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Economic and sociological research that touches upon the determinants of alcohol consumption is mostly centered on the traditional factors of human capital (e.g., education). While much attention is given to education as a valid instrument to reduce alcohol misuse, less is given to the impact of non-cognitive skills. Data are collected from a nationally representative Russian panel survey, 2016–2018. We estimate a random-effects probit model for the probability of abstinence and a random-effects tobit model with a Heckman correction for the volume of alcohol consumption. Non-cognitive skills are consistent predictors of drinking in Russia. In both genders, conscientiousness and extraversion have strong connections to the probability and the volume of alcohol consumption, while openness to experience and neuroticism only affect the volume. The estimates for education differ substantially when the Big Five variables are excluded from the model, which suggests that a major part of the effect of education on alcohol consumption patterns may be mediated through non-cognitive skills. Although educational interventions are often seen as a method of solving excessive drinking problems, introducing personality traits into the analysis raises the question of the effectiveness of such interventions.

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Introduction

There is a growing body of literature studying the importance of non-cognitive skills, also referred to as personality traits, in predicting social outcomes (Heckman et al., 2006). Although the relationship between personality and drinking patterns has been extensively studied in psychology, research in other social sciences has generally explained alcohol consumption with social factors and has claimed the existence of a negative correlation between alcohol abuse and education (Droomers et al., 1999; Cutler and Lleras-Muney, 2010; Conti and Hansman, 2013). However, bringing non-cognitive skills into the analysis complicates the problem since they represent a combination of parental investment, the social environment, and genetic predisposition, which might all contribute to shaping individual socio-economic status and educational choices.

To address non-cognitive skills, the existing research generally relies on the Big Five model, which is an effective framework for identifying and structuring personality attributes. The model consists of conscientiousness, extraversion, neuroticism, agreeableness, and openness to experience (John and Srivastava, 1999). Since conscientiousness implies following social norms and demonstrating effective self-control, being high in conscientiousness is often negatively correlated with different types of risky and unhealthy behaviors, such as avoiding physical activity, following an unhealthy diet, or having various addictions (Meyer et al., 2001; Bogg and Roberts, 2004). The overall protective effect of conscientiousness on health is three times higher than that of other social and economic factors (Roberts et al., 2007). In contrast to conscientiousness, extraversion increases the chances of developing alcohol-related problems (Erevik et al., 2017) as drinking is often perceived as an element of social interaction (Flory et al., 2002; Wicki et al., 2010). Finally, neuroticism is frequently related to different types of psychopathologies, including depression and anxiety. It is also associated with alcohol misuse (Hampson and Friedman, 2008; Adan et al., 2017). The evidence on the relation between alcohol consumption and the rest of the Big Five categories remains disputed.

Russia is a particularly interesting setting to study the relationship between personality traits and alcohol consumption. First, Russia is known for high levels of alcohol consumption and northern drinking patterns (Nemtsov et al., 2011). Although Russia has been moving away from previous drinking levels (Radaev and Roshchina, 2019; Radaev et al., 2020), risky episodic drinking remains a widespread problem (WHO, 2019). Second, problem-drinking among parents has negative effects on children, including lower educational attainment and the development of drinking problems (Mangiavacchi, Piccoli, 2018). Since non-cognitive skills are closely linked to genetics and the social environment during the early stages of childhood, they can serve as a mediator for the process of inheriting alcohol addiction. Finally, non-cognitive skills remain

responsive to external influence until early adulthood. Since the negative consequences of alcohol consumption might differ between personality types, providing insight into the relation between alcohol consumption, education, and non-cognitive skills can be useful for correcting the focus of alcohol-related policy.

Though non-cognitive skills are relatively stable across individuals (Roberts, DelVecchio, 2000), they can still change over time which might consequently create the problem of reversed causality. Evidence suggests that alcohol can be related to changes in personality traits at least in late adolescents, though the question whether such changes occur in adults remains open (Roberts et al., 2006). Although alcohol has a disruptive effect on the brain region which is responsible for behavioral control (Oscar-Berman, Marinković, 2007; Ruan et al., 2019), personality changes measured by the Big Five appear to be less affected (Allen et al., 2015). Much of the empirical literature dedicated to the link between non-cognitive skills and alcohol consumption is based on small samples without sufficient controls for other socio-economic characteristics and lacks any discussion of causality. In contrast, this paper is based on data collected from an annual nationally representative panel survey. Since alcohol is addictive, the current consumption of alcohol depends on the previous history of drinking, making it necessary to control for previous periods of consumption. The use of panel estimators addresses this need and helps to reduce biases possibly arising from purely cross-sectional estimates. Adopting the Five Factor model, we explore the effect of non-cognitive skills on the probability and the volume of alcohol consumption in Russia by combining the existing psychological evidence with other socially important factors.

Methods
Data and sample

For the empirical investigation, we use 2016–2018 data from the Russian panel household survey RLMS-HSE, in which each member of the household is interviewed. The survey uses multistage probability sampling with primary sampling units selected from geographically determined strata, making it nationally representative. The dataset contains detailed information about individual socio-demographic characteristics, non-cognitive skills, and alcohol consumption practices. The sample consists of approximately 23,800 observations corresponding to 11,450 individuals. It is restricted to individuals aged 20–60 since non-cognitive skills are known to remain relatively stable throughout one's working life (Almlund et al., 2011).

Measures

The dataset contains two questions dedicated to alcohol consumption that differ from each other in terms of the time reference. The first question is more general and measures the probability of abstinence: "Do you consume alcoholic beverages, including beer, at least sometimes (Yes/No)?" Respondents who answered "No" are considered to be abstainers. The second question measures current alcohol consumption and is formulated as follows: "In the last 30 days, have you consumed alcoholic beverages (Yes/No)?" Due to the narrow 30-day time window, not all consumers are classified as current consumers, causing the proportion of consumers to differ when measured with different questions. 70% of respondents claim to consume alcohol at least occasionally, while only 49% of the respondents can be considered current consumers. Those who can be classified as neither abstainers nor current consumers are viewed as episodic drinkers. In this study, we prefer abstinence as the core measure of the probability of alcohol consumption; however, we use both measures for a robustness check.

