

# An effect of valuable skills on drinking patterns in contemporary Russia

A. S. Skorobogatov

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# Puzzle

- The established theory in the field of health economics predicts an inverse relationship between drinking and human capital
- The 'legendary' alcohol consumption in Russia and the related health problems (Baltagi, Geishecker 2006)
- Abrupt jump in alcohol use since the beginning of the transitional period (Nemtsov 2000)
- It has been playing central role in mortality crisis in Russia among working men (Leon et al. 2009; Norstrom 2011)
- According to the cross-country statistics, Russians have high educational attainments
- During the transition scope of higher education has been even widened

# The hypothesis

- The higher the value of an individual's skills, the stronger their incentive to abstain from alcohol
- The intuition behind the hypothesis is related to the opportunity cost of physical inability: as far as good physical condition is necessary for realizing valuable skills an owner of more valuable skills, other things being equal, has a stronger pecuniary incentive to support their physical ability
- Alcohol use/abuse is particularly relevant for checking the intuition owing to its immediate weakening effect on physical ability: when an individual is aware of this relationship, he/she abstains from alcohol depending on the return to their skills

## Three explanations of positive link between health behavior and education (Cowell 2006)

- *Efficiency mechanism*: productive efficiency – efficiency for a given set of inputs; allocative efficiency – efficiency at allocating inputs to the health production function. Result – health is a smooth continuous function of education.
- *Unobserved heterogeneity*: unobserved variables are correlated with both the schooling and health decisions, e.g. time preference
- *Future opportunity costs*: schooling induces to reduce unhealthy activities that might limit his earnings capacity by making him ill in the future

# Future opportunity cost of health-impairing behavior

- Opportunity cost of time (Grossman 1972; Dee 2001; Cowell 2006; Skorobogatov 2012).
- Cowell (2006): the three period model of the future opportunity cost in which "the combined effect of the future health consequences of the unhealthy behavior on being alive in period three together with the effect of education on future wages"
- Identification of the interest effect: discontinuous jumps in earnings as a result of a degree effect using discrete factor approximation (quasi maximum likelihood) estimator (Mroz 1999)
- Smoking, binge drinking, and binge drinking frequency were regressed by the interest degree variables and controls for effects implied by the alternative models -- schooling and a number of personal and other controls to separate influence of unobserved heterogeneity
- The main idea and conclusion were that people take care about their health depending on their long-term earnings perspective

# Current opportunity cost of physical inability

- Skorobogatov (2012): skills affect the drinking pattern via the currently expected earnings
- The hypothesis tested by Cowell has much in common with that tested in this paper:
  - common in research question - testing the mechanism relating human capital to health behavior
  - in interest mechanism - opportunity cost in terms of forgone earnings
  - in estimating technique - using instruments
- The main difference in interest mechanism is opportunity cost in terms of current rather than future forgone earnings. It entails difference in prediction, namely, smoking is to be much less important factor than binge drinking.
- Control for the efficiency mechanism can be accomplished through inclusion of schooling, and control of unobserved heterogeneity at some extent can be made via inclusion of a number of personal and other controls

# The inverted U-shape link between alcohol use and earnings

- Bray (2005): effect of alcohol use on the return to education and work experience. In his wage equation, Bray used three vectors related to demographics, human capital, and health status. Drinking was assumed to affect wage through health and human capital accumulation. The result was that heavy, rather than moderate, alcohol consumption adversely affects the return.
- Barrett (2002): wage premium for drinkers and wage penalty for heavy drinkers. Heaviness of drinking was measured by Barrett via amount of drink at a single sitting as it was stated to be more strongly correlated with health effects than volume consumed per a period or frequency of drinking.
- MacDonlad and Shield (2001): using several indicator variables on the base of drinking frequency also supported the inverted U-shaped link
- Srivastava (2010): frequent bingers experience reduced earnings whereas non-bingers and occasional bingers have wage premium over abstainers
- Kim and Roshin (2009): On the data of RLMS the U-shaped link was supported
- Lye and Hirschberg (2010): the alcohol-income puzzle consisting in that wage bonus was associated with moderate alcohol use while health effect related to moderate drinking was very little. It implies that there is to be some omitted variables associated both to alcohol use and human capital.
- French et al. (2011): pathways to good and poor performance are distinguished as results of moderate drinking and alcohol misuse. The latter is described via behaviors like weekly or more frequent binge drinking and alcohol dependence. In this context, employment problems are considered such as being fired or laid off from a job, being unemployed, conflict with a supervisor/co-worker.
- Peters (2009): drinking as a way of investing in social capital in the American army. His result was that officers who drank had wage bonus comparing non-drinkers
- Cawley and Ruhm (2012): the peer effects which may underlie the alcohol-performance pathways. They distinguish the three channels -- common constraints, information spillovers and 'bandwagon effect'.

