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# TO DRINK OR NOT TO DRINK: THE MICROECONOMIC ANALYSIS OF ALCOHOL CONSUMPTION IN RUSSIA IN 2006-2010

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# TO DRINK OR NOT TO DRINK: THE MICROECONOMIC ANALYSIS OF ALCOHOL CONSUMPTION IN RUSSIA IN 2006-2010[2]

The goal of this project is to investigate the influence of economic and social factors on the demand for alcohol in modern Russia. The regression models are estimated on the base of "The Russia Longitudinal Monitoring Survey (RLMS-HSE)" 1994-2011. There are three classic models of demand for alcohol (Becker & Murphy, 1988): the static, myopic and rational addiction models. We use a two-step estimation method because of the two-step consumer decision ("to drink or not to drink" and "how much to drink"). This allows us to distinguish between the factors influencing each decision separately. The contribution of this paper is to use as independent variables not only economic parameters (as prices and incomes of respondent and his\her family members) but also social characteristics such as educational level, gender, age, nationality, optimism level, alcohol use by other family members. The first results have demonstrated that some social factors (education, marital status, alcohol use by other family members) are more important than economic ones such as the price of alcohol.

JEL Classification: Z13, I12, D11, D12.
Keywords: alcohol consumption, addictive behavior, demand for alcoholic beverages.

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# 1 Introduction

As alcohol is a consumer good, its use is regulated by the same principles as the other commodities. However, alcohol, is unlike most other consumer goods: in great doses it can cause black-outs and loss of physical control; it is addictive; and long term use damages health. Consumption of consciousness changing substances and leading to dependence (in particular alcohol, cigarettes, drugs) is called "addictive behavior". The use of these types of goods damages the health of the population, which in turn, influences incomes, economic efficiency, expenses on services of public health system. "The total tangible cost of alcohol to the European Union has been estimated at €125 billion, 1,3% of the gross domestic product". [WHO (2010), P.8].

According to WHO, an annual consumption of more than eight liters of pure alcohol is hazardous for health. As official statistics show, annual sales of alcohol in Russia have grown over the last 20 years (1990-2009) by 70%, from 5,38 to 9,13 liters of pure alcohol per capita. At the same time the mortality rate due to alcohol has increased almost 4-fold: from 12,3 to 48,4 persons per 100 000. The mortality rate due to alcohol sharply jumped in 2005, then gradually decreased, but even in 2009 it remained higher than in 2004. However according to Nemtsov's (2004) estimates, figures on the mortality rate due to alcohol are underestimated, as they include only the direct influence of alcohol on death (i.e. alcoholic poisoning). Nemtsov believes that about third of all deaths in Russia are connected with alcohol abuse. Denisova (2010) found a very strong influence of smoking and excess alcohol consumption on the odds of death in Russia in 1994-2007. Treisman (2010) showed a dependence between binge drinking and mortality, and the role of low prices as a negative factor in mortality rates on a regional level.

Over the last 5 years, Russian government adopted several measures aimed at reducing alcohol consumption. Among them are restrictions on producers, advertising and sales, a minimum price on vodka, and an increase in tax rates. Rosstat data show, that the sales of alcohol and its estimated consumption decreased during the second half of 2000. But it is necessary to know whether price increases can reduce alcohol consumption in Russia even further or if it will lead to a change in the  structure of consumption (in favor of cheaper alcohol and moonshine). Hence the need to study both economic factors (such as price and income) and social factors (such as culture and the role of social interactions) in demand for alcohol. The purpose of this paper is to investigate these factors in Russia in 2006-2011 for adults over the age of 15.

## 2 Theoretical background

### 2.1 The new theory of tastes

The consumption of some goods has a "predilection" effect and their consumption increases with time. This effect is often explained by a change of tastes: the more a person listens to good music, the more he or she wishes to listen to it. In the case of the consumption of alcohol, nicotine, drugs the effect is due to the medical dependence on those substances. However economists Becker & Stigler (1977) explain such predilection without recourse to changes of taste: "The essence of our explanation lies in the accumulation of what might be termed "consumption capital" by the consumer, and we distinguish "beneficial" addiction like Marshall's good music from "harmful" addiction like heroin." [Becker & Stigler (1977), p.78]

According to their theory, "the consumer good" is pleasure (or appreciation) due to the consumption (instead of the good itself), and the amount of appreciation produced at any moment would depend on the time allocated to the consumption and the specific consumption capital.

An additional amount of such consumption capital increases the productivity of time spent on consumption. According to this point of view, the relative consumption of a given addictive good would increase at each next moment not because tastes shift in its favor, but because its shadow price (the marginal cost of adding a unit of commodity output) declines, as skill and experience in the appreciation of a given good are acquired with exposure. So the marginal utility of the time spent on consumption grows with an increase in amount of consumption capital even if tastes are unchanged.

The accumulation of consumption capital for any consumer goods can depend on the level of education and other types of human capital, and this can explain why the structure of consumption by people varies by education. Researchers focus on those habits which have strong negative social consequences: consumption of alcohol, tobacco and drugs.

As Becker & Stigler (1977) assert, addiction would increase the time spent on consumption (or the amount consumed) at younger ages, because it can be considered as an investment that increases future consumption capital. Although the shadow price tends to fall with age, and consumption tends to rise, alcohol consumption need not rise with age because the growth in "alcohol" capital means that alcohol appreciation could rise even when alcohol consumption fell.

## 2.2 Economic model of demand for alcohol

Specificity of demand for alcohol consists in an addiction effect, i.e. the dependence of present consumption on the consumption in the past. The explanation of demand for alcohol has been given in the theory of rational addiction of Becker and Murphy [Becker and Murphy (1988), Becker, Grossman, and Murphy (1994)]. The main feature of this model is that the past consumption of some goods influences their current consumption by affecting the marginal utility of current and future consumption. This model was also generalized by Cook and Moore (2000).

In this model the individual chooses to maximize lifetime utility V, which is the discounted sum of the period-specific utilities:

$$V = \sum_{t=1}^{\infty} \beta^{t-1} U^t , \qquad (1)$$

where the individual discount factor is $\beta = 1/(1+r)$; $r$ is the discount rate, and the period-specific utility function depends on health capital ($H_t$), other goods consumption ($X_t$), the consumption of alcohol ($A_t$) and the consumption of alcohol in the past ($A_{t-1}$):

$$U^t = (H_t, X_t, A_t, A_{t-1}) .$$

Income in any period can be calculated as:

$$Y_t = W_t L_t + I_t ,$$

Where $W_t$ is the current wage, $L_t$ is labor hours, $I_t$ is non-labor income.

Health in any time depends on following factors:

$$H_t = H(M_t, A_t, H_{t-1}, v_H) , \qquad (2)$$

Where $H_{t-1}$ is the preexisting health-capital stock, $M_t$ is medical care, and $v_H$ are other determinants of health.

Then if equations (1) and (2) are quadratic, and holding the marginal utility of wealth constant, the maximization of utility function subject to all constraints is the demand function:

$$A_t = \alpha_0 + \alpha_1 A_{t+1} + \alpha_2 P_{A_t} + \alpha_3 A_{t-1} + \alpha_4 W_t + \alpha_5 P_{M_t} + \alpha_6 Z_t + \varepsilon_{A_t} ,$$

Where $P_A$ and $P_M$ are the prices of alcohol and medical care, and $Z_t$ represents one or more covariates.

In the other variant of the model on demand for alcohol the consumer is "non-rational" or "myopic" [Becker, Grossman and Murphy (1994)], so the consumption depends only on the past but not on the future. The static model excludes both lagged and leaded consumption. But the model of rational addiction is a generalized case of "myopic" and static models. The curve of demand for alcohol has a classical negative inclination, i.e. consumption of alcoholic

beverages decreases with price increase. In addition alcohol consumption as a whole decreases with an increase in the price of all alcoholic beverages.