After estimating the probability of abstinence, we measure the volume of alcohol consumed for current consumers based on a set of consecutive questions: 1) "Which of these alcoholic beverages have you drunk in the last 30 days? 2) "For those beverages that you have drunk, how many grams do you usually consume per day?" and 3) "How many days in a month do you usually drink these beverages?" The list of alcoholic beverages includes beer, wine, champagne, fortified wine, moonshine, vodka, cognac, whiskey, liquor, and alcoholic cocktails. For each of the 10 beverages, the volume was recalculated in grams of pure ethanol consumed in a month to allow for comparisons while ignoring the specifics of different drinks.

The Big Five model has multiple variations that differ from one another by the number of measured facets. The most popular model is NEO-PI-R (McCrae and John, 1992), which consists of 240 elements. The survey module in RLMS-HSE dedicated to non-cognitive skills is based on a short Big Five inventory called BFI-S (John and Srivastava, 1999), consisting of 24 questions. Each question represents a facet related to one of the Big Five categories (for complete mapping, see Table 1 in the Appendix). Compared to NEO-PI-R, short scales have been proven to be valid, reliable, and easily understandable instruments that make it possible to use them in empirical investigations (Hahn et al., 2012). A similar inventory is used in the Skills Towards Employability survey (STEP) conducted by the World Bank (Pierre et al., 2014). Responses are self-evaluated, ranging from 1 ("almost never") to 4 ("almost always"), depending on the frequency with which the facet is observed in the respondent's behaviour. Each category is calculated as an average of all the included facets, standardized with a mean of 0 and a standard deviation of 1.

The survey module dedicated to non-cognitive skills was first introduced to RLMS-HSE in 2016 and is designed to be repeated once every five years. Although the majority of the

respondents answered the personality questions in 2016, some of the respondents who joined the survey in more recent years answered them only in the year they were first surveyed. Therefore, data on personality traits for each individual are available only in one wave. Due to the short-term stability of non-cognitive skills (Schäfer, 2017; Cobb-Clark and Schurer, 2012), we extrapolate the cross-sectional data on personality traits from one wave to the two other waves. Using data for three years instead of one enables us to exploit the panel nature of the survey to obtain more reliable results.

Based on the literature, we propose several hypotheses regarding the relationship between non-cognitive skills and alcohol consumption. First, we suppose that conscientiousness should be positively related to the probability of abstinence and negatively to the volume of alcohol consumed due to the negative correlation between conscientiousness and unhealthy habits (Bogg and Roberts, 2004). Second, since conscientiousness reportedly affects educational attainment (Almlund et al., 2011), including it into the estimated model would drive the coefficient related to education downwards. Third, we expect extraversion to be negatively related to the probability of abstinence due to the high social interaction of extraverts which might entail frequent drinking. However, we do not expect it to be related to higher volumes of alcohol consumption. Finally, similar to previous studies, we do not expect any statistically significant relationship with alcohol consumption for openness to experience or agreeableness.

Statistical analysis

Our empirical strategy is based on the double-hurdle theoretical model (Labeaga, 1999), which suggests that consumer choice is carried out in two stages. First, one decides whether to drink or not, which in the context of this paper is measured as the probability of abstinence. After the initial decision is made, one decides on the frequency of consumption and the volume of alcohol. This methodological approach is quite common in research dedicated to alcohol consumption (Radaev et al., 2020). Using a random-effects probit model, we first estimate the relation between non-cognitive skills and the probability of abstinence. The inclusion of random effects helps us to account for individual-level heterogeneity in alcohol consumption, thus controlling for the addictive nature of alcohol. However, the use of a random effects model does not allow us to establish the direction of causality, which is a drawback. We suppose that the effect goes from non-cognitive skills to alcohol consumption patterns due to relative stability of the Big Five (Allen et al., 2015). Moreover, changes in personality traits are likely to occur with a time lag. Since we observe constant personality traits in our sample, we can suppose that these traits affect alcohol consumption and not vice versa. The dependent variable equals 1 if the respondent claimed to have never consumed alcohol, and 0 otherwise.

For the second stage, we estimate the factors determining the volume of alcohol consumption using a random-effects tobit model with a Heckman correction for the selection of abstinence. Due to the volatility in alcohol consumption for some individuals who are not classified as abstainers but who avoided drinking over the last 30 days, the information about volume is missing, meaning that data are censored. Using the tobit model allows us to account for this censoring. We perform a Heckman correction by including the inverse Mills ratio calculated from a cross-sectional probit model for the probability of abstinence similar to that estimated at the first stage. The dependent variable in the second-stage model is the natural logarithm of the volume of pure ethanol in grams consumed in the last 30 days.

The controls for the models in both stages are divided into several subgroups. The first subgroup is a set of variables that reflect individual socio-demographic features, including gender, age divided by 10 and its square, ethnicity (a binary variable that equals 1 if the individual reports to be of Slavic origin—either Russian, Ukrainian, or Belorussian—and 0 otherwise), education (university, college[5], or below as a reference category), the logarithm of the household's per capita income, marital status (a binary variable that equals 1 if the respondent is married, either formally or informally, and 0 otherwise), the presence of children younger than 18 years old, the number of adults in the household (excluding the respondent if aged 18+ and her spouse, if applicable), religion (a binary variable that equals 1 if the respondent defines herself as Muslim, and 0 otherwise), the type of settlement (Moscow and Saint Petersburg as the two capital cities, regional centre, city, or village as a reference category), and body weight divided by 10. To control for the significant inter-regional heterogeneity in Russia, a second subset of variables consists of regional characteristics, including average regional air temperature in January as a proxy for climate, regional per capita income, and average regional prices for beer and vodka as the prices for the most common alcoholic beverages. All monetary values are log transformed and adjusted to 2018 levels using regional the Consumer Price Index. We additionally add dummies for the year of observation to control for possible bi-directional effects. Table 2 in the Appendix presents descriptive statistics for all the variables used in the analysis. We carry out the estimations separately for men and women due to gender-specific differences in alcohol consumption.