# Impact of prices on drinking

- Cook and Peters (2005): for solving the paradox, they applied to exploring the link between prices and drinking. As a measure of drinking they used frequency of binge drinking, specifically 6 drinks or more on a single occasion. According to their results, prevalence of full-time work increases with alcohol prices that the authors explained via an inverse effect of alcohol use on labor supply. Hence a decrease of alcohol use due to the prices rise is to increase labor supply. Further, they revealed a positive association between alcohol prices and earnings of full-time workers which suggests an inverse effect of drinking use on not only employment but also on performance of the employed. Alcohol is treated by the authors as a normal good, and thereby positive association between its consumption and earnings can be explained by the income effect.
- Stockwell et al. (2011): agree who explored effect of minimum pricing on alcohol use
- Cawley, Ruhm (2012): there is match between their conclusion and positive income elasticity of alcohol demand supported by hundreds empirical studies

# TORA

- Becker and Murphy (1988): a rational addict allocates their budget to maximize their life-time utility given the addictive good pays depending on the stock of its past consumption
- The most interesting 'counter-intuitive' implication hereof is that long-term price elasticity is positively linked with addictiveness of a good
- In empirical models, consumption of an addictive good was regressed by its past consumption as well as past and expected prices
- Cawley and Ruhm (2012): Its elaboration in the form of 'the two-stock model' was proposed in which two stocks of past consumption were introduced into the model -- with the adjacent complementarity and substitutability
- Baltagi and Geishecker (2006): testing the hypothesis on RLMS

# Impact of economic condition on drinking

- Dee (2001): alcohol abuse is induced by economic recessions. Binge drinking is strongly countercyclical. Economic recession induces drinking among both getting unemployed and remaining employed
- Income effect is dominated by other factors, namely opportunity cost of time and psychological stress. Implicit price of binge drinking falls during recessions so that this factor prevails if binge drinking is more among unemployed than those remaining employed.
- Overall alcohol consumption and binge drinking behave differently during the recessions - the former dropped while the latter rose.

# Link between alcohol use and alcohol-related problems

- Danielsson et al. (2011): the bulk of the alcohol-related problems are accounted for by the minority of frequent heavy drinkers
- Thus, alcohol-related problems can serve appropriate proxies of alcohol abuse and/or dependence.

# Empirical studies of alcohol use in Russia

- Nemtsov (2000), Shiff et al. (2005), Pomerleau et al. (2005), Baltagi and Geishecker (2006), Kim and Roshin (2009), Kusmitch' and Roshin (2007): studies without referring to the skills or associated variables
- Denisova (2010): a trend, albeit a weak one, of the substitution of harder spirits with softer drinks for the more educated and well-paid
- Leon et al. (2009): hazardous drinking is prevalent among those with low educational attainment and poor economic positions
- Here we start with these results, examining the effect of the value of skills in terms of its pecuniary return in more detail. Unlike the well-known hypothesis, we analyze the effect of human capital on alcohol-related health behavior rather than that of health condition on earnings. At the same time, the latter hypothesis is adapted within our own hypothesis, as it suggests that, while that relationship is present, people are aware of it and accommodate it in their drinking decisions.

# Measures of valuable skills

- Log total labor earnings (LTInc)
- Professional mastership (PM)
- Their interactions:

LTInc \* higher median professional level

LTInc \* eight levels of PM starting from the second one

# Drinking measures

## Drinking pattern:

- On the streets: among men about 13% of men and among women only 3,6% answered positively this question
- At workplace: the corresponding values were 8.5% and 7.7%
- Without or before eating: 39% and 32% among men and 19% and 12% among women

## Self-reported alcohol-related problems

- At work: about 4%, for female persons it is 0.4%
- At home: 14.5% and 2.4%
- In health: in excess of 12% and slightly more than 4%
- Other problems: about 1.5% and 0.33%.

# Controls for personal characteristics

- Gender
- Age and squared age
- Marital status
- Health status
- Religious affiliation
- Respect status

# Controls for labor market conditions

- Log population size
- Average real income

## Sample statistics of drinking patterns: by gender and median log earnings (indicator)

	male		female	
	lme	hme	lme	hme
a respondent				
drinks:				
on the streets	0.132 (0.338)	0.0975 (0.297)	0.0285 (0.167)	0.0281 (0.165)
on workplace	0.113 (0.316)	0.0886* (0.284)	0.107*** (0.309)	0.136*** (0.343)
without eating	0.433*** (0.496)	0.334*** (0.472)	0.227*** (0.419)	0.130*** (0.336)
before eating	0.348*** (0.477)	0.286*** (0.452)	0.116** (0.320)	0.123*** (0.329)
alcohol-related				
problems:				
on workplace	0.0594 (0.237)	0.0266 (0.161)	0.00300 (0.0548)	0.00625 (0.0789)
at home	0.195*** (0.397)	0.0875 (0.283)	0.0270 (0.162)	0.0109 (0.104)
with health	0.132 (0.338)	0.0676** (0.251)	0.0315** (0.175)	0.0375** (0.190)
the other	0.0191 (0.137)	0.0122 (0.110)	0.00300 (0.0548)	0.00625 (0.0789)
Observations	471	903	666	640

standard deviations in parentheses; \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$