## 2.3 The sociological theories explaining alcohol consumption

There are at least two sociological explanations for people's propensity to alcohol consumption, despite its fatal consequences. The first one considers drinking as a form of deviant behavior, when the individual does not respect social norms and rules. The second approach believes that drinking is a way of changing psychological state, an escape from problems or a form relaxation.

Alcohol consumption when considered a form of deviant behavior, is under the influence of individual subculture and also of the social environment. The theory of social hoops [Hirschi (1969)] asserts that the individual is deviant by his own nature, but his abstention from deviant behavior is influenced by such factors as the respect of social norms (for example, religiousness), or participation in socially approved activity (in particular, work or study). The concept of the differentiated association [Sutherland (1924)], on the contrary, assumes that deviant behavior can be trained and promoted by the subculture encouraging it.

If alcohol consumption is a reaction to adverse social factors and to individual psychological and emotional health then personal resources could counteract it. As Peirce (1994) and his colleagues have shown, among these resources there are levels of self-respect and self-trust, and also social contacts and perceived social support. Parker and Brody (1982) have found the following factors positively influencing alcohol consumption: emotional difficulties at work; a lack of social interaction at work; the low social control.

Besides the addictive effect there is also the effect of "collective consumption" because drinking is often a social activity. The consumption of alcoholic beverages depends on the social environment as well. It can influence consumption both indirectly and directly through increased availability. In addition to influencing the decision to drink or not and how much to drink, the social environment can influence the choice of beverage.

Distinctions in the predilections of different social groups for certain kinds of beverages are analyzed within the structural approach in sociology. In particular, the studies of Thornton (1987) in Austria have shown that the consumption of hard liquor is typical for the social stratum of farmers who are connected by a close network of interaction and dialogue. Champagne consumption is typical for "professionals" who are very individualistic and connected by conventional attitudes. In Russia champagne and cognac are often drunk at the formal events as well (drunk at work or on the occasion of official holidays, for example, New Year). On the contrary, close friends are more likely to choose vodka or beer for casual socializing.

## 2.4 Results of empirical research: what factors influence consumption of alcohol?

As a rule, the majority of empirical economic research on alcohol and tobacco consumption considers the influence of such parameters as education, consumer income, and price (and the corresponding tax policy).

Empirical research confirms that the educational level of a consumer influences alcohol and tobacco consumption negatively. It has been shown that the influence of education on health is mediated by the consumption of goods which can be considered negative investments in health. There are several possible explanations for this. Grossman (1972) has shown that people with a higher level of education make more effective investments in health capital and are therefore less inclined to alcohol and tobacco use.

Within the other approach Farrell & Fuchs (1982) have shown that there is no direct influence of educational level on the consumption of alcohol and cigarettes, but both of these variables are simultaneously influenced by the factor of time preference. This explanation follows the theory of rational addiction offered in the paper of Becker & Stigler (1977) quoted above. People with a higher educational level who are disposed to invest in human capital, are characterized by a low rate of future discounting, which is why they think about the future and do not prefer current pleasure to the future harm. For this reason they are less likely to become dependent on addictive goods.

Finally, the third explanation was offered by Kenkel (1991): the influence of educational level on alcohol and tobacco consumption is because of the greater awareness of educated people about the negative consequences of such consumption. However this hypothesis has not found empirical confirmation. Indeed, it was shown that the awareness of the negative consequences of smoking negatively influences consumption of cigarettes, but the role of this mechanism is much weaker for alcohol consumption. Besides, empirical results have confirmed that a lack of knowledge about health consequences, at least, is not the only reason for addictive behavior. Thus, Kenkel comes to conclusion that the interrelation of educational level and a healthy way of life is caused more likely by personal characteristics of individuals.

Price increases are the other important factor in reducing consumption of alcohol and cigarettes. The consumption of addictive goods decreases as price increases, as was found by Clements, Yang & Zheng (1997). The same conclusion was made by Andrienko & Nemtsov (2005) for Russia in 1994-2003, including their estimates of cross price elasticity, which means that tax policy measures can be effective in the reduction of alcohol and tobacco consumption.

Alcohol is a normal good, that is, alcohol consumption (in its physical amount) increases with income growth. At the same time some researchers have shown a nonlinear form of dependence between incomes and alcohol consumption in Russia [Andrienko & Nemtsov 2005]. Demianova (2005) found that the influence of some social factors, in particular, alcohol consumption by other family members, on RLMS data in 2000. Differentiation between alcohol consumption of different groups of population (by age, gender, residence, income level, education) were presented on RLMS data for 1994-2002 by Tapilina (2006) and for 2006-2008 by Denisova (2010b). They found that gender, educational level and age are more influential than income.

## 3 Methodology of empirical research

### 3.1 Data description

"The Russia Longitudinal Monitoring Survey" (RLMS-HSE)[3] is the empirical base of this project. RLMS is a series of nationally representative surveys designed to monitor the effects of reforms on the health and economic welfare of households and individuals in the Russian Federation. It represents a number of annual surveys on the basis of a likelihood stratified multistage territorial sample developed with the assistance of experts in this area. Data have been collected 20 times since 1994. RLMS has been run jointly by the Carolina Population Center at the University of North Carolina at Chapel Hill, and the Demoscope team in Russia. Since 2006 this project was also managed and financed by National Research University Higher School of Economics, and in 2010 its name was changed to "RLMS-HSE".

This database is a panel survey representative of Russia, containing a wide range of the questions concerning different areas of household behavior: work, health, income and expenditure, education. It gives us a good informational basis for the empirical testing of the models of the economic behavior of households, including models of individual alcohol consumption. An important feature is the panel nature of the data which allows us to use lagged variables and to control for permanent unobserved individual characteristics. We also have information about other members of a family, in particular, their incomes and alcohol consumption. There is information about each family member and also about the household as a whole. The surveys were conducted annually from 1994 till 2011 (except for gap years of 1997 and 1999). In the samples of 1994-2009 there were more than 4000 households and about 12-15

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[3] "The Russia Longitudinal Monitoring Survey of NRU-HSE (RLMS-HSE)", accomplished by the National research university Higher school of economics and Joint-Stock Company "Demoscop" with the assistance of the Carolina Population Center at the University of North Carolina at Chapel Hill and Institute of Sociology of the Russian Academy of Sciences. (Sites of RLMS-HSE survey: http://www.hse.ru/rlms, http://www.cpc.unc.edu/projects/rlms)

thousand individuals, depending on the round. In 2010 the sample was expanded by 50%. Data about alcohol consumption by people over 15 are used in all further estimations. Weighted representative data are used for the estimation of alcohol use, panel data for regression analysis. A representative sample of people over 15 was made in 1994: 8478 individuals (panel sample - 8814); in 2001: 7195 (9917); in 2006: 6993 (12325), in 2011 - 14462 (18086).

## 3.2 The methodology of estimating demand for alcohol

In this paper, we follow the methodology of Becker, Grossman & Murphy (1994) subsequently developed by Labeaga (1999). Their theoretical approach is based on the model of rational addiction. In different papers, however, the myopic or static models are tested which use the same basic principles, depending on the availability of data sets. But Becker, Grossman & Murphy (1994) tested the demand for tobacco on aggregate data, using information about expenditure on tobacco. They also offered a way to estimate the model with lagged and leaded consumption using the instrumental variables (IV) of past and future tobacco prices as they are not correlated with the error term. However, this solution to the problem of endogenous regressors is not suitable for micro level analysis because individual past and future consumption depends on many parameters other than prices. The change of price and price differences between places of residences alone cannot explain the individual demand.