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[5] When speaking of a "college", we refer to vocational college graduates

Sensitivity analysis

We use random-effects probit for the first stage and random-effects tobit for the second stage as benchmark models for further analysis. In addition, we run several other models to ensure the robustness of our findings.

First, we run a pooled probit model with standard errors clustered at the individual level as a robustness check for the first stage (see Table 6 in the Appendix). The estimates obtained this way are more stable to possible autocorrelation and heteroscedasticity, while using clustered errors allows us to control for the dependence between observations belonging to the same individuals in different survey waves.

Second, we run a first-stage model taking the probability of consumption in 30 days as the dependent variable instead of the probability of abstinence (see Table 6 in the Appendix). The dependent variables equal 1 if the respondent consumed alcohol during the past 30 days, and 0 otherwise. The results are very close to those of the "abstinence" model. Since the relationship between the first-stage probability model and the second-stage "volume" model runs through a Heckman correction for selection into abstinence, we find it more convenient to report the results of the probit model with the status of abstinence as a dependent variable as the benchmark model in this paper.

Third, we run a panel Heckman model for current consumers with a correction for selection into current consumption (see Table 7 in the Appendix). The main equation included all the variables in previous models, except for religion which was used as an exclusion restriction variables in the selection equation. The selection equation included the logarithm of each household's per capita income, age divided by 10 and its square, gender, education, the presence of children, ethnicity, religion, body weight divided by 10, regional income, type of settlement, and the Big Five categories.

Overall, the results were robust to using various measures of alcohol consumption and econometric techniques, which points at the significant relation between non-cognitive skills and alcohol consumption. The findings are stable for both genders.

Results

Descriptive statistics

Table 2 in the Appendix presents the percentage of abstainers depending on their socio-demographic characteristics. Our data show that abstinence is more common among women. In terms of volume, women drink 66 grams of pure ethanol per month (SD = 194), which is four times less than men (M = 284, SD = 639, t(23,944) = –37.5, p= 0.00). This is in line with the literature and suggests that men are generally more prone to alcohol abuse and related problems

(Nolen-Hoeksema, 2004). Regarding personality traits, women tend to have a higher mean level of all the Big Five categories which is a common phenomenon across different nations (Schmitt et al., 2008). We also observe nonlinearity between the probability of alcohol consumption and age. The greatest proportion of consumers is concentrated in the 30–39 age group, in which 54% of respondents drank at least once during the last 30 days. The youngest age group (20–29) contains the largest proportion of abstainers (34%), the lowest proportion of current consumers (45%), and the lowest volume of consumed alcohol in grams of pure ethanol (M = 116 grams (SD=326) compared to M = 186 grams (SD=500) in the 30–39 age group and M = 168.3 grams (SD=471) in the 40+ age group (Wilks' lambda = 0.99, $F_{(2, 23943)} = 28.87$, p = 0.00) among current consumers. The descriptive statistics do not provide much evidence of the existence of a relationship between education and alcohol consumption. The volume of pure ethanol consumption per month is similar between university and college graduates (M = 114, SD = 289 and M = 122, SD = 324, respectively, t(13,265) = 1.46, p = 0.15). However, compared to groups with a lower level of education (M = 171, SD = 490), individuals with a college diploma or university degree drink significantly less (t(23,944) = 15.95, p = 0.00). Since higher education provides more job opportunities and more financial stability, university and college graduates may also focus on the quality of the consumed alcohol rather than its quantity.

Table 3 in the Appendix reports the differences in summery statistics between abstainers and current consumers. On average, compared to current and occasional consumers, abstainers demonstrate significantly higher levels of conscientiousness (t(23,951) = –2.61, p = 0.00) and agreeableness (t(23,951) = –3.49, p = 0.00), while lower levels of extraversion (t(23,951) = 7.19, p = 0.00), and openness to experience (t(23,951) = 5.31, p = 0.00). Similar patterns are found for the volume of consumed alcohol. Higher levels of conscientiousness are associated with lower volumes of alcohol consumption. Individuals with scores in the top quartile of conscientiousness consumed on average 120 grams of pure ethanol per month (SD = 350), while those in the lowest quartile drank 255 grams (SD = 696, t(9,789) = 12.03, p = 0.00). In contrast, scores in the top quartile of neuroticism correspond to higher volumes of consumed alcohol (M = 206, SD = 574) compared to scores in the lowest quartile of neuroticism (M = 130, SD = 338, t(11,308) = –8.85, p = 0.00).

The effect of non-cognitive skills on alcohol consumption

Detailed results of the regression analysis are shown in Tables 4 and 5 in the Appendix. The results reveal the presence of a statistically significant relationship between alcohol consumption and non-cognitive skills. The estimates are close to each other in both genders. On average, conscientiousness is associated with a slightly higher possibility of abstinence. A one

standard deviation increase in conscientiousness is associated with an increase in the probability of abstinence of 2.5 percentage points for men and 1.7 percentage points for women. In contrast, a one standard deviation increase in extraversion reduces this probability by 2.1 percentage points for men and 2.7 percentage points for women. The rest of the Big Five categories are not statistically significant for the probability of abstinence.