# Sample statistics of drinking patterns: by age and median log earnings (indicator)

	age<25		24<age<40		39<age<60		age>59	
	lme	hme	lme	hme	lme	hme	lme	hme
a respondent drinks:								
on the streets	0.209 (0.408)	0.239 (0.428)	0.0762 (0.266)	0.0797 (0.271)	0.0368 (0.188)	0.0260 (0.159)	0.0172 (0.131)	
on workplace	0.0798* (0.272)	0.0755 (0.265)	0.103* (0.304)	0.126*** (0.332)	0.122*** (0.327)	0.0984*** (0.298)	0.112* (0.317)	0.121 (0.329)
without eating	0.282** (0.451)	0.333* (0.473)	0.328*** (0.470)	0.262*** (0.440)	0.325*** (0.469)	0.213*** (0.410)	0.250* (0.435)	0.318* (0.469)
before eating	0.362*** (0.482)	0.453*** (0.499)	0.246** (0.432)	0.266*** (0.442)	0.164 (0.371)	0.133*** (0.340)	0.112 (0.317)	0.0909 (0.290)
alcohol-related problems:								
on workplace	0.0123 (0.110)	0.0189 (0.136)	0.0264 (0.161)	0.0207 (0.143)	0.0348 (0.183)	0.0174 (0.131)	0.00862 (0.0928)	
at home	0.0613 (0.241)	0.0503 (0.219)	0.0997 (0.300)	0.0510 (0.220)	0.116 (0.321)	0.0637* (0.244)	0.0517 (0.222)	0.0303 (0.173)
with health	0.0307 (0.173)	0.0503 (0.219)	0.0616 (0.241)	0.0606 (0.239)	0.0909 (0.288)	0.0507* (0.219)	0.0862 (0.282)	0.0606 (0.240)
the other	0.00613 (0.0783)	0.00629 (0.0793)	0.00880 (0.0935)	0.0128 (0.112)	0.0116 (0.107)	0.00868* (0.0928)	0.00862 (0.0928)	
Observations	163	159	341	627	517	691	116	66

standard deviations in parentheses; \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$

# Sample statistics of drinking patterns: by education degrees and median log earnings (indicator)

	Primary school		High school		Higher school		Postgraduate degree	
	lme	hme	lme	hme	lme	hme	lme	hme
a respondent drinks:								
on the streets	0.134 (0.341)	0.161 (0.368)	0.0635 (0.244)	0.0691 (0.254)	0.0524 (0.223)	0.0450 (0.208)		
on workplace	0.102 (0.303)	0.124 (0.331)	0.104*** (0.306)	0.0895*** (0.286)	0.136*** (0.344)	0.139*** (0.346)		
without eating	0.344*** (0.477)	0.343 (0.476)	0.324*** (0.468)	0.279*** (0.449)	0.241*** (0.429)	0.176*** (0.381)	0.167 (0.389)	
before eating	0.287 (0.454)	0.372** (0.485)	0.206*** (0.405)	0.230*** (0.421)	0.178* (0.384)	0.160*** (0.367)	0.0833 (0.289)	
alcohol-related problems:								
on workplace	0.0764 (0.267)	0.0365 (0.188)	0.0203 (0.141)	0.0170 (0.129)	0.0105 (0.102)	0.0157 (0.124)		
at home	0.197 (0.399)	0.109 (0.313)	0.0877 (0.283)	0.0623* (0.242)	0.0524 (0.223)	0.0313 (0.174)		
with health	0.146 (0.355)	0.102* (0.304)	0.0673 (0.251)	0.0532 (0.225)	0.0366 (0.188)	0.0470 (0.212)		
the other	0.0127 (0.113)	0.0146 (0.120)	0.0102 (0.100)	0.0113 (0.106)	0.00524 (0.0724)	0.00587 (0.0765)		
Observations	157	137	787	883	191	511	2	12

standard deviations in parentheses; \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$

## Sample statistics of drinking patterns: by median professional group (indicator) and median log earnings (indicator)

	lower median professional group		higher median professional group	
	lme	hme	lme	hme
a respondent drinks:				
on the streets	0.0983 (0.298)	0.103 (0.305)	0.0349 (0.184)	0.0431 (0.203)
on workplace	0.119*** (0.324)	0.118*** (0.323)	0.0977*** (0.297)	0.103*** (0.304)
without eating	0.315*** (0.465)	0.276*** (0.447)	0.307*** (0.462)	0.226*** (0.418)
before eating	0.240*** (0.428)	0.273*** (0.446)	0.170* (0.376)	0.179*** (0.384)
alcohol-related problems:				
on workplace	0.0343 (0.182)	0.0213 (0.145)	0.0163 (0.127)	0.0147 (0.121)
at home	0.103 (0.304)	0.0558 (0.230)	0.0814 (0.274)	0.0533* (0.225)
with health	0.0640 (0.245)	0.0542 (0.227)	0.0791 (0.270)	0.0544* (0.227)
the other	0.0140 (0.118)	0.00985 (0.0988)	0.00465 (0.0681)	0.0102 (0.101)
Observations	641	609	430	882

standard deviations in parentheses; \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$

# Sample statistics of alcohol use grouped by median earnings indicator and genders

- For males higher median group by earnings (hme) shows lower participation rates across all the drinking dummies
- For females higher group by earnings, conversely, shows higher participation in most cases
- only for two dummies, 3d and 6th, higher earnings female group displays tangibly less participation rate
- only in one case (2d) females displayed higher participation, namely well-paid women more often drink at workplace than men with any fortunes
- Thus, sign of the link between earnings and alcohol use is rather different for genders: a preliminary account of such a difference may be related to what is the main effect of earnings with respect to drinking. For men it may be a financial opportunity cost of drinking so that higher earnings would be consistent with higher opportunity cost of alcohol use/abuse, whereas for women income effect may be of most importance. The cause for this difference may be the fact that it is men who as a rule bear main responsibility for a family welfare so that a man takes more care about his earnings than a woman

