical collections and other resources. In the dataset[1], the data for each subject of the Russian Federation are averaged for 2015-2019 values for each variable. Below is a list of variables used in the study, that consists of: name of the variable, description, units, data source.

DEPENDENT VARIABLE			
crimes	number of crimes per capita	crimes per person	Crimestat
REGRESSOR			
beer	annual retail sale of low-alcohol products	liters per person	UIIS
CONTROL VARIABLES			
vrp	gross regional product per capita	RUB per person	UIIS
males	proportion of men in the population of the region	%	Rosstat
gini	measure of economic inequality	index	UIIS
savings	share of savings in household income	%	Rosstat
urban	share of urban population in the region	%	UIIS
migration	number of migrants per inhabitant	migrants per capita	Rosstat
unemp	unemployment rate in the region	%	Rosstat
jan_temp	average temperature in January	℃	Gilsocmin
july_temp	average temperature in June	℃	Gilsocmin
y_rainfall	annual rainfall in the region	mm	Gilsocmin
sun	number of sunny days per year	numbers	Gilsocmin
bar	number of restaurants/bars in the region	numbers	UIIS
income	per capita income	RUB	Rosstat
poverty	proportion of the population below the poverty line	%	Rosstat
social	the share of social payments in the	%	Rosstat

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[1] Dataset is available by the link (click here)

|	income of the population		
region	identifier of the region belonging to the federal district	[1-8]*	
hdi	human development index of the region	index	Rosstat
alcoholic	number of alcoholics per capita	alcoholics per capita	UIIS
educ	number of university students per capita	students per capita	Rosstat
investig	percentage of solved crimes	%	Crimestat
religion	identifier of the predominant religion in the region	1 - Christianity 2 - Islam 3 - Buddhism	Rosstat
rural	indicator of urbanization of the region	0 - share of the urban population > 70% 1 - share of the urban population < 70%	UIIS

(*)

1 - Central Federal District
2 - Northwestern Federal District
3 - Southern Federal District
4 - North Caucasian Federal District
5 - Volga Federal District
6 - Ural Federal District
7 - Siberian Federal District
8 - Far Eastern Federal District

In the course of the reconnaissance analysis, the features of the variables and some regions were revealed. When constructing scatterplots, some groups of regions were knocked out of the general cloud. For example, when constructing a scatter plot: crimes~unemp, the regions of the North Caucasian Federal District clearly stand out from the rest - with a high level of unemployment, a noticeably smaller number of crimes are committed there. A similar picture for this FD can also be seen in other relationships involving the level of crime. Another example is the Far Eastern Federal District, the regions of this federal district have in common a noticeably high per capita number of people suffering from alcoholism, despite the fact that the level of income there is relatively high. This observation also stands out from the rest and is somewhat at odds with intuitive assumptions, although further exploratory analysis

showed that there is a positive relationship between the level of alcohol consumption and the level of income.

It is likely that the cultural characteristics of the region, in particular, religious ones, strongly influence the key regressor and the explanatory variable. Boxplots grouped by the religion variable showed that the largest per capita number of crimes is committed in regions where the majority adheres to Buddhism, but this is more likely not due to the religion itself, but to the fact that the regions traditionally identified as "Buddhist" are among the poorest. and the least developed regions of Russia.
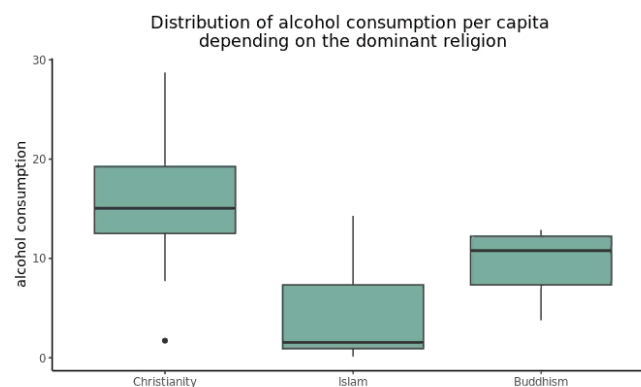

Significant is the difference between representatives of the Muslim and Christian faiths - in the regions professing Islam, less alcohol is consumed and fewer crimes are committed. This is largely due to the cultural characteristics of these regions.