Table 5 in the Appendix further reveals a strong relationship between non-cognitive skills and the volume of consumed alcohol. All the Big Five categories demonstrate the same direction of the effects for both men and women, although the magnitude of these effects has gender-specific differences. The estimated effect of the Big Five categories is significantly larger in the volume models, suggesting that personality traits mostly influence frequency and consumption patterns rather than the probability of drinking itself. The results suggest that extraversion is positively related to the volume of consumption among both men and women. A one standard deviation increase in extraversion is associated with a rise in the log volume of consumed alcohol of 27 percentage points for men and 24 percentage points for women. The close results for extraversion for men and women implies that the social context is equally important for both genders. In contrast, a one standard deviation increase in openness to experience, which is usually related to novelty seeking and consequent psychoactive substance abuse, is associated with a 7 percentage point reduction in the log of alcohol consumption volume among men. For women, openness to experience is statistically insignificant. The effect of neuroticism is statistically significant, although the magnitude of the effect is larger for women. A one standard deviation increase in neuroticism increases the log volume of consumed alcohol by 7 percentage points for men and 13 percentage points for women. This finding could be due to gender differences in drinking motives. While drinking among men is frequently associated with conformity and enhancement motives, women are more prone to use alcohol as a coping mechanism to help them escape negative emotions (Cooper, 1994). Moreover, higher neuroticism is associated with depressive episodes, which are more likely to be experienced by women (Van de Velde et al., 2010). In this context, alcohol can also serve as an instrument of self-medication for depressive symptoms. Contrary to neuroticism, the effect of conscientiousness is substantially greater for men than for women both in terms of the probability of abstinence and in terms of the volume of alcohol consumption. A one standard deviation increase in conscientiousness reduces the log volume of alcohol consumption by 38 percentage points for men and 28 percentage points for women. Conscientiousness can affect alcohol consumption via more developed self-control and more effective decision-making when it comes to health investments. Since conscientiousness is positively associated with all types of healthy behaviors, including avoiding addictive substances, it can be viewed as farsightedness expressing itself in consistent human capital accumulation (both

in terms of health and education). Finally, agreeableness is not linked to either the probability of consuming or the volume consumed.

Non-cognitive skills and education

Although the positive association between education and alcohol consumption is well-established (Cutler and Lleras-Muney, 2010), non-cognitive skills may partly mediate the observed relationship. Our results demonstrate that education is not statistically significant for the probability of abstinence. However, a clear relationship exists between education and the volume of alcohol intake. Columns 3 and 4 in Table 5 in the Appendix show the results of the model without the Big Five variables. A university degree decreases the log quantity of monthly consumed alcohol by 50 percentage points for men and 31 percentage points for women. A college diploma yields a 37 percentage point reduction in alcohol consumption for men and 21 percentage point reduction for women in the model without the Big Five. All the coefficients are statistically significant at the 0.1 percent level. Adding non-cognitive skills to the analysis substantially reduces the effect of tertiary education in both genders. The coefficients partly lose their significance, especially for those with a college diploma. The effect of a university degree is almost halved to 26 percentage points for men and 16 percentage points for women. A less dramatic but still notable reduction is observed for college diploma. A college diploma reduces the log volume of alcohol consumption by 37.4 percentage points for men and 21 percentage points for women when personality traits are excluded from the analysis, but by 24.8 percentage points for men and by 11.6 percentage points for women, respectively, when personality traits are present.

Previous research conducted on the same data but covering a different time period and age group revealed a statistically significant negative effect of education with regard to the probability of abstinence (Radaev et al., 2020). We hypothesize that the reason our result differs from that in previous research could be due either to the time frame or to the age restrictions that we imposed on our data. To test these hypotheses, we first ran our models for the probability of abstinence and the volume of consumption without non-cognitive variables on a sample without age restriction for 2016–2018, then we ran our models with the age restriction but for 2012–2015. Both a university degree and college diploma were significantly negatively associated with the probability of abstinence and with the volume of consumed alcohol in both genders when age was not restricted. Restricting the sample to individuals aged 20–60 for 2012–2015 yielded results similar to those obtained in our paper.

Finally, some insights can be obtained from the analysis of the control variables. First, the results are mostly in line with research dedicated to the factors for alcohol consumption in Russia. We observe a significant inverse u-shape relationship between alcohol consumption and age,

which is well-documented both in the Russian and the international context. There are also significant time effects in our models, which demonstrate the general trend of decreasing alcohol consumption in Russia. Second, most of the coefficients remain stable in the models with and without the presence of non-cognitive variables, with a few exceptions. For instance, income per capita loses its significance for men when non-cognitive skills are introduced into the first-stage model. Moreover, being married is positively significant for the volume of consumed alcohol among women but loses this significance with the inclusion of the personality variables. The results also suggest that higher body weight is associated with a higher probability of drinking in both genders, although the effect is quantitively reduced with the inclusion of non-cognitive skills. As body weight is a parameter of health, non-cognitive skills, mostly conscientiousness and neuroticism, can affect it through habits, namely, an unhealthy diet or lack of physical exercise (Sutin and Terracciano, 2016). Finally, an inverse Mills ratio is also significant for volume regressions, affirming the need to perform a Heckman correction for the problem of self-selection into abstinence.

Discussion

The results yield two important insights. First, our analysis suggests that non-cognitive skills have a statistically significant link with alcohol consumption and strongly predict both the probability and the volume of consumption after controlling for social and economic factors. Since the effect of a university degree and college diploma on the volume of alcohol consumption drastically differs with and without the inclusion of non-cognitive skills, we suppose that personality can serve as an intermediate point between education and alcohol-related behaviour. Therefore, by avoiding personality traits, we overestimate the effect of education on alcohol consumption. We believe that personality serves as a mediator for this relationship (and not vice versa) as some personality traits are formed before formal, especially tertiary, education. Although universities and colleges provide students with a new social environment that promotes their sociability and agreeableness, the personality traits that are related to alcohol consumption the most (i.e., conscientiousness, extraversion, and neuroticism) are already formed by the time a person enrolls in university or college. Twin research suggests that 30–50% of self-assessed personality traits are inherited (Loehlin et al., 1998) with extraversion and neuroticism being the most heritable categories of the Big Five and conscientiousness mostly representing the result of primary socialization. Therefore, adding non-cognitive skills to the analysis allows us to re-evaluate the effect of tertiary education on alcohol-related behavior. Further policy interventions aiming to reduce risky behaviours, including alcohol abuse, should focus on the formation of non-

cognitive skills related to conscientiousness during school as part of early socialization. The interventions within tertiary education aimed at building particular skills might be less effective.