# Alcohol use grouped by median earnings indicator and age

- In most cases age under 25 years displays more share of the positive response for various drinking variables in higher earnings group which is obviously related to the fact that they are not employed nor married
- Only the most active age between 39 and 59 displays consistent inverse link between earnings and drinking participation rate. The latter age displays also more difference between the earnings groups by problems at workplace and in health

# Alcohol use grouped by median earnings indicator and schooling

- There displays consistent drop in drinking participation along with the growth of educational attainment
- Difference in drinking problems in favor of lower earnings groups grows weaker from lower educational level to higher one

# Alcohol use grouped by median earnings indicator and professional mastership

- Drinking participation tends to fall from lower median professional level to higher one
- Earnings tend to induce drinking participation in lower professional group and once more higher one, but alcohol problems are inversely related to earnings in both groups
- Difference in drinking problems in favor of lower earnings groups grows weaker from lower professional level to higher one
- Thus, contrary to the intuition and the hypothesis to be tested in this study, the mean values in Tables 3-4, as a whole, show stronger inverse association between earnings and drinking for less educated and professional workers. It could mean that either unskilled workers are more financially induced not to abuse alcohol or drinking entails more financial losses or, at last but not least, there is some mixture of these mutual relationships.

# The prediction

The hypothesis would be supported if the earnings in the upper levels were correlated with the drinking effect dummies in a different way than they are in the lower levels. In the first case, earnings are to be a less favorable factor of the positive outcomes

- if a negative correlation is observed in both upper and lower levels, then in the upper ones it is to be stronger
- if a positive correlation is observed for both, then in the upper ones it is to be weaker
- The best result, with respect to fitting the hypothesis' prediction, would be if a negative correlation were observed in the upper levels, while a positive correlation or statistically insignificant relationship were observed in the lower levels

# Endogeneity issues

- Omitted variables: the unobserved heterogeneity of respondents which implies that some of their unobserved characteristics affect both interest regressors and dependent variables
- A measurement error: self-reported data are vulnerable to self-appraisal-related bias
- The reverse causality: an individual may form their attitude to alcohol and face its effects before making a decision about investment in human capital. If, for example, we estimate earnings' effect on alcohol use in a simple regression we will observe associations reflecting mutual impacts instead of wanted causal one-way effect.

# Order conditions of the model identification

- The exact identification makes it to be necessary to use two excluded instruments
- When dealing with a linear model imposing overidentifying restrictions makes it possible to apply Hansen  $J$  test of the validity of the whole of instruments
- For this sake, we will use three instruments

# GMM linear probability model

- Unlike nonlinear models including probit one, a linear probability model as far as it is estimated with the GMM estimator allows to use the relevance and validity tests of instruments, while not producing heteroskedasticity-related inconsistent standard errors (Baum et al. 2003)
- F statistic: testing joint significance of the coefficients on the excluded instruments as well as the standard partial R-squared and the Shea's partial R-squared
- Rule of thumb: difference between the standard partial R-squared and the Shea' partial R-squared is not to be much
- Hansen  $J$  test of overidentifying conditions: for testing the null on the orthogonality of the excluded instrument to an error term. The p-value of the test in excess of ten means failure to reject the null which allows us to consider the instruments to be valid.

# Relevance and validity of at least of one of the instruments

The reliability of the test requires relevance and validity of at least of one of the instruments

Key identifying premise is that our instruments affect a drinking pattern variable only through our endogenous variables:

- at least one of our excluded instruments, namely, regional real income is to affect the drinking pattern no other way than via individual earnings.
- the same is likely to be true for the work experience variables

# The included instruments as covariates of the excluded ones

Identification of the interest causation from the excluded instrument to drinking pattern variables via endogenous ones

- Covariates of work experience: gender and age variables, the respect status and log population size
- Covariates of the real income: log population size, schooling, health status, and religious affiliation

Important controls consciously dropped from the model:

- Smoking
- Body mass index

# Lists of the instruments

The included instruments: gender, age and squared age, schooling, marital, health, and respect statuses, and dummy for muslim religious affiliation

The excluded instruments: real regional income, work experience and squared work experience.

These excluded exogenous covariates are implied to affect the return to skills via a spectrum of both subjective and objective opportunities of employment and reward, while not being related to the error term in the second stage equations.

# The structural model

$$D_i = \mathbb{I}(D_i^* > 0)$$
$$D_i^* = \mathbf{X}_1 \boldsymbol{\alpha}_1 + \mathbf{Y} \boldsymbol{\beta} + \varepsilon$$

$$\mathbf{Y} = \mathbf{X}_1 \boldsymbol{\alpha}_{21} + \mathbf{X}_2 \boldsymbol{\alpha}_{22} + \boldsymbol{\eta} = \mathbf{X} \boldsymbol{\alpha}_2 + \boldsymbol{\eta}$$

In these equations  $D_i$  denotes our observed dependent variable, and  $D_i^*$  is a latent variable affecting the probability of the positive outcome of  $D_i$ ;  $\mathbf{X}_1$  is a  $1 \times J$  vector of exogenous covariates including an intercept;  $\mathbf{Y}$  is a  $1 \times K$  vector of the endogenous regressors;  $\varepsilon$  denotes an error term in the second stage equation and  $\varepsilon \sim N(0, 1)$  which implies the normalization of the model for the sake of its identification as a probit one;  $\mathbf{X}_2$  is a  $1 \times L$  vector of excluded instruments;  $\boldsymbol{\eta}$  is a  $1 \times K$  vector of error terms in the first stage equation for the endogenous regressors. In the previous subsection, we have described the nine included, the three excluded instruments, and the two endogenous variables so that  $J = 10$ ,  $K = 2$ , and  $L = 3$ .