In addition to the problem of estimating past and future consumption (though these variables are available in panel data they are often considered to have measurement error) micro data on alcohol (and tobacco) consumption are usually censored at two levels. First, we can assume that an individual makes an initial decision on consumption, that is "to drink or nor to drink". The model on participation is usually tested with use of a probit regression. In a similar case related to women's labor supply, this equation can be used for correcting the selection bias in the model for working hours using the Heckman procedure. It is appropriate as those people who have decided to work must allocate time for work. Drinkers or smokers, however, might not be consuming, depending on the time of survey. When Labeaga (1999) analyzed the consumption of tobacco in Spain he used the variable of weekly expenditure on tobacco as a variable of interest. Due to the short period when surveys were conducted there were many observations equal to zero (due to the "infrequency of purchase"). That is why he proposed to use the Tobit model for the estimation of demand using the inverse Mills ratio for bias correction. This methodological approach is based on the idea of the double-hurdle theoretical model.

Similar methodology was used by Andrienko & Nemtsov (2005) to estimate demand for alcohol in 1994-2002 in Russia. We also believe that a two-step consumer decision (whether and how much to drink) requires a two-step model. First, we will estimate the equation of participation with a binary dependent variable (0 = abstainer and 1 = drinker). Then we will calculate the inverse Mills ratio to include it in the Tobit model. This equation is estimated for drinkers only, since the consumption of 'light drinkers" is equal to zero (as it is assumed in double-hurdle model).

### 3.3 Measuring alcohol consumption in RLMS data

The correct calculation of the percentage of alcohol abstainers in RLMS-HSE data became possible in 2006, when a new question was included in the questionnaire: "Do you consume alcoholic beverages, including beer, at least sometimes?" We will use this question to construct dummy variable for the participation equation (0 = abstainer and 1 = drinker). The next question is about consumption of different alcoholic beverages in the last 30 days. This question made it possible to separate alcohol abstainers from "light consumers", who drink alcohol but did not do it in the last 30 days and so their pure alcohol consumption is equal to zero.

In 1994-2005 there were two questions about alcohol: "Did you drink it in the last 30 days?", and "If so, how many grams did you usually consume per day". Considering the difference of the amount of alcohol in different drinks (beer - 4-6%, wine dry - 10-12%, fortified wine - 15-18%, vodka and moonshine - about 40%, alcoholic cocktails - 5-15%), it is possible to estimate approximately the daily average alcohol consumption as in Andrienko & Nemtsov (2005). We also estimate the monthly average of alcohol consumption using the question "How often have you drunk alcoholic beverages in the last 30 days?" This first method of monthly consumption is not exact because we have information about the frequency of drinking in general, but not of every beverage.

A second method became available in 2006, when the additional question about each drink was introduced: "How many days did you consume this beverage in the last 30 days?" Therefore it is possible to correct our estimates of the amount of alcohol consumed (by multiplication of day dose of each kind of beverages by the quantity of corresponding days, and then summation). We will compare the results of these two methods. The variable calculated by the second method (data from 2006-2011) will be used as the dependent variable in the model of demand for alcohol (Tobit model). The alcohol consumption of "light consumers" (who drink but did not drink in the last 30 days) is assumed to be 1 g (ln(1)=0).

## 3.4 Measuring explanatory variables

In its classic form the model of rational addiction uses only past and future consumption, prices, and income as necessary determinants of present consumption. Other influencing factors may be not important at the macro level, but the individual demand for addictive goods, including alcohol, depends also on social and demographic characteristics as was shown above. In his estimation of household demand for tobacco Labeaga (1999) and Jones & Labeaga (2003) used, in addition to income and price, such variables as family size, information about the head of the household, and regional dummies. Andrienko & Nemtsov (2005) used the log of income per capita; prices of alcohol, tobacco and sugar; gender; age and dummies for urbanization level as independent variables in their estimation of individual alcohol consumption.

We also included in our model the prices of different alcoholic beverages as independent variables. Information about prices on different alcoholic beverages in 2006-2011 on a regional level was found in Rosstat Data.[4] All prices were adjusted for inflation to 2011 levels. We also calculated the "regional price on pure alcohol" by dividing the total sales of alcoholic beverages in rubles by volume in pure alcohol.

Many variables measuring income are used. First we include the log of real family income per capita. Second, the log of personal income and third, the log of income of all other family members are used in different specifications. The quadratic dependence on income was also tested. All of these variables were also adjusted for inflation to 2011 levels.

We take the following variables as the determinants: gender, age and age squared, and dummies for residence type. All these dependent variables were used in the model of Andrienko & Nemtsov (2005) and therefore it should be possible to compare the results for different rounds of RLMS. Our general hypothesis is that besides economic factors like prices and income, alcohol consumption is greatly influenced by social characteristics, as predicted by a sociological approach. That is why we introduce into our model the following independent variables: marital status, number of children of different ages and number of adults (over 15 years old), dummies for nationality, labor force participation, educational level, smoking, satisfaction with life, anxiety about future income, self-estimation of health, and body mass index. We also use the drinking status of spouse and other family members (in the participation model), and pure alcohol consumption by all other family members because of the collective character of alcohol consumption. In our model we include the regional unemployment level as well, because we believe that an unfavorable economic or social environment can stimulate alcohol use; for the same reason we use information on infrastructure characteristics, such as whether there was

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[4] Unified interdepartmental statistical information system http://www.fedstat.ru/indicator/data.do
http://www.fedstat.ru/indicator/data.do?id=31448&referrerType=0&referrerId=1293294

some State enterprise closed in the last 12 month in the region; whether there are cafes, restaurants, a police station and parks or stadiums around the place of residence. Descriptive statistics of independent and dependent variables can be found in the table 7.

# 4 Estimates of alcohol consumption based on the RLMS-HSE data for 2006-2011

## 4.1 Estimation of reduced model of alcohol consumption[5]

We start with the results based on a model similar to that used by Andrienko & Nemtsov (2005) for RLMS data 1994-2002. Here we aim to compare their results with those obtained in the new period (2006-2011) and the dependent variable in the participation equation (drinker-abstainer) based on the direct question about alcohol use (see above). We also construct the price variable differently. "Prices on different types of drinks were calculated as average in a given site using information about household expenditures on vodka, beer, wine and other drinks and number of purchased drinks in last 7 days. Moreover, we calculated for each individual his average price on ethanol using his structure of consumption and average prices on different drinks. For respondent not reported drinking we assigned average price of ethanol in its site. Average price for two other goods, sugar and tobacco, were constructed in similar way." (Andrienko & Nemtsov, 2005)

We use the Rosstat data on regional prices for different alcoholic beverages and the "regional price of pure alcohol" (see above). All prices were adjusted for inflation to 2011 levels. We believe that Rosstat information about prices is more objective than that calculated using variables about household expenditure because it reflects not only the differentiation between region on price but also on family income. In richer regions households buy more expensive alcoholic beverages.

As Andrienko & Nemtsov (2005), we estimated the two-step model of demand for alcohol first using the probit regression for alcohol use (drinker-abstainer) and then the tobit regression including the inverse Mills ratio. The set of independent variables is similar to Andrienko & Nemtsov: income per capita, gender, age, urbanization dummies and prices of alcohol, tobacco and sugar (as the proxy for the moonshine price). For the participation equation we also use the variable for the drinking status of other family members. These results are shown in the tables 1 (prices on different beverages) and 2 (price on pure alcohol). The participation equation shows that all individual characteristics have a predictable effect. Men are more likely to drink than women. The percentage of drinkers is lower among the young and the old than

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[5] All regression estimations were made on panel data, using the "cluster" option for standard errors.

among individuals of middle age. In the villages there are fewer drinkers than in cities and small towns. Income per capita has the expected positive influence on alcohol consumption. Our results also confirmed that having relatives who use alcohol increases the likelihood of an individual being a drinker.