Second, social norms play an important role when it comes to gender differences in alcohol consumption. Cultural expectations around traditional gender roles imply that women should not drink, while men are less stigmatized for bad habits, including alcohol consumption (Erol et al., 2015). Future initiatives to reduce alcohol misuse need to focus on changing social normative beliefs and attitudes around alcohol consumption.

Conclusion

The growing literature on non-cognitive skills suggests their importance in a wide range of social outcomes. The present study extends previous research evaluating the relationship between the Five-Factor Model of personality and alcohol consumption by using representative Russian panel data. The results demonstrate a strong and persistent relationship between alcohol consumption and individual personality traits. Extraversion and neuroticism are positively related to the probability and the volume of alcohol consumption, while conscientiousness and openness to experience show the opposite result. Agreeableness is not statistically significantly related to our measures of alcohol consumption. The effects differ between men and women. Conscientiousness demonstrates a larger effect in the male sample, while neuroticism is strongly associated with alcohol consumption in females. Openness to experience shows a negative statistically significant result only in males. These results are retained when controlling for individual socioeconomic characteristics and for cross-regional heterogeneity. The analysis is robust to using different econometric techniques and measures of alcohol consumption.

Though the link between personality traits and alcohol consumption has already been discussed in the psychological literature, it has remained largely absent from economic and sociological research, lacked any connection to any socio-economic characteristics of individuals, and was mostly based on small samples. In contrast, our paper is based on a large representative sample and takes into account the complex nature of personality traits by examining their contribution to alcohol consumption while controlling for education. Education is often considered to be an important characteristic which reduces probability of excessive alcohol consumption. Particular policy interventions are designed to prevent alcohol abuse in young adults attending colleges (Larimer, Cronce, 2007). However, our analysis suggests that policy interventions in tertiary education can be ineffective since those personality traits that further promote alcohol consumption are already formed by the time an individual graduates from high school. Therefore, we suggest that policy interventions aimed at reducing alcohol consumption should be focused on the formation of non-cognitive skills, namely high levels of conscientiousness, during school.

We recognize several limitations of this research. First, our measures of alcohol consumption and the Big Five are based on survey data, which are often subject to measurement errors due to cultural and social norms. Second, the time frame of 30 days for alcohol reporting does not capture all drinkers, although it has a minimal risk of underreporting. Finally, in terms of health risks, we are more interested in risky excessive drinking that combines volume and frequency of consumption rather than the fact of alcohol consumption. Some literature dedicated to alcohol consumption touches upon models of drinking, which differ by both content and consequences. Although non-cognitive skills can be related to such behavioral models, this paper does not focus on them. We also ignore the specific features that can be related to the consumption of different alcoholic beverages.

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Table 1. Distribution of responses to the non-cognitive skills questions, according to the Big Five taxonomy, %.

	Almost always	Frequently	Sometimes	Almost never
Openness				
Do you come up with ideas other people haven't thought of before?	10.63	21.71	48.89	18.77
Are you very interested in learning new things?	34.82	42.49	20.29	2.41
Do you enjoy beautiful things, like nature, art and music?	50.52	33.64	14.28	1.56
Conscientiousness				
When doing a task, are you very careful?	35.56	51.37	11.98	1.09
Do you finish whatever you begin?	33.04	51.88	13.57	1.50
Do you work very hard? For example, do you keep working when others stop to take a break?	16.29	34.01	35.87	13.83
Do you prefer relaxation more than hard work?*	12.26	31.44	47.21	9.09
Do you enjoy working on things that take a very long time (at least several months) to complete?	7.86	18.95	38.65	34.54
Do you work very well and quickly?	27.32	51.05	18.56	3.06
Do you think carefully before you make an important decision?	27.76	49.30	19.91	3.03
Extraversion				
Are you talkative?	27.27	38.52	29.19	5.02
Do you prefer to keep your opinion to yourself?*	13.85	40.70	37.31	8.15
Are you outgoing and sociable, for example, do you make friends very easily?	20.16	37.23	32.28	10.34
Agreeableness				
Do you forgive other people easily?	15.80	41.81	35.27	7.11
Are you very polite to other people?	38.09	50.57	10.75	0.59
Are you generous to other people with your time or money?	10.86	31.19	44.41	13.54
Do you ask for help when you don't understand something?	21.18	44.07	31.00	3.76

Neuroticism

Do people take advantage of you?	5.26	15.21	51.28	28.26
Do you tend to worry?	12.47	29.51	48.16	9.87
Do you think about how the things you do will affect you in the future? *	28.31	42.49	24.26	4.94
Are you relaxed during stressful situations?*	12.74	36.81	37.93	12.52
Do you get nervous easily?	12.16	25.72	51.82	10.30
Are people mean/not nice to you?	2.17	8.72	36.35	52.76
Do you think about how the things you do will affect other?*	22.33	46.77	26.43	4.47

Note: (*) the scale in the marked questions was not reversed for the sake of coherence with other components of the category

Table 2. Average values of variables for male and female samples

	Male		Female	
	Mean	**SD**	**Mean**	**SD**
Abstainer	0.24	0.43	0.33	0.47
Pure alcohol consumption in 30 days (LN)	3.23	2.88	1.81	2.31
Openness	-0.08	1.02	0.07	0.96
Conscientiousness	-0.06	1.02	0.07	0.95
Extraversion	-0.14	1.00	0.14	0.97
Agreeableness	-0.14	0.99	0.14	0.96
Neuroticism	-0.12	1.00	0.09	0.96
Age /10	3.97	1.09	4.09	1.11
Age squared /100	16.97	8.95	17.97	9.26
Household per capita income (LN)*	9.73	0.67	9.74	0.65
College	0.21	0.41	0.25	0.44
University	0.26	0.44	0.37	0.48
Ethnicity (Russians, Ukrainians, Belarusians)	0.87	0.34	0.89	0.31
Muslims	0.08	0.26	0.06	0.23
Married	0.78	0.42	0.70	0.46
Body weight (/10)	8.07	1.44	7.06	1.59
Presence of children	0.72	0.45	0.83	0.37
Number of adults in a household. except the respondent and the living spouse 18+	1.87	1.68	1.80	1.64
Moscow and St. Petersburg	0.09	0.29	0.11	0.31
Regional centre	0.31	0.46	0.31	0.46
City (not the regional centre)	0.28	0.45	0.28	0.45
Village	0.32	0.47	0.31	0.46
Prices of the Russian beer in the region (LN)	4.71	0.07	4.72	0.07
Prices of the Russian vodka in the region (LN)	6.41	0.12	6.42	0.12
Average temperature in January in the region	-12.07	6.21	-12.49	6.35
Income per capita in the region	10.32	0.32	10.34	0.32