# The regression of the error term

$$\varepsilon = \boldsymbol{\eta} \boldsymbol{\Sigma}_{22}^{-1} \boldsymbol{\Sigma}_{21} + e$$

$$e | \varepsilon, \boldsymbol{\eta} \sim N(0, 1 - \boldsymbol{\Sigma}_{21}^{\top} \boldsymbol{\Sigma}_{22}^{-1} \boldsymbol{\Sigma}_{21})$$

$$\text{Var}(\varepsilon, \boldsymbol{\eta}) = \begin{pmatrix} 1 & \boldsymbol{\Sigma}_{21}^{\top} \\ \boldsymbol{\Sigma}_{21} & \boldsymbol{\Sigma}_{22} \end{pmatrix}$$

# The conditional probability of the positive response

$$\begin{aligned}\mathbb{P}\{D_i = 1 | \mathbf{Y}, \mathbf{X}\} &= \Phi(w_i) \\ \mathbb{P}\{D_i = 0 | \mathbf{Y}, \mathbf{X}\} &= 1 - \Phi(w_i)\end{aligned}$$

$$w_i = \frac{\mathbf{X}_1 \boldsymbol{\alpha}_1 + Y \boldsymbol{\beta} + \eta \boldsymbol{\Sigma}_{22}^{-1} \boldsymbol{\Sigma}_{21}}{\sqrt{1 - \boldsymbol{\Sigma}_{21}^\top \boldsymbol{\Sigma}_{22}^{-1} \boldsymbol{\Sigma}_{21}}}$$

# The conditional maximum likelihood estimator

$$f(D_i, \mathbf{Y}|\mathbf{X}) \equiv f(D_i|\mathbf{Y}, \mathbf{X}) f(\mathbf{Y}|\mathbf{X}) \equiv \Phi(w_i) f(\mathbf{Y}|\mathbf{X})$$

$$f(\mathbf{Y}|\mathbf{X}) \equiv f(Y_i|Y_j, \mathbf{X}) f(Y_j|\mathbf{X}) = \frac{1}{2\pi\sqrt{|\Sigma_{22}|}} \exp\left\{-\frac{1}{2}(\mathbf{Y} - \mathbf{X}\alpha_2)\Sigma_{22}^{-1}(\mathbf{Y} - \mathbf{X}\alpha_2)^\top\right\}$$

$$L_i = \Phi^{D_i}(w_i) \{1 - \Phi(w_i)\}^{1-D_i} f(\mathbf{Y}|\mathbf{X})$$

$$\ln L = \sum_{i:D_i=1} \ln \Phi(w_i) + \sum_{i:D_i=0} \ln \{1 - \Phi(w_i)\} + \sum_{i=1}^N \ln f(\mathbf{Y}|\mathbf{X})$$

# Results for the interest regressors from simple probit regressions

	a respondent drinks				alcohol-related problems			
	on the streets	on workplace	without eating	before eating	at workplace	at home	in health	the other
log total labor earnings	-0.1740** (0.0541) [-0.0192]	-0.0368 (0.0501) [-0.0067]	-0.1209** (0.0385) [-0.0378]	-0.1497*** (0.0410) [-0.0384]	-0.1774* (0.0740) [-0.0078]	-0.2583*** (0.0500) [-0.0284]	-0.0817 (0.0504) [-0.0095]	-1.1570 (70.2409) [-0.0224]
log total labor earnings*P2	0.0100 (0.0269) [0.0011]	0.0135 (0.0287) [0.0025]	-0.0136 (0.0210) [-0.0042]	0.0355 (0.0217) [0.0091]	0.0191 (0.0400) [0.0008]	0.0232 (0.0263) [0.0025]	-0.0325 (0.0284) [-0.0038]	0.8624 (70.2407) [0.0167]
log total labor earnings*P3	0.0184 (0.0224) [0.0020]	0.0304 (0.0218) [0.0055]	0.0090 (0.0164) [0.0028]	0.0256 (0.0179) [0.0066]	0.0144 (0.0330) [0.0006]	0.0074 (0.0219) [0.0008]	-0.0065 (0.0210) [-0.0008]	0.9067 (70.2407) [0.0176]
log total labor earnings*P4	-0.0036 (0.0221) [-0.0004]	-0.0048 (0.0221) [-0.0009]	-0.0022 (0.0157) [-0.0007]	0.0326 (0.0171) [0.0084]	0.0079 (0.0316) [0.0003]	-0.0096 (0.0212) [-0.0011]	-0.0399 (0.0210) [-0.0046]	0.9033 (70.2407) [0.0175]
log total labor earnings*P5	0.0209 (0.0203) [0.0023]	0.0432* (0.0194) [0.0079]	-0.0055 (0.0146) [-0.0017]	0.0140 (0.0163) [0.0036]	0.0102 (0.0302) [0.0005]	-0.0297 (0.0207) [-0.0033]	-0.0508* (0.0199) [-0.0059]	0.8802 (70.2407) [0.0170]
log total labor earnings*P6	-0.0212 (0.0218) [-0.0023]	0.0357 (0.0196) [0.0065]	-0.0093 (0.0148) [-0.0029]	0.0101 (0.0164) [0.0026]	-0.0019 (0.0312) [-0.0001]	-0.0192 (0.0205) [-0.0021]	-0.0219 (0.0190) [-0.0025]	0.8539 (70.2407) [0.0165]
log total labor earnings*P7	-0.0105 (0.0208) [-0.0012]	0.0106 (0.0193) [0.0019]	-0.0033 (0.0141) [-0.0010]	0.0242 (0.0158) [0.0062]	-0.0103 (0.0306) [-0.0005]	-0.0104 (0.0195) [-0.0011]	-0.0373* (0.0185) [-0.0043]	0.8832 (70.2407) [0.0171]
log total labor earnings*P8	-0.0047 (0.0219) [-0.0005]	0.0091 (0.0198) [0.0017]	-0.0117 (0.0146) [-0.0036]	0.0139 (0.0164) [0.0036]	-0.0116 (0.0317) [-0.0005]	-0.0176 (0.0202) [-0.0019]	-0.0170 (0.0185) [-0.0020]	0.8930 (70.2407) [0.0173]
log total labor earnings*P9	-0.0227 (0.0264) [-0.0025]	0.0254 (0.0205) [0.0046]	-0.0208 (0.0157) [-0.0065]	-0.0028 (0.0181) [-0.0007]	0.0113 (0.0325) [0.0005]	-0.0155 (0.0216) [-0.0017]	-0.0033 (0.0193) [-0.0004]	0.9041 (70.2407) [0.0175]
Observations	2678	2675	2671	2673	3330	3324	3315	3304
Pseudo R-squared	0.1942	0.0207	0.0649	0.1214	0.1750	0.1813	0.1238	0.1669