The effect of price on wine and tobacco was found to have a negative influence on the likelihood of alcohol use. These results differ from those obtained by Andrienko & Nemtsov (2005) but they do not contradict the theory. In the model with the calculated "regional price of pure alcohol" its influence was insignificant. But the most unexpected result is the positive effect of prices on vodka, beer and cognac on the drinking decision. Though the same effect was found by Andrienko & Nemtsov for wine prices they do not propose any explanation. But even if it is negligible for wine prices, we cannot ignore the positive influence of vodka and beer prices on decision to drink and therefore tax policies aimed at reducing alcohol use might not be effective. Two possible explanations will be discussed below.

In the static model of demand for pure alcohol, all individual parameters have a predictable effect on consumption. Prices on wine, pure alcohol and vodka influence the amount of consumed alcohol negatively accordingly to the hypothesis about the negative elasticity of demand on prices (but significance of the vodka effect is very low). Andrienko & Nemtsov (2005) only found a negative influence of prices on beer and wine, while prices on vodka, sugar and tobacco were insignificant for pure alcohol consumption. On the contrary, pure alcohol consumption depends positively on prices of sugar, cognac and fortified wine, and does not depend on beer price.

The problem of endogeneity remains, this fact leads us to the conclusion that sometimes a decrease in the prices of alcoholic beverages can be seen as a positive instrument of economic policy, aimed to improve the situation with alcoholism, because a fall in moonshine consumption diminishes the harm from alcohol use.

### 4.2 Estimation of the full participation model

The main part of our study is the estimation of the model of demand for alcohol, using the set of social variables. Here we will discuss the results of modeling the equation of participation (table 3), for the total population and for men and women separately. As it includes as an independent variable "past drinking status" (a lagged variable), the IV probit was estimated with the log of income per capita, the smoking status of the respondent, the log of regional price of the pure alcohol, and regional sales of pure alcohol in liters (all in the past period, T-1).

It was found that males, people of middle age and those who live in the regional centers are more likely to be drinkers. Our results show that income per capita is insignificant but the log of individual income influences the participation decision positively. At the same time the effect of incomes of all other family members is negative. We use here total income but not the income per capita as we control for the number of household members (adults and children separately). All these results correspond to the theoretical hypothesis.

Now we turn our attention to other variables included in the model. These are the variables about the drinking status of respondent in the past and about his\her relatives in the present. To be drinker in the past strongly increases the likelihood of being a drinker in the present. This fact also corresponds to the theory of the "myopic" consumer. If a respondent's spouse uses alcohol, it has the positive impact on the decision to be drinker, similarly the presence of other drinkers in the household. Conversely if the spouse is an abstainer this increases the likelihood of the respondent not drinking. Here is the cross influence of two variables: marital status and whether the spouse drinks. In general, married people are more likely to drink alcohol, but this is true only for those whose spouses drink.

Family structure also influences drinking behavior. There are few drinkers in large households (taking into account adults only). It is expected that baby is a good reason for women not to drink, however women from households were there are children of 1-2 years, are more likely to be drinkers than that ones from families without children. Men are less likely to drink in the families with children of 7-15 years.

The educational level is a negative factor in drinking alcohol (but in the static model without past drinking status, it is positive). Some theoretical approaches and empirical studies have shown that for some reason more educated people should be less disposed to use alcohol. The latest medical research confirmed that the moderate alcohol consumption can be even beneficial for health. This can, partly, explain why educated individuals drink. At the same time the most serious harm to the health is caused not by alcohol use per se, but depends on the amount consumed. The demand model shows that more educated people drink less. A university degree is significant only for women, and a technical school diploma only for men. Employment status in the past is also a significant factor in alcohol use. The unemployed are more likely to drink. We believe that unemployed Russian men should be more stressed than employed ones because of the stereotype that men must be the breadwinners. It could be a confirmation of the social theory that alcohol use is an escape.

As expected, ethnicity is an important factor in alcohol use. Unfortunately, we have no information about the religion of respondents; ethnicity is therefore used as a proxy. As social theory suggests, religion has a strong influence on some social actions, including alcohol

consumption therefore it is not surprisingly that Tatar men and women (most of whom are Muslim) are less likely to drink than Russians. But such dependence was not confirmed for people of the North Caucasus and the Volga region and the Russian North.

It was expected that bad health (self-assessment) and advanced age would inhibit drinking, which was confirmed for the static choice model, but in this myopic model it is insignificant. We also noted that some facts confirm the concept of alcohol use as the some sort of escape; but it is not confirmed for the variable measuring the anxiety (in the past) about future income and for life satisfaction.

Finally, we look at the price impact. In the model using the calculated price on pure alcohol no dependence was found. If we include regional prices of different beverages we found some confirmation of the economic theory, because vodka and wine prices have a negative effect, but only for women. Beer prices however have a positive effect which contradicts the theory.

We suggest at least two possible explanations. The first one appeals to the theory of supply and demand where higher prices result from increased demand. This may also explain the differences between regions and between years. Real prices on vodka and wine were decreasing and beer prices were increasing between 2006-2011 according Rosstat data. The average price of beer increased by 15%, and the average price of vodka decreased by only 5%: at the same time the regional difference in prices was much higher. For example, in 2011 the average price for one liter of vodka in Tatarstan was 208 rubles (the lowest), and in Kamchatka 415 rubles (the highest), i.e. more than twice as expensive. The same difference was found in the beer prices (minimum price 48 rubles per liter, maximum price 100 rubles). We would, therefore, expect the greater impact of regional difference in price on alcohol use.

According to the data, there is a significant correlation between prices on all alcoholic beverages, and also between prices, regional level of average income per capita and the likelihood of being a drinker. In wealthier regions the prices on all alcoholic beverages are higher as is the percentage of drinkers, but at the same time the relative price of beer in comparison to vodka is lower. That is why the influence of prices on drinking in the model is relative: for the average vodka price the influence on beer price is positive, and for the average beer price the influence of vodka price is negative. The influence of prices on the decision to drink vodka or/and beer in Russia was found by Yakovlev (2012), but it was negative. The most significant influence of prices should be not on the decision to drink, but on the volume of alcohol consumed.

During the same period the percentage of drinkers among Russians grew. This fact makes us to believe that there should be other explanatory variables influencing simultaneously the

change in prices and the growth of the number of drinkers. This result has some consequences for our research. The decision to drink and prices are not exogenous and this leads us to look for some instrumental variables for our models.

## 4.3 Estimation of the demand model

Now we will explain the results of the demand models (tables 4, 5 and 6). Table 4 shows the tobit regression estimation, including inverse Mills ratio, for the static model of alcohol consumption. We estimated the coefficients in the model for the total population (testing the influence of the log of income per capita as well as the quadrativ income specification) and for men and women separately.

As it was predicted, men drink more than women. The influence of age is quadratic as was found in the selection model. Higher education has a negative effect on the amount of the alcohol consumed but only for men. This fact conforms to the hypothesis. People who worked in the past (T-1) are less moderate consumers than the unemployed. Income per capita has the predicted positive impact but only for women. The quadratic dependence of consumption (inverse U shaped) on income was confirmed for the whole sample. As social theory predicts, there is a high correlation between the alcohol consumption of respondents and the alcohol consumption of family members. The influence of family size remains significant. Married women drink less than single ones and those who have children under 1. There is no difference between single and married men, and households with children under 3 even stimulate alcohol consumption by men. Maybe the birth of a child can be considered as stress for fathers leading to the increase of drinking. Older children (of 7-15 years) stimulate a reduction in alcohol consumption by men. Both men and women drink less in larger families (measured as the number of adults over 16).

Nationality is insignificant for the demand model (except for woman from the North Caucasus), and it means that ethnic barriers are high for the decision whether to drink but not the amount for those who decided to drink. As for the selection model, family structure is an important parameter. Health was not one of the barriers to drink, being a drinker suggests also a lack of concern about health. The negative impact of life satisfaction (in the past) on the present consumption is unsurprising because a bad emotional state is considered as a possible determinant of heavy drinking.