	Male		Female	
	Mean	**SD**	**Mean**	**SD**
Years				
2016	0.35	0.48	0.35	0.48
2017	0.33	0.47	0.33	0.47
2018	0.32	0.47	0.32	0.47
Number of observations	10,282		13,671	

Note: (*) all monetary values are adjusted to 2018 via regional Consumer price Index

Table 3. Average values of variables for current consumers and abstainers

	Abstainer		Current consumer	
	Mean	**SD**	**Mean**	**SD**
Openness	-0.05	1.02	0.02	0.98
Conscientiousness	0.04	1.00	-0.03	0.98
Extraversion	-0.05	0.98	0.05	1.01
Agreeableness	0.05	1.01	0.01	0.98
Neuroticism	0.01	1.01	0.00	0.99
Age /10	4.05	1.18	4.02	1.06
Age squared /100	17.80	9.77	17.31	8.76
Household per capita income (LN)*	9.62	0.69	9.82	0.65
College	0.24	0.42	0.22	0.41
University	0.30	0.46	0.33	0.47
Ethnicity (Russians, Ukrainians, Belarusians)	0.81	0.39	0.92	0.27
Muslims	0.13	0.34	0.03	0.18
Married	0.68	0.47	0.76	0.43
Body weight (/10)	7.27	1.58	7.65	1.61
Presence of children	0.75	0.43	0.80	0.40
Number of adults in a household. except the respondent and the living spouse 18+	2.09	1.90	1.68	1.50
Moscow and St. Petersburg	0.08	0.27	0.12	0.33
Regional centre	0.25	0.43	0.34	0.47
City (not the regional centre)	0.27	0.44	0.29	0.45
Village	0.40	0.49	0.25	0.43
Prices of the Russian beer in the region (LN)	4.71	0.07	4.72	0.07
Prices of the Russian vodka in the region (LN)	6.42	0.13	6.41	0.12
Average temperature in January in the region	-11.36	6.59	-12.95	6.17
Income per capita in the region	10.29	0.30	10.36	0.34

Years

	Abstainer		Current consumer	
	Mean	**SD**	**Mean**	**SD**
2016	0.35	0.48	0.35	0.48
2017	0.33	0.47	0.34	0.47
2018	0.32	0.47	0.32	0.46
Number of observations	7,017		11,855	

Note: (*) all monetary values are adjusted to 2018 via regional Consumer price Index

Table 4. Marginal effects from the random effects probit model with the status of abstinence as a dependent variable

	Male	Female	Male	Female
	(1)	**(2)**	**(3)**	**(4)**
Big Five				
Openness	0.00528	-0.00704		
	(0.00517)	(0.00707)		
Conscientiousness	0.0247***	0.0172**		
	(0.00691)	(0.00664)		
Extraversion	-0.0213***	-0.0272***		
	(0.00591)	(0.00592)		
Agreeableness	0.00478	0.00345		
	(0.00681)	(0.00531)		
Neuroticism	-0.000950	-0.00480		
	(0.00640)	(0.00601)		
Control variables				
Age /10	-0.180***	-0.260***	-0.173***	-0.249***
	(0.0420)	(0.0352)	(0.0397)	(0.0361)
Age squared/100	0.0243***	0.0335***	0.0236***	0.0327***
	(0.00497)	(0.00398)	(0.00468)	(0.00438)
Income per capita (LN)	-0.0162*	-0.0449***	-0.0142	-0.0453***
	(0.00725)	(0.00725)	(0.00863)	(0.00815)
College	0.0181	-0.00436	0.0208	-0.00382
	(0.0114)	(0.0134)	(0.0124)	(0.0127)
University	0.000858	0.00296	0.00845	0.00397
	(0.0140)	(0.0142)	(0.0147)	(0.0122)
Slavs	-0.0218	-0.0662***	-0.0235	-0.0685***
	(0.0221)	(0.0183)	(0.0259)	(0.0186)
Muslims	0.178***	0.214***	0.175***	0.216***
	(0.0418)	(0.0336)	(0.0333)	(0.0308)
Married	-0.0318	0.00571	-0.0257	0.00539
	(0.0162)	(0.0108)	(0.0136)	(0.0112)
Body weight (/10)	-0.0113**	-0.0111**	-0.0108**	-0.0126***
	(0.00411)	(0.00379)	(0.00396)	(0.00369)