Standard errors are in parenthesis; marginal effects are in square brackets; \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$

# Results for log total labor earnings and professional level from simple probit and simultaneous probit regressions

	a respondent drinks							
	on the streets		on workplace		without eating		before eating	
	probit	ivprobit	probit	ivprobit	probit	ivprobit	probit	ivprobit
log total labor earnings	-0.1768*** (0.0514) [-0.0196]	0.4469* (0.1826) [0.0896]	-0.0204 (0.0466) [-0.0038]	-0.0789 (0.2287) [-0.0189]	-0.1312*** (0.0368) [-0.0411]	-0.3113 (0.2107) [-0.0978]	-0.1219** (0.0388) [-0.0315]	-0.0426 (0.2212) [-0.0116]
professional level	-0.0494* (0.0237) [-0.0055]	-0.4291*** (0.0826) [-0.0860]	-0.0081 (0.0192) [-0.0015]	0.3309** (0.1257) [0.0795]	-0.0140 (0.0156) [-0.0044]	0.0749 (0.1606) [0.0235]	-0.0250 (0.0168) [-0.0065]	-0.2021 (0.1394) [-0.0553]
Observations	2576	2005	2574	2004	2571	2000	2573	2002
Pseudo R2	0.1854		0.0123		0.0607		0.1141	
Wald exogeneity test (p-value)	32.0598 0.0000		10.0823 0.0015		0.9284 0.3353		1.7345 0.1878	
Tests on instruments from GMM linear probability model								
1-st stage F-test (for log total labor earnings) (p-value)	40.8110 0.0000		40.8137 0.0000		41.4983 0.0000		40.8344 0.0000	
Adjusted R squared	0.2267		0.2267		0.2273		0.2268	
Partial R squared	0.0563		0.0563		0.0571		0.0564	
Shea's partial R squared	0.0418		0.0419		0.0427		0.0417	
1-st stage F-test (for professional level) (p-value)	9.5157 0.0000		9.5171 0.0000		9.4026 0.0000		9.4179 0.0000	
Adjusted R squared	0.2596		0.2595		0.2583		0.2590	
Partial R squared	0.0187		0.0187		0.0185		0.0185	
Shea's partial R squared	0.0139		0.0139		0.0138		0.0137	
2-nd stage J test (p-value)	0.0000027 0.9987		3.6013 0.0577		5.5261 0.0187		0.1881 0.6645	

Standard errors are in parenthesis; marginal effects are in square brackets; \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$

# Continued

	alcohol-related problems							
	at workplace		at home		in health		the other	
	probit	ivprobit	probit	ivprobit	probit	ivprobit	probit	ivprobit
log total labor earnings	-0.2008** (0.0704) [-0.0088]	-0.0350 (0.3820) [-0.0040]	-0.2773*** (0.0485) [-0.0302]	0.2266 (0.2183) [0.0413]	-0.0816 (0.0492) [-0.0095]	0.2036 (0.2246) [0.0382]	-0.2395** (0.0859) [-0.0049]	-0.2970 (0.5133) [-0.0328]
professional level	-0.0159 (0.0323) [-0.0007]	-0.3852*** (0.1124) [-0.0440]	-0.0309 (0.0214) [-0.0034]	-0.3920*** (0.0797) [-0.0714]	0.0150 (0.0206) [0.0017]	-0.3880*** (0.0770) [-0.0728]	0.0093 (0.0447) [0.0002]	-0.3956** (0.1405) [-0.0437]
Observations	3210	2443	3205	2440	3198	2434	3186	2421
Pseudo R2	0.1823		0.1829		0.1134		0.1476	
Wald exogeneity test (p-value)		11.6574 0.0006		24.4652 0.0000		26.9731 0.0000		23.1085 0.0000
Tests on instruments from GMM linear probability model								
1-st stage F-test (for log total labor earnings) (p-value)		47.7660 0.0000		47.8152 0.0000		47.0951 0.0000		48.6940 0.0000
Adjusted R squared		0.2299		0.2284		0.2298		0.2270
Partial R squared		0.0532		0.0533		0.0525		0.0543
Shea's partial R squared		0.0449		0.0449		0.0449		0.0454
1-st stage F-test (for professional level) (p-value)		12.9999 0.0000		13.0320 0.0000		12.9032 0.0000		13.1057 0.0000
Adjusted R squared		0.2595		0.2600		0.2618		0.2599
Partial R squared		0.0198		0.0199		0.0199		0.0201
Shea's partial R squared		0.0167		0.0168		0.0170		0.0168
2-nd stage J test (p-value)		0.2298 0.6317		0.0172 0.8956		0.1541 0.6946		0.0646 0.7994