When studying the distribution of the vrp variable, it was found that there are very large values in the sample. The difference between the vrp values in individual regions is significant, therefore, in the model it would be preferable to consider not an absolute change, but a relative one. To do this, the vrp logarithm will be included in the model.

Also, the marginal effect of alcohol consumption differs for regions with different degrees of urbanization. There are several reasons for this. In regions with a relatively large proportion of the rural population, the consumption of illegal alcohol (moonshine, homemade wine) is widespread, which is not taken into account in official data. Moreover, in such regions, statistics generally work worse - not all crimes are recorded, not all alcohol sold is reflected in the available data. With the growth of urbanization, the level of alcohol sales is also growing, and the culture of its consumption is also changing (in rural areas, for example,

restaurants and bars are not common). A conditional division of observations into regions with a low level of urbanization (< 70%) and a high level of urbanization (> 70%) was made. 70% is almost the median value. These groups are characterized by differences in the level of alcohol consumption, as well as in the level of crime.
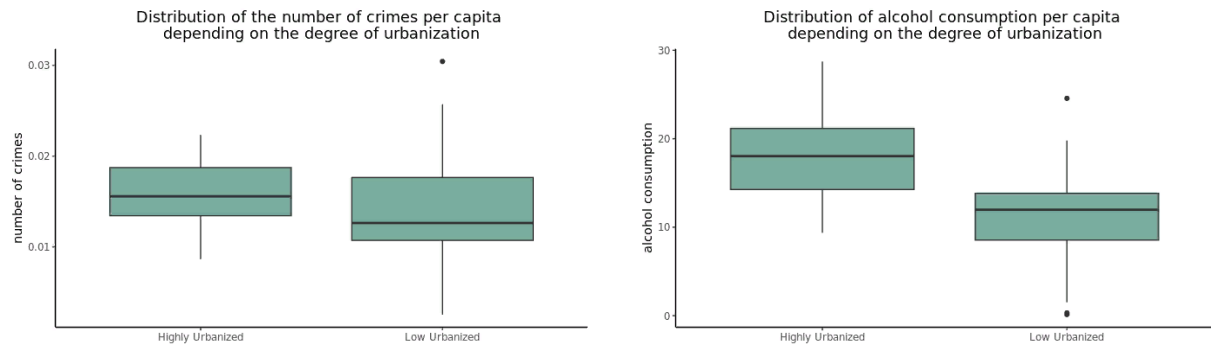

Alcohol consumption can be related to crime rates through two channels: changes in the social environment (marginalization of society, income, unemployment rate) and drunken crimes. Crimes committed while intoxicated make up a significant proportion of the total number of crimes, so this is an important direct channel for the direct influence of the level of alcohol consumption on the level of crime.

$$crimes = \beta_0 + \beta_1 * beer + \beta_2 * beer^2 + \beta_3 * urban + \beta_4 * sun + \beta_5 * unemp + \beta_6 * income + \beta_7 * poverty + \beta_8 * alcoholic + \beta_9 * log(vrp) + \beta_{10} * hdi + \beta_{11} * bar + \beta_{12} * migration + \beta_{13} * y\_rainfall + \beta_{14} * social + \beta_{15} * investig + \beta_{16} * educ + \beta_{17} * savings + \beta_{18} * gini + \beta_{19} * jantemp + \beta_{20} * julytemp + \beta_{21} * males + \beta_{22} * religion2 + \beta_{23} * religion3 + \beta_{24} * (beer : rural) + \beta_{25} * (beer^2 : rural) + u_i$$

Growth in beer consumption may be associated with the marginalization of society and other social indicators, however, beer consumption is practically not associated with crimes committed while intoxicated, so it cannot affect the variable being explained through this channel. It follows that the marginal effect of beer consumption will be lower than the marginal effect of hard alcohol consumption.