	Male	Female	Male	Female
Presence of children	-0.0591***	-0.0601***	-0.0570***	-0.0633***
	(0.0170)	(0.0151)	(0.0162)	(0.0178)
Number of adults in a household, except the respondent and the living spouse 18+	0.00720**	0.0173***	0.00785**	0.0173***
	(0.00272)	(0.00313)	(0.00302)	(0.00299)
Moscow and St. Petersburg (Village is base category)	-0.0852**	-0.0810**	-0.0914**	-0.0885***
	(0.0320)	(0.0257)	(0.0298)	(0.0216)
Regional centre	-0.0984***	-0.0849***	-0.0997***	-0.0905***
	(0.0136)	(0.0149)	(0.0171)	(0.0164)
City (not the regional centre)	-0.0494**	-0.0340*	-0.0460**	-0.0355*
	(0.0165)	(0.0155)	(0.0168)	(0.0171)
Prices of the Russian beer in the region (LN)	0.0189	-0.195**	0.0393	-0.191
	(0.0770)	(0.0741)	(0.0855)	(0.0979)
Prices of the Russian vodka in the region (LN)	0.192**	0.0698	0.203***	0.0835
	(0.0651)	(0.0587)	(0.0608)	(0.0525)
Average temperature in January in the region	0.00282**	0.00404***	0.00258***	0.00394***
	(0.000912)	(0.00112)	(0.000764)	(0.000961)
Income per capita in the region	-0.0547*	-0.0500	-0.0455*	-0.0520*
	(0.0267)	(0.0255)	(0.0220)	(0.0235)
Years (2016 is base category)				
2017	0.0319***	0.0375***	0.0313***	0.0368***
	(0.00716)	(0.00513)	(0.00770)	(0.00649)
2018	0.0451***	0.0158*	0.0454***	0.0154**
	(0.00790)	(0.00802)	(0.00762)	(0.00597)
Number of observations	10,233	13,644	10,233	13,644
Number of groups	4,631	5,820	4,631	5,820

Bootstrap standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5. Marginal effects from the random effects tobit model with the pure alcohol consumption in 30 days (ln) as a dependent variable

	Male	Female	Male	Female
	(1)	(2)	(3)	(4)
Big Five				
Openness	-0.0700*	0.0555		
	(0.0289)	(0.0290)		
Conscientiousness	-0.382***	-0.280***		
	(0.0380)	(0.0284)		
Agreeableness	0.0263	0.0113		
	(0.0347)	(0.0309)		
Extraversion	0.270***	0.235***		
	(0.0316)	(0.0253)		
Neuroticism	0.0673*	0.126***		
	(0.0329)	(0.0240)		
Control variables				
Age /10	2.847***	1.918***	3.019***	1.753***
	(0.248)	(0.170)	(0.278)	(0.161)
Age squared/100	-0.361***	-0.256***	-0.390***	-0.243***
	(0.0306)	(0.0207)	(0.0333)	(0.0194)
Income per capita (LN)	0.579***	0.522***	0.593***	0.491***
	(0.0439)	(0.0317)	(0.0515)	(0.0321)
College	-0.248**	-0.116*	-0.374***	-0.209***
	(0.0761)	(0.0504)	(0.0873)	(0.0547)
University	-0.257***	-0.161**	-0.498***	-0.313***
	(0.0686)	(0.0520)	(0.0696)	(0.0516)
Slavs	0.550***	0.291**	0.551***	0.242*
	(0.148)	(0.111)	(0.138)	(0.101)
Muslims	-1.750***	-1.900***	-1.624***	-1.287***
	(0.220)	(0.194)	(0.151)	(0.0700)
Married	0.0434	0.0664	0.0850	0.128**
	(0.0944)	(0.0473)	(0.103)	(0.0459)
Body weight (/10)	0.137***	0.0916***	0.224***	0.155***
	(0.0203)	(0.0164)	(0.0238)	(0.0180)
Presence of children	0.702***	0.545***	0.540***	0.379***

	Male	Female	Male	Female
	(0.0984)	(0.0749)	(0.0790)	(0.0820)
Number of adults in a household, except the respondent and the living spouse 18+	-0.141***	-0.133***	-0.151***	-0.128***
	(0.0189)	(0.0170)	(0.0202)	(0.0176)
Moscow and St. Petersburg (Village is base category)	0.664***	0.536***	0.914***	0.640***
	(0.166)	(0.102)	(0.155)	(0.106)
Regional centre	0.692***	0.619***	0.827***	0.656***
	(0.0825)	(0.0683)	(0.103)	(0.0572)
City (not the regional centre)	0.493***	0.415***	0.498***	0.408***
	(0.0834)	(0.0646)	(0.0983)	(0.0601)
Prices of the Russian beer in the region (LN)	0.358	0.864**	0.000625	0.465
	(0.517)	(0.332)	(0.551)	(0.394)
Prices of the Russian vodka in the region (LN)	-1.031**	-0.812**	-1.442***	-1.023***
	(0.374)	(0.290)	(0.386)	(0.282)
Average temperature in January in the region	-0.0531***	-0.0456***	-0.0543***	-0.0437***
	(0.00486)	(0.00311)	(0.00540)	(0.00334)
Income per capita in the region	0.909***	0.704***	0.835***	0.703***
	(0.130)	(0.111)	(0.137)	(0.106)
Years (2016 is base category)				
2017	-0.240***	-0.140***	-0.261***	-0.115***
	(0.0400)	(0.0313)	(0.0353)	(0.0324)
2018	-0.186***	-0.116**	-0.215***	-0.105**
	(0.0563)	(0.0426)	(0.0460)	(0.0343)
Inverse Mills ratio	-5.475***	-3.841***	-5.698***	-3.905***
	(0.121)	(0.0978)	(0.105)	(0.0870)
Number of observations	10,233	13,644	10,233	13,644
Number of clusters	4,621	5,820	4,621	5,820

Bootstrap standard errors in parentheses
* p < 0.05, ** p < 0.01, *** p < 0.001

Table 6. Marginal effects from the pooled probit model with the status of abstinence (1-2) and with the probability of consumption in 30 days (3-4) as a dependent variable