Standard errors are in parenthesis; marginal effects are in square brackets; \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$

# Results for log total labor earnings and the interaction term from simple probit and simultaneous probit regressions

	a respondent drinks							
	on the streets		on workplace		without eating		before eating	
	probit	ivprobit	probit	ivprobit	probit	ivprobit	probit	ivprobit
log total labor earnings	-0.1705*** (0.0502) [-0.0189]	0.3935* (0.1688) [0.0890]	0.0035 (0.0460) [0.0007]	-0.0924 (0.2175) [-0.0230]	-0.1279*** (0.0360) [-0.0401]	-0.2829 (0.2158) [-0.0889]	-0.1377*** (0.0378) [-0.0355]	-0.0458 (0.2221) [-0.0127]
log total labor earnings*higher median prof	-0.0138 (0.0103) [-0.0015]	-0.1934*** (0.0297) [-0.0437]	-0.0151 (0.0078) [-0.0028]	0.1471** (0.0561) [0.0367]	-0.0053 (0.0064) [-0.0017]	0.0196 (0.0840) [0.0062]	-0.0009 (0.0069) [-0.0002]	-0.1079 (0.0643) [-0.0299]
Observations	2678	2080	2675	2078	2671	2074	2673	2076
Pseudo R2	0.1880		0.0129		0.0633		0.1176	
Wald exogeneity test (p-value)		47.4951 0.0000		12.4909 0.0004		0.5987 0.4391		3.1090 0.0779
Tests on instruments from GMM linear probability model								
1-st stage F-test (for log total labor earnings) (p-value)		43.7347 0.0000		44.0763 0.0000		44.5599 0.0000		43.8834 0.0000
Adjusted R squared		0.2307		0.2313		0.2314		0.2309
Partial R squared		0.0572		0.0577		0.0582		0.0575
Shea's partial R squared		0.0396		0.0396		0.0398		0.0392
1-st stage F-test (for IIS) (p-value)		7.5673 0.000		7.4928 0.0001		7.6967 0.0000		7.5550 0.0001
Adjusted R squared		0.1817		0.1810		0.1802		0.1809
Partial R squared		0.0123		0.0122		0.0125		0.0123
Shea's partial R squared		0.0085		0.0084		0.0086		0.0084
2-nd stage J test (p-value)		0.2826 0.5950		4.2930 0.0383		3.7913 0.0515		1.3142 0.2516

Standard errors are in parenthesis; marginal effects are in square brackets; \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$

# Continued

	alcohol-related problems							
	at workplace		at home		in health		the other	
	probit	ivprobit	probit	ivprobit	probit	ivprobit	probit	ivprobit
log total labor earnings	-0.1688*	-0.0796	-0.2764***	0.1991	-0.1092*	0.2184	-0.2313**	-0.1830
	(0.0677)	(0.3761)	(0.0465)	(0.2007)	(0.0471)	(0.2026)	(0.0848)	(0.4721)
	[-0.0075]	[-0.0115]	[-0.0305]	[0.0428]	[-0.0128]	[0.0476]	[-0.0046]	[-0.0276]
log total labor earnings*higher median prof	-0.0121	-0.1775***	-0.0010	-0.1804***	0.0061	-0.1789***	0.0122	-0.1763***
	(0.0135)	(0.0474)	(0.0091)	(0.0287)	(0.0087)	(0.0292)	(0.0191)	(0.0518)
	[-0.0005]	[-0.0256]	[-0.0001]	[-0.0388]	[0.0007]	[-0.0390]	[0.0002]	[-0.0266]
Observations	3330	2533	3324	2529	3315	2521	3304	2509
Pseudo R2	0.1724		0.1768		0.1141		0.1454	
Wald exogeneity test		16.5697		42.6704		42.8582		42.1210
(p-value)		0.0000		0.0000		0.0000		0.0000
Tests on instruments from								
GMM linear probability model								
1-st stage F-test (for log total labor earnings)		51.4848		51.3977		50.2515		52.2444
(p-value)		0.0000		0.0000		0.0000		0.0000
Adjusted R squared		0.2326		0.2323		0.2324		0.2309
Partial R squared		0.0542		0.0542		0.0531		0.0552
Shea's partial R squared		0.0397		0.0396		0.0395		0.0405
1-st stage F-test (for IIS)		10.7079		10.7475		10.4573		10.8972
(p-value)		0.0000		0.0000		0.0000		0.0000
Adjusted R squared		0.1837		0.1847		0.1864		0.1852
Partial R squared		0.0137		0.0138		0.0135		0.0139
Shea's partial R squared		0.0100		0.0101		0.0101		0.0102
2-nd stage J test		0.5951		0.0783		0.4992		0.1495
(p-value)		0.4404		0.7796		0.4799		0.6990