There is some influence of the place of residence on alcohol intake. Women in villages consume less than those in cities. Regional unemployment rate has positive influence on female consumption which also confirms the theory of escapism. If there are cafes and restaurants it has some positive influence on the consumption, we believe that these facilities make alcohol use

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more institutionalized. Our hypothesis that the presence of a stadium or a park can create an alternative way to spend the spare time was also confirmed.

The influence of the price does not confirm the economic theory. The effect of the prices of vodka and beer are insignificant (contrary to the selection model), and these two alcoholic beverages make up more than 80% of all pure alcohol consumed, so the influence of their prices should be the most important. Only the price on the fortified wine has the predicted effect but only for men; on the contrary the price on the wine under 14%, influences the consumption by women positively.

The real price of vodka and wine decreased in 2006-2011. At the same time alcohol consumption grew in 2006-2008, and then fell in 2009-2010. As for the structure of consumption, during this period the percentage and amount of pure alcohol from moonshine fell (from 53,2 to 26,4 grams monthly per drinker). It means that people changed to a higher quality of alcohol. We believe that the decreasing vodka and wine prices played a positive role in this process. The increase in sugar prices also influenced the fall of moonshine consumption, the increase in beer price influenced the decrease of its part in monthly total alcohol consumption from 129,5 to 110,6 grams of pure alcohol per drinker.

The static model also shows that alcohol consumption decreased in 2008-2011 in comparison with 2006.

But these conclusions were made only for the static model, i.e. if the effect of lagged consumption is negligible. The most important result of the economic theory is the addictive character of alcohol use, so we can expect that the influence of habits (consumer capital) should be significant. On the micro level, only the panel data give us the possibility to include the past consumption in the myopic model. As it was mentioned above the use of such a model requires instrumental variables; lagged alcohol consumption was instrumented by the lagged tobacco use (there are very high correlation between these two variables), lagged income per capita, regional price of pure alcohol and the regional level of pure alcohol sales (in liters). The influence of lagged alcohol use was significant and positive which confirms the theory of "myopic" consumption (table 5).

Some of the independent variables in this model are also significant: gender, consumption of alcohol by other family members, family size and the presence of a baby in the household. Others are significant only for women: income, age, marital status, ethnicity of North Caucasus and living in a village. Education, past employment status, life satisfaction, social infrastructure (cafes, restaurants and stadiums) are insignificant. A more contradictory result is the positive influence of Tatar ethnicity on alcohol consumption by men.

All prices on alcoholic beverages are insignificant in the myopic model for women. Men's consumption is influenced by fortified wine price negatively and by wine and beer prices positively. Vodka price is insignificant. These facts do not confirm the economic theory.

In the rational addiction model (table 6) alcohol consumption was instrumented by future tobacco consumption and regional prices on pure alcohol (T+1) and alcohol sales (in liters). Both past and future alcohol consumption has positive impact that confirms the theory of rational addiction. Alcohol use of other family members and gender, as family characteristics and nationality for women are significant, but the influence of all other variables including price is negligible.

The inverse Mills ratio is significant and negative in static models, what let us to conclude that estimation without this correction would bias the coefficients. In all regressions with lagged and lead consumption, the inverse Mills ratio is significant and positive. It means that in myopic and rational addiction models there is a positive association between the stochastic components in both the consumption and the participation model.

## 5 Conclusions

We found a significant influence of social characteristics on the decision "to drink or not to drink". Income has a predictable impact, but the role of prices is ambiguous. The significance of the variable in the selection models for men and women are similar excluding education and some family parameters.

The static model of demand for pure alcohol also demonstrates the importance of many social parameters such as gender, age, family structure, ethnicity, life satisfaction and per capita income. Some variables measuring the development of social infrastructure are also important. In the demand model the difference between the determinants of alcohol consumption for men and women is higher than in the selection model. The influence of prices on beer and vodka was insignificant.

The myopic and rational addiction models confirmed the impact of the lagged and lead consumption (therefore of consumer capital or habits). Some social parameters are significant in these models but others are not. Income influence remains positive for women only. The impact of prices in the myopic model is contradictory, and in the rational addiction model it is negligible. In all demand models and in the selection model the influence of alcohol consumption of other family member was positive.

The estimation of the demand model for heavy drinkers let us suppose that an increase in prices of alcoholic beverages would have a negative effect on the demand of moderate

consumers, but only the set of cultural measures (education, employment, health assurance, etc.) would reduce the demand of heavy drinkers.

The main conclusion of our research is that in modern Russia culture seems to be a more important factor in alcohol consumption than an increase in prices. The influence of consumer capital (i.e. addiction) also is very high so we cannot expect that any increase in prices will decrease consumption. In this case the most probable effect is a change of the structure of consumption in favor of cheaper brands of alcohol, and moonshine. To reduce the consumption of alcohol long-term measures aimed at a change of culture are needed.

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# APPENDIX[6]

## Table 1. Estimation of demand for alcohol in model without social parameters, 2006-2011

| Cross-sectional | Probit, participation, clustered reg | Tobit, consumption, drinkers only | | |
|---|---|---|---|---|
| | | M1, clustered reg | M3, IV | M4, IV |
| There are other drinkers in the family | 0,494*** | | | |
| Lagged log alcohol consumption | | | 0,889*** | 0,597*** |
| Lead log alcohol consumption | | | | 0,332*** |
| Male =1 | 0,337*** | 1,832*** | 0,366*** | 0,313*** |
| Age/10 | 0,869*** | 0,805*** | -0,281*** | -0,267** |
| Age square /100 | -0,097*** | -0,104*** | 0,020** | 0,022* |
| Moscow, S.Petersburg | -0,050 | -0,067 | -0,095 | -0,256** |
| Regional center | 0,282*** | 0,371*** | -0,014 | -0,015 |
| Other town (village is the base category) | 0,191*** | 0,358*** | 0,072* | 0,083* |
| Mills inverse ratio | | -0,771*** | -0,423*** | -0,342** |
| Log income per capita | 0,079*** | 0,168*** | 0,058*** | 0,053** |
| Log regional income per capita | 0,244*** | 0,359*** | 0,088 | 0,215** |
| Log fortified wine price | 0,067 | 0,246** | -0,084 | -0,001 |
| Log wine price | -0,437*** | -0,341** | 0,183 | 0,305* |
| Log vodka price | 0,174** | -0,341* | -0,095 | -0,109 |
| Log cognac price | 0,199*** | 0,438*** | 0,227** | 0,140 |
| Log beer price | 0,363*** | 0,051 | 0,041 | -0,511* |
| Log sugar price | 0,589*** | 2,161*** | 0,726*** | 0,144 |
| Log tobacco price | -0,299*** | -0,977*** | -0,451 | -0,128 |
| round16 | -0,036 | 0,522*** | | |
| round17 | -0,066** | 0,643*** | -0,019 | -0,076 |
| round18 | -0,167*** | 0,041 | -0,205*** | -0,164** |
| round19 | -0,277*** | -0,159** | -0,146 | -0,022 |
| round20 | -0,085 | 0,585*** | 0,051 | |
| Const | -7,632*** | -9,475*** | -3,142*** | -1,615 |
| Number of observations | 78228 | 54352 | 33507 | 20774 |
| Censored obs. | | 12377 | 7584 | 4521 |
| Uncensored obs. | | 41975 | 25923 | 16253 |
| Prob > chi$^2$ | 0,00 | 0,00 | 0,00 | 0,00 |
| Pseudo R$^2$ | 0,12 | 0,04 | - | - |
| Wald test of exogeneity Prob > chi$^2$ | | | 0,00 | 0,00 |

**Here and below:**

M1, M2 - static model

M3 - myopic model; M4 - rational addiction model

M3, M4 with IV for lagged and lead log alcohol consumption; instruments are: log income per capita (T-1) and (T+1); number of cigarettes used (T-1) and (T+1); log price on pure alcohol in the region (T-1) and (T+1); sales of pure alcohol in the region in liter (T-1) and (T+1).