	Male	Female	Male	Female
	(1)	(2)	(3)	(4)
Big Five				
Openness	0.000163	-0.00749	-0.00938	0.00952
	(0.00647)	(0.00665)	(0.00759)	(0.00724)
Conscientiousness	0.0250***	0.0148*	-0.0463***	-0.0313***
	(0.00658)	(0.00667)	(0.00715)	(0.00662)
Extraversion	-0.0216***	-0.0259***	0.0209**	0.0255***
	(0.00571)	(0.00574)	(0.00735)	(0.00502)
Agreeableness	0.00393	0.00648	0.0101	0.00854
	(0.00641)	(0.00613)	(0.00657)	(0.00540)
Neuroticism	-0.00350	-0.00809	0.00168	0.0130**
	(0.00604)	(0.00577)	(0.00739)	(0.00547)
Control variables				
Age /10	-0.177***	-0.264***	0.227***	0.215***
	(0.0402)	(0.0387)	(0.0453)	(0.0356)
Age squared/100	0.0242***	0.0346***	-0.0298***	-0.0285***
	(0.00478)	(0.00457)	(0.00533)	(0.00423)
Income per capita (LN)	-0.0282***	-0.0753***	0.0265*	0.0676***
	(0.00802)	(0.00936)	(0.0108)	(0.00809)
College	0.00556	-0.00765	-0.0328**	-0.0195
	(0.0134)	(0.0129)	(0.0114)	(0.0113)
University	-0.000709	0.00706	-0.0162	-0.0157
	(0.0135)	(0.0127)	(0.0156)	(0.0131)
Slavs	-0.00743	-0.0599*	0.0490*	0.0541*
	(0.0234)	(0.0243)	(0.0241)	(0.0216)
Muslims	0.198***	0.224***	-0.144***	-0.197***
	(0.0373)	(0.0347)	(0.0328)	(0.0275)
Married	-0.0462**	0.00830	0.0298	-0.000618
	(0.0164)	(0.0117)	(0.0188)	(0.0136)
Body weight (/10)	-0.0104*	-0.0121***	0.0144**	0.0103**
	(0.00409)	(0.00367)	(0.00474)	(0.00373)
Presence of children	-0.0645***	-0.0681***	0.0630***	0.0587***
	(0.0169)	(0.0174)	(0.0166)	(0.0133)

	Male	Female	Male	Female
Number of adults in a household, except the respondent and the living spouse 18+	0.00722*	0.0176***	-0.00895*	-0.0184***
	(0.00337)	(0.00341)	(0.00372)	(0.00379)
Moscow and St. Petersburg (Village is base category)	-0.0899**	-0.0778**	0.0769*	0.0440
	(0.0276)	(0.0268)	(0.0312)	(0.0256)
Regional centre	-0.0950***	-0.0731***	0.0881***	0.0633***
	(0.0160)	(0.0151)	(0.0191)	(0.0147)
City (not the regional centre)	-0.0418**	-0.0273	0.0743***	0.0512***
	(0.0161)	(0.0151)	(0.0152)	(0.0136)
Prices of the Russian beer in the region (LN)	0.0635	-0.223*	-0.174*	0.0729
	(0.0978)	(0.0924)	(0.0818)	(0.0802)
Prices of the Russian vodka in the region (LN)	0.172**	0.0857	-0.156*	-0.0667
	(0.0610)	(0.0595)	(0.0732)	(0.0677)
Average temperature in January in the region	0.00278**	0.00402***	-0.00548***	-0.00604***
	(0.000951)	(0.000883)	(0.000964)	(0.000939)
Income per capita in the region	-0.0422	-0.0242	0.150***	0.136***
	(0.0255)	(0.0257)	(0.0259)	(0.0268)
Years (2016 is base category)				
2017	0.0298***	0.0338***	-0.0155*	-0.00488
	(0.00718)	(0.00699)	(0.00696)	(0.00842)
2018	0.0404***	0.0134	-0.0339***	-0.00422
	(0.00809)	(0.00775)	(0.00847)	(0.00864)
Number of observations	10,282	13,671	10,276	13,670

Clustered standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 7. Marginal effects for Heckman model among current consumers (those who consumed alcohol in 30 days) conditional on the dependent variable being observed

	Male	Female
	(1)	(2)
Big Five		
Openness	-0.0702**	-0.00325
	(0.0237)	(0.0271)
Conscientiousness	-0.103***	-0.142***
	(0.0243)	(0.0275)
Extraversion	0.0869***	0.107***
	(0.0210)	(0.0234)
Agreeableness	-0.0102	-0.0383
	(0.0231)	(0.0249)
Neuroticism	0.0795***	0.114***
	(0.0218)	(0.0238)
Control variables		
Age /10	0.846***	0.532**
	(0.158)	(0.173)
Age squared/100	-0.0945***	-0.0714***
	(0.0189)	(0.0206)
Income per capita (LN)	0.0855**	0.0218
	(0.0313)	(0.0360)
College	-0.205***	-0.124*
	(0.0470)	(0.0535)
University	-0.211***	-0.249***
	(0.0490)	(0.0515)
Slavs	-0.125	0.0975
	(0.0687)	(0.0867)
Muslims	0.105***	0.139***
	(0.0184)	(0.0219)
Married	-0.124*	-0.0128
	(0.0557)	(0.0467)
Body weight (/10)	0.0157	0.0205
	(0.0141)	(0.0144)

	Male	Female
Presence of children	0.0699	-0.0545
	(0.0571)	(0.0722)
Number of adults in a household, except the respondent and the living spouse 18+	-0.0166	-0.0188
	(0.0132)	(0.0158)
Moscow and St. Petersburg (Village is base category)	-0.212*	0.0766
	(0.104)	(0.107)
Regional centre	-0.107	0.0951
	(0.0571)	(0.0636)
City (not the regional centre)	0.0357	0.153*
	(0.0574)	(0.0642)
Prices of the Russian beer in the region (LN)	1.456***	1.265***
	(0.342)	(0.374)
Prices of the Russian vodka in the region (LN)	0.893***	0.590*
	(0.233)	(0.277)
Average temperature in January in the region	-0.00550	-0.00878*
	(0.00352)	(0.00387)
Income per capita in the region	-0.180	-0.0900
	(0.0958)	(0.107)
Years (2016 is base category)		
2017	-0.0430	-0.0133
	(0.0336)	(0.0377)
2018	0.0375	0.0974*
	(0.0356)	(0.0393)
Number of observations	10,276	13,670

Bootstrap standard errors in parentheses
* p < 0.05, ** p < 0.01, *** p < 0.001

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