Standard errors are in parenthesis; marginal effects are in square brackets; \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$

# Summary of the results from the simple probit equations

- Amongst the eight equations for various drinking dependent variables five ones, 1st, 3d, 4th, 5th, and 6th, display significant negative associations between log total earnings and a drinking pattern.
- As for the interaction variables, a weak insignificant tendency is displayed for the higher professional level variables to have negative correlation with a drinking pattern comparing with those for lower professional levels. However, they fail to display a monotonous inverse trend across all the professional levels.
- Dummy for alcohol intake on workplace tends to display a positive associations with the interest measures across the professional levels among which the fifth and the sixth display p-values under 0.1.
- Pseudo R-squared in this equation is the smallest among the equations which implies that drinking at workplace depends on earnings across all the professional levels and the specified range of the controls much less than the other drinking pattern variables.
- Sample size is consistently more in case of the alcohol effects variables than those for drinking circumstances. And excluding the first equation the same holds for pseudo R-squared.
- Except for the second equation, and in Table 6 the seventh too, all the equations display significant negative associations between log total labor earnings and a drinking pattern
- The other interest variable --- professional level in Table 6 and the interaction term for log total labor earnings of higher median group by professional level in Table 6 --- except for the first equation in Table 6 do not display any significant link with drinking variables.

# Summary of the results from the simultaneous probit equations

- Log total labor earnings: in all cases where it is admissible to have simultaneous probit estimates as consistent ones they are either positive (1st) or insignificant (2d, 5-8th), while a regular probit tends to give more significant and more intensively inversed associations between earnings and drinking pattern
- Professional level: except for the second equation, in all cases where we can safely have simultaneous probit estimates as consistent ones they display significant and more intense inverse links between professional level and drinking patterns comparing with a simple probit
- The interaction term: all the equations show insignificant results for the earnings variable. The interaction term behaves generally the same way as the professional level variable does

# The results of testing the instruments

Wald tests of exogeneity: in two cases the test strongly rejects the null of endogeneity

GMM linear probability model

- in all cases p-values of F statistic are under 0.001
- The values of F statistics and thereby partial R-squareds for the earnings variable are as a whole 3-4 times exceed those for the skills variable
- The adjusted R-squareds are higher for the latter
- The Shea's partial R-squareds are expectedly less than the standard partial one, and the difference between them tends to be the same for both earnings and skills variables
- Hansen J tests display p-values under 0.1 for the second equation and the third one

# Discussion of relevance and validity of instruments

- F statistic: p-values  $< 0.001$ ; the threshold value of 10
- R-squareds: not much difference between the standard and the Shea's partial R-squareds
- J test: in two cases rejects the null of validity of the instruments

The general conclusions:

- estimates obtained via the instrumental probit regressions are consistent and unbiased
- lack of significant link between log total labor earnings and any drinking variables
- the skills variables have significantly inversely affect probabilities of drinking on the streets and of all the alcohol-related problems
- probability of drinking on workplace, is positively affected by the skills variables

# Discussion of the results for the earnings variable

## Complex nature of earnings effect

- earnings induce demand for alcohol given the latter is a normal good
- higher earnings are consistent with more opportunity cost of drinking
- control for professional level so that this effect is for earnings unrelated to professional level, e.g. for people working not by their specialty, common labor, rent-takers etc.

## Inconsistent estimates from the simple probit are significantly inverse

- the reverse effect of alcohol abuse on earnings
- as far as this effect is inverse one the inconsistent estimates containing the two bilateral effects are to be inverse ones.

# Discussion of the results for the skills variable

- Whereas unskilled workers do not respond to their earnings change as to their involvement in alcohol abuse skilled workers do respond, namely, their probability of alcohol abuse drops when their earnings rise
- Such an inverse effect of the skilled variables can be explained by the opportunity cost of leisure
- Positive effect of the skills variables on dummy for drinking at workplace can be explained by the widespread in Russia corporate culture assuming mini-parties on workplace at the end of or after working day
- That the effect of earnings on the drinking variables do not depend on the professional mastery according to the inconsistent estimates and that this effect do depend on the skills variables according to consistent estimates can be explained by measurement error

# The reverse causality bias

- It is to display in estimates of effects of both earnings and professional level, in the former case this bias is to be much more than that in the latter case, since a time span for the revealing the reverse effect is much shorter
- A hard-drinking person may immediately face their earnings fall, but it is not the case as to their professional level

# Implications for economics and practice

- The main finding: persistent inverse casual pathways of skilled workers' earnings on the measures of their drinking patterns
- Time opportunity cost approach: higher earnings are related to more or harder work for unskilled workers, while not being related to higher hour wage, and skilled workers do face higher hour wage; so, the same rise in earnings may involve higher opportunity cost of leisure for skilled workers, while not involving the same for unskilled ones
- Economics of transition: the total structural transformation in Russia has resulted in loss of jobs by skilled workers and made them work not by their specialty. So, their knowledge and work experience have become useless with as regard to their job responsibilities and hour wages
- Policy implication: human potential and its realization may be a major force of, not only. economic growth but also, temperance of people with respect to alcohol and other drugs

Thank you!

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