The dependent variable for all probit model: abstainer = 0, drinker = 1, all simple.

The dependent variable for all tobit model is the log of monthly ethanol consumption for drinkers only. For light drinkers pure alcohol consumption is equal to 1g (log alcohol consumption = 0) .

*** - 1% significance, ** - 5%, * - 10%.

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[6] Rosstat data are taken from [Rosstat (1997-2011)]; Alcohol consumption on RLMS-HSE data are calculated for adults aged over 15 years, weighted representative data.

**Table 2. Estimation of demand for alcohol in model without social parameters, 2006-2011**

| Cross-sectional | Probit, participation, clustered reg | Tobit, consumption, drinkers only | | |
|---|---|---|---|---|
| | | M1, clustered reg | M3, IV | M4, IV |
| There are other drinkers in the family | 0,498*** | | | |
| Lagged log alcohol consumption | | | 0,880*** | 0,594*** |
| Lead log alcohol consumption | | | | 0,327*** |
| Male =1 | 0,335*** | 1,838*** | 0,381*** | 0,328*** |
| Age/10 | 0,869*** | 0,819*** | -0,278*** | -0,273** |
| Age square /100 | -0,097*** | -0,106*** | 0,020** | 0,022* |
| Moscow, S.Petersburg | -0,163*** | -0,041 | -0,049 | -0,132 |
| Regional center | 0,265*** | 0,432*** | 0,028 | 0,029 |
| Other town (village is the base category) | 0,198*** | 0,387*** | 0,100** | 0,107** |
| Mills inverse ratio | | -0,744*** | -0,439*** | -0,369** |
| Log income per capita | 0,084*** | 0,167*** | 0,052** | 0,043* |
| Log regional income per capita | 0,289*** | 0,436*** | 0,161** | 0,242** |
| Log pure alcohol price | -0,051 | -0,476** | -0,167 | -0,177 |
| Log sugar price | 0,461*** | 1,833*** | 0,789*** | 0,269 |
| Log tobacco price | -0,010 | -0,549*** | -0,409** | -0,393* |
| round16 | -0,065*** | 0,479*** | | |
| round17 | -0,116*** | 0,547*** | -0,027 | -0,076 |
| round18 | -0,232*** | -0,004 | -0,232*** | -0,160** |
| round19 | -0,323*** | -0,222*** | -0,194** | -0,071 |
| round20 | -0,212*** | 0,283** | -0,013 | |
| Const | -6,269*** | -6,144*** | -1,265 | -0,315 |
| Number of observations | 78228 | 54352 | 33507 | 20774 |
| Censored obs. | | 12377 | 7584 | 4521 |
| Uncensored obs. | | 41975 | 25923 | 16253 |
| Prob > chi$^2$ | 0,00 | 0,00 | 0,00 | 0,00 |
| Pseudo R$^2$ | 0,12 | 0,04 | - | - |
| Wald test of exogeneity Prob > chi$^2$ | | | 0,00 | 0,00 |

## Table 3. Estimation of the full participation model (IV), probit, all population, 2007-2011

| | All | All | Male | Female |
|---|---|---|---|---|
| Drinker, T-1 | 2,663*** | 2,671*** | 2,840*** | 2,549*** |
| There are other drinkers in the household | 0,193*** | 0,188*** | 0,158*** | 0,214*** |
| Spouse is drinker | 0,167*** | 0,163*** | 0,228*** | 0,151*** |
| Spouse is abstainer | -0,116*** | -0,115*** | -0,141*** | -0,089*** |
| Male =1 | 0,079*** | 0,077*** | | |
| Age/10 | -0,066*** | -0,068*** | -0,057 | -0,065** |
| Age square /100 | 0,004 | 0,005* | 0,003 | 0,004 |
| Technical school diploma | -0,022* | -0,024** | -0,042** | -0,011 |
| University diploma | -0,042*** | -0,043*** | -0,024 | -0,045*** |
| Log of individual income | 0,006*** | 0,006** | 0,004 | 0,007** |
| Log of all other family income | -0,004** | -0,004** | -0,005 | -0,004* |
| Ethnicities of North Caucasus (base cat. - Russians, Ukrainians) | 0,080* | 0,127*** | 0,133* | 0,071 |
| People of Volga and Russian North | -0,039 | -0,028 | 0,043 | -0,041 |
| Tatars | -0,069** | -0,079*** | -0,084** | -0,080** |
| Number of adults (15+) | -0,040*** | -0,037*** | -0,030*** | -0,045*** |
| Number of children under 1 year | -0,096** | -0,094** | 0,070 | -0,172*** |
| Number of children 1-2 year | 0,065*** | 0,066*** | 0,035 | 0,078*** |
| Number of children 3-6 year | 0,018 | 0,019 | -0,017 | 0,030 |
| Number of children 7-15 year | 0,021** | 0,020** | 0,033** | 0,010 |
| Employed, T-1 | -0,054*** | -0,056*** | -0,077*** | -0,049** |
| Health self-estimation, T-1 | -0,006 | -0,007 | -0,001 | -0,005 |
| Anxiety about income, T-1 | 0,006 | 0,006 | 0,011 | 0,003 |
| There are fast food in this place | -0,057*** | -0,046** | -0,105*** | -0,020 |
| Some State enterprises were closed in 12 months | 0,022 | 0,017 | 0,018 | 0,018 |
| There are police office in this place | 0,040** | 0,056*** | 0,011 | 0,076*** |
| Town non the regional center | -0,054*** | -0,039** | -0,055* | -0,035 |
| Village (Regional center is the base category) | -0,060*** | -0,030 | -0,083** | -0,008 |
| Log regional income per capita | -0,009 | -0,006 | -0,063 | 0,025 |
| Regional unemployment rate | -0,002 | -0,004 | -0,007 | -0,003 |
| Log pure alcohol price | -0,002 | | | |
| Log fortified wine price | | 0,060 | 0,014 | 0,089* |
| Log wine price | | -0,103** | -0,035 | -0,148** |
| Log vodka price | | -0,250*** | -0,155 | -0,293*** |
| Log beer price | | 0,353*** | 0,400** | 0,310*** |
| Log sugar price | 0,041 | 0,182** | 0,138 | 0,217** |
| Log tobacco price | -0,116* | -0,348*** | -0,339** | -0,350*** |
| round17 | 0,046* | 0,056** | 0,040 | 0,065** |
| round18 | 0,133*** | 0,122*** | 0,110** | 0,126*** |
| round19 | 0,117*** | 0,075** | 0,041 | 0,089* |
| round20 | 0,159*** | 0,189*** | 0,165** | 0,200*** |
| Const | -0,959*** | -0,682** | -0,760 | -0,571 |
| rho | -0,628 | -0,635 | -0,581 | -0,652 |
| Number of observations | 49486 | 49486 | 20272 | 29214 |
| Prob > chi$^2$ | 0,00 | 0,00 | 0,00 | 0,00 |
| Wald test of exogeneity (Prob > chi$^2$) | 0,00 | 0,00 | 0,00 | 0,00 |

IV for lagged alcohol consumption (yes or no) are: the log income per capita (T-1) and (T+1); smoking status of the respondent (T-1); log price on pure alcohol in the region (T-1); sales of pure alcohol in the region in liter (T-1). Dependent variable for all probit model: abstainer = 0, drinker = 1, all simple.