Robust standard errors were calculated taking into account the assumption of heteroscedasticity using the basic White method. The 5% significance level was chosen to determine the significance of the marginal effect. Regression results are in the Appendix.
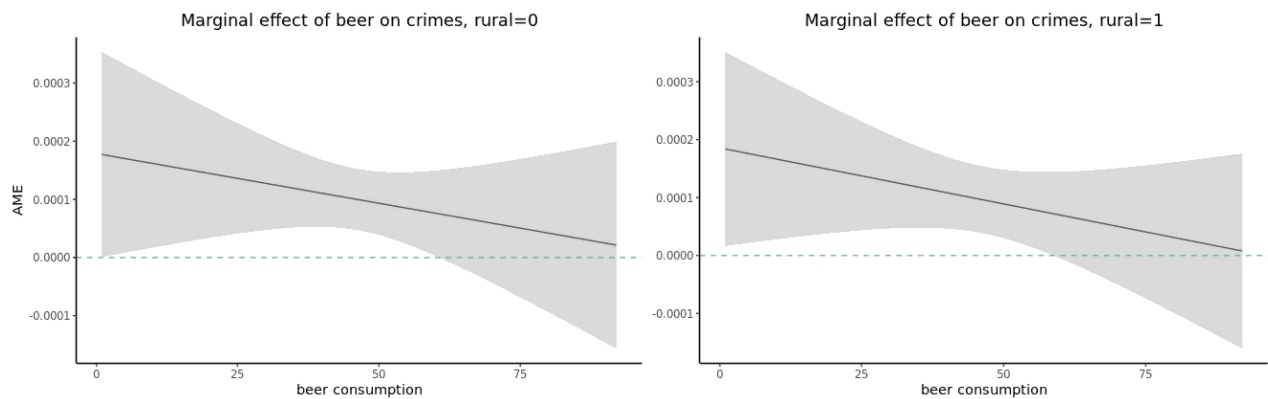
The marginal effect of beer consumption on the level of crime turned out to be significant (at beer $\in$ [1;58] for regions with low urbanization and at beer $\in$ [1;60] for regions with high urbanization), positive and decreasing. The marginal effect values are in the range [0.00018; 0.00013]. It is also worth noting that the effect is practically indistinguishable for regions with low and high urbanization. This may be due to the fact that the culture of consumption of beer and low-alcohol drinks does not differ between urban and rural areas. Beer is an affordable alcohol that does not have any illegal substitutes. Its consumption is less related to income and population structure, as well as other features of the region.

CONCLUSIONS

The relationship between the consumption of alcoholic beverages and the number of crimes in the regions was not as unambiguous as expected. For regions with a large share of the urban population, it is positive over a certain period, while for regions with a small share of the urban population, it becomes negative with an increase in consumption rates. It was found that the impact of alcohol consumption on the number of crimes of a certain category (murder, intentional infliction of harm to health, theft, rape, robbery, hooliganism) is not significant and the volume of alcohol consumption is not directly related to crimes committed while intoxicated. It was also shown that the volume of consumption of beer drinks has a

positive effect on the growth of crime, and this effect is almost the same for regions with varying degrees of urbanization.

One of the limitations of the study is that the statistics used only take into account the consumption of legal alcohol. Such statistics do not reflect the real level of consumption. For example, in the Caucasian regions, the production of homemade wine is common, and in rural areas, moonshine is used in fairly large volumes. Moreover, the data do not reflect the volume of the illegal alcohol market, which is directly related to the unfavorable social situation, and hence to the level of crime. It is possible that adding some expert estimates of the size of the illegal market to the model would make it possible to more accurately determine the effects under study.

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APPENDIX

Dependent variable: crimes

beer	0.0002
I(beer2)	-0.0000
savings	-0.0002***
males	-0.0004
urban	0.0000
gini	-0.0080
migration	0.0220
unemp	0.0010***
july_temp	-0.0010***
y_rainfall	-0.0000
sun	0.0000**
jan_temp	-0.0002**
log(vrp)	0.0075***
bar	-2.4900
income	-0.0000
poverty	-0.0000
social	0.0001
hdi	-0.0833**
alcoholic	1.2494
educ	0.0000
investig	-0.0001
religion2	-0.0011
religion3	0.0067***
beer : rural1	0.0000
I(beer2) : rural1	-0.0000