**Table 4. Estimation of the full demand model, tobit with inverse Mills ratio, drinkers only, static model, 2007-2011**

| | All | All | Male | Female |
|---|---|---|---|---|
| Log alcohol consumption of all other family members | 0,263*** | 0,264*** | 0,261*** | 0,287*** |
| Male =1 | 2,122*** | 2,120*** | | |
| Age/10 | 0,815*** | 0,807*** | 1,010*** | 0,647*** |
| Age square /100 | -0,101*** | -0,100*** | -0,107*** | -0,096*** |
| Technical school diploma | -0,035 | -0,031 | 0,016 | -0,054 |
| University diploma | -0,120** | -0,119** | -0,179** | -0,102 |
| Married | -0,067 | -0,064 | -0,080 | -0,262*** |
| Log income per capita | 0,117*** | | | |
| Income per capita (/ 10000) | | 0,089*** | 0,058** | 0,122*** |
| Income per capita square | | -0,0001*** | -0,001 | -0,001*** |
| Ethnicities of North Caucasus (base cat. - Russians, Ukrainians) | -0,957*** | -0,978*** | -0,392 | -3,068*** |
| People of Volga and Russian North | 0,137 | 0,136 | 0,157 | 0,107 |
| Tatars | 0,140 | 0,138 | 0,046 | 0,223 |
| Number of adults (15+) | -0,314*** | -0,311*** | -0,311*** | -0,321*** |
| Number of children under 1 year | -0,297*** | -0,304*** | 0,288*** | -0,973*** |
| Number of children 1-2 year | 0,090* | 0,085* | 0,167*** | 0,007 |
| Number of children 3-6 year | 0,040 | 0,039 | 0,039 | 0,015 |
| Number of children 7-15 year | -0,061* | -0,063* | -0,138*** | 0,000 |
| Employed, T-1 | 0,166*** | 0,169*** | 0,194*** | 0,167** |
| Health self-estimation, T-1 | 0,048 | 0,045 | 0,058 | 0,046 |
| Life satisfaction, T-1 | -0,079*** | -0,075*** | -0,095*** | -0,056** |
| There are cafes in this place | 0,227*** | 0,231*** | 0,190* | 0,301** |
| There are restaurants | 0,134* | 0,135* | 0,196** | 0,047 |
| There are parks or stadium | -0,277*** | -0,270*** | -0,215** | -0,341*** |
| Town non the regional center | -0,049 | -0,054 | 0,031 | -0,131* |
| Village (Regional center is the base category) | -0,243*** | -0,256*** | -0,008 | -0,488*** |
| Log regional income per capita | 0,154 | 0,144 | 0,086 | 0,248* |
| Regional unemployment rate | 0,015 | 0,014 | -0,010 | 0,033** |
| Log fortified wine price | -0,375*** | -0,379*** | -0,648*** | -0,132 |
| Log wine price | 0,354* | 0,347** | 0,640*** | -0,002 |
| Log vodka price | 0,185 | 0,197 | 0,124 | 0,228 |
| Log beer price | 0,000 | 0,010 | 0,433 | -0,357 |
| Log sugar price | 0,818*** | 0,816*** | 0,190 | 1,382*** |
| Log tobacco price | 0,333 | 0,312 | 0,231 | 0,466 |
| Mills inverse ratio | -0,825*** | -0,826*** | -0,825*** | -0,799*** |
| round17 | -0,036 | -0,034 | -0,093 | 0,004 |
| round18 | -0,431*** | -0,420*** | -0,220** | -0,618*** |
| round19 | -0,514*** | -0,501*** | -0,259* | -0,760*** |
| round20 | -0,462*** | -0,446*** | -0,464** | -0,482** |
| Const | -4,14*** | -4,4*** | -1,45 | -5,35*** |
| Number of observations | 34503 | 34503 | 15626 | 18877 |
| uncensored | 26789 | 26789 | 13382 | 13407 |
| Prob > chi$^2$ | 0,00 | 0,00 | 0,00 | 0,00 |
| Pseudo R$^2$ | 0,06 | 0,06 | 0,03 | 0,04 |

**Table 5.Estimation of the full demand model, tobit with inverse Mills ratio, drinkers only, myopic model IV, 2007-2011**

| | All | Male | Female |
|---|---|---|---|
| Lagged log alcohol consumption | 0,967*** | 0,946*** | 1,078*** |
| Log alcohol consumption of all other family members | 0,161*** | 0,159*** | 0,164*** |
| Male =1 | 0,602*** | | |
| Age/10 | 0,224*** | 0,105 | 0,301*** |
| Age square /100 | -0,034*** | -0,016 | -0,044*** |
| Technical school diploma | -0,014 | 0,013 | -0,025 |
| University diploma | -0,008 | 0,061 | -0,073 |
| Married | -0,119*** | -0,040 | -0,201*** |
| Income per capita (/ 10000) | 0,037*** | 0,027 | 0,041** |
| Income per capita square | 0,0001* | 0,000 | 0,000 |
| Ethnicities of North Caucasus (base cat. - Russians, Ukrainians) | -0,358** | 0,057 | -2,148*** |
| People of Volga and Russian North | 0,011 | 0,035 | 0,020 |
| Tatars | 0,194** | 0,281** | 0,077 |
| Number of adults (15+) | -0,173*** | -0,169*** | -0,174*** |
| Number of children under 1 year | -0,281*** | 0,175 | -0,732*** |
| Number of children 1-2 year | 0,276*** | 0,174*** | 0,417*** |
| Number of children 3-6 year | 0,000 | 0,057 | -0,062 |
| Number of children 7-15 year | -0,031 | -0,055* | -0,006 |
| Employed, T-1 | -0,057 | -0,030 | -0,081 |
| Health self-estimation, T-1 | 0,010 | 0,036 | -0,006 |
| Life satisfaction, T-1 | 0,003 | -0,003 | 0,012 |
| There are cafes in this place | 0,020 | 0,029 | -0,013 |
| There are restaurants | -0,026 | -0,036 | -0,053 |
| There are parks or stadium | -0,017 | 0,026 | -0,070 |
| Town non the regional center | 0,030 | 0,148*** | -0,052 |
| Village (Regional center is the base category) | -0,098* | 0,090 | -0,271*** |
| Log regional income per capita | -0,070 | -0,157 | 0,041 |
| Regional unemployment rate | -0,019** | -0,029** | -0,015 |
| Log fortified wine price | -0,070 | -0,295** | 0,151 |
| Log wine price | 0,130 | 0,464*** | -0,226 |
| Log vodka price | 0,032 | -0,110 | 0,078 |
| Log beer price | 0,160 | 0,821*** | -0,465 |
| Log sugar price | 0,635*** | 0,355 | 0,810*** |
| Log tobacco price | -0,334 | -0,410 | -0,209 |
| Mills inverse ratio | 1,373*** | 1,735*** | 1,372*** |
| round17 | -0,053 | -0,100 | -0,026 |
| round18 | -0,141** | -0,077 | -0,196** |
| round19 | -0,131 | -0,102 | -0,160 |
| round20 | 0,025 | -0,079 | 0,087 |
| Const | -2,54*** | -2,38** | -1,85* |
| Number of observations | 32482 | 14584 | 17898 |
| uncensored | 25176 | 12482 | 12694 |
| Prob > chi$^2$ | 0,00 | 0,00 | 0,00 |
| Wald test of exogeneity (Prob > chi$^2$) | 0,00 | 0,00 | 0,00 |

The dependent variable for all tobit models is the log of monthly alcohol consumption for drinkers only. For light drinkers pure alcohol consumption is equal to 1g (the log of alcohol consumption = 0). IV for lagged log alcohol consumption are: log income per capita (T-1); number of cigarettes used (T-1); log price on pure alcohol in the region (T-1); sales of pure alcohol in the region in liter (T-1).

**Table 6. Estimation of the full demand model, tobit with inverse Mills ratio, drinkers only, rational addiction model IV (two step estimation), 2007-2011**

| | All | Male | Female |
|---|---|---|---|
| Lagged log alcohol consumption | 0,562*** | 0,600*** | 0,589*** |
| Lead log alcohol consumption | 0,423*** | 0,338*** | 0,498*** |
| Log alcohol consumption of all other family members | 0,124*** | 0,119*** | 0,136*** |
| Male =1 | 0,475*** | | |
| Age/10 | 0,040 | -0,068 | 0,084 |
| Age square /100 | -0,009 | 0,007 | -0,016 |
| Technical school diploma | -0,018 | -0,028 | 0,019 |
| University diploma | 0,011 | -0,021 | 0,050 |
| Married | -0,024 | 0,078 | -0,139*** |
| Income per capita (/ 10000) | 0,030* | -0,005 | 0,052** |
| Income per capita square | 0,000 | 0,000 | 0,000 |
| Ethnicities of North Caucasus (base cat. - Russians, Ukrainians) | -0,314* | -0,009 | -1,715*** |
| People of Volga and Russian North | 0,001 | -0,068 | 0,089 |
| Tatars | 0,324*** | 0,264* | 0,367** |
| Number of adults (15+) | -0,137*** | -0,128*** | -0,148*** |
| Number of children under 1 year | -0,397*** | 0,009 | -0,865*** |
| Number of children 1-2 year | 0,144*** | 0,069 | 0,203** |
| Number of children 3-6 year | 0,037 | 0,066 | -0,007 |
| Number of children 7-15 year | -0,019 | -0,058 | 0,016 |
| Employed, T-1 | 0,029 | 0,092 | -0,037 |
| Health self-estimation, T-1 | 0,031 | 0,075* | 0,001 |
| Life satisfaction, T-1 | -0,006 | -0,017 | 0,005 |
| There are cafes in this place | -0,024 | 0,037 | -0,097 |
| There are restaurants | 0,065 | 0,107 | 0,012 |
| There are parks or stadium | -0,066 | -0,051 | -0,082 |
| Town non the regional center | 0,058 | 0,089 | 0,059 |
| Village (Regional center is the base category) | -0,016 | 0,162* | -0,154 |
| Log regional income per capita | 0,082 | 0,128 | 0,070 |
| Regional unemployment rate | 0,000 | -0,006 | 0,001 |
| Log fortified wine price | -0,002 | -0,206 | 0,164 |
| Log wine price | 0,131 | 0,332 | -0,047 |
| Log vodka price | 0,066 | -0,082 | 0,178 |
| Log beer price | -0,482* | -0,015 | -0,860** |
| Log sugar price | 0,131 | -0,315 | 0,377 |
| Log tobacco price | -0,010 | -0,027 | 0,073 |
| Mills inverse ratio | 0,802*** | 1,089*** | 0,784*** |
| round17 | -0,084 | -0,168** | -0,034 |
| round18 | -0,141* | -0,067 | -0,185* |
| round19 | -0,016 | 0,088 | -0,109 |
| Const | -0,903 | -0,306 | -1,02 |
| Number of observations | 20824 | 9160 | 11664 |
| uncensored | 16296 | 7919 | 8377 |
| Prob > chi$^2$ | 0,00 | 0,00 | 0,00 |
| Wald test of exogeneity (Prob > chi$^2$) | 0,003 | 0,009 | 0,003 |

The dependent variable for all tobit models is the log of monthly alcohol consumption for drinkers only. For light drinkers pure alcohol consumption is equal to 1g (the log alcohol consumption = 0). IV for lagged and lead log alcohol consumption; instruments are: log income per capita (T-1); number of cigarettes used (T-1) and (T+1); log price on pure alcohol in the region (T-1) and (T+1); sales of pure alcohol in the region in liter (T-1) and (T+1).

**Table 7. Variables means, by drinker status, 2007-2010.**

| | Abstainers | Light consumers | Drinker + consumer | Total |
|---|---|---|---|---|
| Drinker , T | 0,00 | 1,00 | 1,00 | 0,70 |
| Drinker , T-1 | 0,31 | 0,75 | 0,88 | 0,71 |
| There are other drinkers in the household | 0,42 | 0,47 | 0,46 | 0,45 |
| Spouse is drinker | 0,23 | 0,45 | 0,52 | 0,44 |
| Spouse is abstainer | 0,24 | 0,15 | 0,14 | 0,17 |
| Ln of pure alcohol consumption | | 0,00 | 3,90 | 3,90 |
| Lagged log alcohol consumption | 0,7 | 1,8 | 3,6 | 2,7 |
| Lead log alcohol consumption | 0,7 | 1,7 | 3,5 | 2,7 |
| Log alc. cons. of all other family members | 2,6 | 2,7 | 3,6 | 3,3 |
| Male | 0,31 | 0,30 | 0,47 | 0,42 |
| Age/10 | 4,7 | 4,5 | 4,2 | 4,4 |
| Technical school diploma | 0,33 | 0,42 | 0,44 | 0,41 |
| University diploma | 0,16 | 0,21 | 0,23 | 0,21 |
| Log income per capita | 9,0 | 9,0 | 9,1 | 9,1 |
| Income per capita (/ 10000) | 1,0 | 1,0 | 1,2 | 1,1 |
| Log of individual income | 7,5 | 8,2 | 8,4 | 8,1 |
| Log of all other family income | 7,7 | 7,9 | 8,2 | 8,0 |
| Russians, Ukrainians | 0,82 | 0,87 | 0,90 | 0,88 |
| Ethnicities of North Caucasus | 0,08 | 0,05 | 0,02 | 0,04 |
| People of Volga and Russian North | 0,03 | 0,03 | 0,03 | 0,03 |
| Tatars | 0,04 | 0,02 | 0,02 | 0,03 |
| Number of adults (15+) | 2,9 | 2,7 | 2,7 | 2,8 |
| Number of children under 1 year | 0,04 | 0,05 | 0,04 | 0,04 |
| Number of children 1-2 year | 0,10 | 0,11 | 0,12 | 0,12 |
| Number of children 3-6 year | 0,08 | 0,10 | 0,11 | 0,10 |
| Number of children 7-15 year | 0,31 | 0,31 | 0,30 | 0,31 |
| Employed, T-1 | 0,41 | 0,60 | 0,71 | 0,62 |
| Health self-estimation, T-1 | 3,1 | 3,2 | 3,2 | 3,2 |
| Anxiety about income, T-1 | 3,8 | 3,8 | 3,8 | 3,8 |
| Life satisfaction, T-1 | 3,0 | 3,0 | 3,1 | 3,1 |
| There are fast food in this place | 0,39 | 0,39 | 0,43 | 0,42 |
| Some State enterprises were closed in 12 months | 0,16 | 0,16 | 0,16 | 0,16 |
| There are police office in this place | 0,88 | 0,88 | 0,91 | 0,90 |
| There are cafes in this place | 0,82 | 0,83 | 0,87 | 0,86 |
| There are restaurants | 0,66 | 0,66 | 0,73 | 0,71 |
| There are parks or stadium | 0,84 | 0,86 | 0,89 | 0,88 |
| Town non the regional center | 0,24 | 0,24 | 0,27 | 0,26 |
| Village (Regional center is the base category) | 0,40 | 0,37 | 0,30 | 0,33 |
| Log regional income per capita | 9,7 | 9,7 | 9,8 | 9,7 |
| Regional unemployment rate | 7,3 | 7,0 | 6,7 | 6,9 |
| Log fortified wine price | 5,5 | 5,5 | 5,5 | 5,5 |
| Log wine price | 5,4 | 5,4 | 5,4 | 5,4 |
| Log vodka price | 5,5 | 5,5 | 5,5 | 5,5 |
| Log beer price | 4,0 | 4,0 | 4,0 | 4,0 |
| Log sugar price | 3,5 | 3,6 | 3,6 | 3,6 |
| Log tobacco price | 2,8 | 2,8 | 2,8 | 2,8 |
| Log pure alcohol price | 6,8 | 6,9 | 6,9 | 6,9 |

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