

Projections of Alcohol Consumption among the Population of Russia

Elena Yurjevna Alekseicheva, Zhanna Arakelovna Kevorkova, Irina Petrovna Komissarova,
 Albina Nikolaevna Mayorova, Olga Vladimirovna Rozhnova

Abstract: *The topic owes its relevance to the dual significance of alcohol production, distribution, and consumption for a nation's social-economic development. The authors analyze and forecast changes in the volume and structure of alcohol consumption among the population of Russia and assess the relationship between alcohol consumption and prices in the country. The authors' projections of alcohol consumption were produced using the statistical method of regression analysis. To assess the strength of the relationship between consumption and prices, the authors constructed relevant scatter plots and computed the coefficient of determination and the linear pair correlation coefficient. As a result, the authors detected a number of downward trends in and put together forecasts of the nation's consumption of alcoholic products per capita in absolute alcohol, overall consumption of alcoholic products in physical terms, and consumption of particular types thereof (beer and beer-based beverages, vodka, spirit and liqueur products, wine products, including champagne and sparkling wine, and cognac and brandy spirits, including brandy and calvados). The authors are expecting no significant changes in the structure of the nation's alcohol consumption. There is a very strong linear relationship between alcohol consumption and prices in Russia. With vodka, this relationship is reverse. However, the authors have found that the relationship between consumption and prices in terms of cognac, beer, and wine has changed from direct linear to reverse linear. Considering the rise in prices, the relationships detected substantiate the projected trend of alcohol consumption in Russia declining.*

Index Terms: *alcoholic products, consumption, per capita consumption, price*

I. INTRODUCTION

Russian legislation defines alcoholic products as “food products made using or not using ethyl alcohol (which is made from food raw materials) and/or alcohol-containing food products with an ethyl alcohol content of over 0.5% of the volume of a finished product...” [1]. In recent years, the share of alcoholic products in Russia's overall retail turnover has declined. In 2017, it totaled 6.7% [2]. The alcohol industry has a dual effect on the nation's social and economic

development. On the one hand, as excise duty products, alcoholic products are a significant source of government revenue. Alcohol production is attractive to investors, as it is among the sectors characterized by high profitability [3], sustainable consumer demand, low production costs [4], quick returns on investment, and a fast production process [5]. On the other hand, excessive alcohol consumption may have a negative effect in terms of morbidity, mortality, and life expectancy in the nation and break down families, cause child neglect, lead to spikes in crime and suicide rates, and threaten the country's national security [6]-[11]. In Russia, accidental alcohol poisoning is the cause of over 23,000 deaths per year, with 75,000 people dying from diseases associated with alcohol abuse [12]. The illegal sale of alcoholic products, including low-grade and counterfeit ones, is causing great harm to people's health and affecting the national budget. In this paper, the authors analyze the change in the volume and structure of the consumption of alcoholic products among the population of Russia; provide forecasts for the consumption of alcoholic products and certain types thereof (beer and beer-based beverages, vodka, spirit and liqueur products, wine products, including champagne and sparkling wine, and cognac and brandy spirits) among Russia's population in 2020; assess the relationship between the nation's alcohol consumption and prices.

II. LITERATURE REVIEW

At the moment, Russia is characterized by the Central European type of alcohol consumption, which is characterized by an orientation toward beer and nonregular consumption of hard alcohol. Notwithstanding that Russia is a leader in vodka consumption, the structure of the nation's alcohol consumption has gone through significant change. More specifically, compared with the mid-1960s, when hard alcohol accounted for nearly 70% of the nation's total consumption, today alcohol consumption in Russia is characterized by a growing share of beer and beer-based beverages [8]. According to scholar T.Iu. Glushko [13], the structure of alcohol consumption in Russia is currently characterized by a large share of hard liquor, a growing share of low-alcohol beverages and beer, as well as an increase in popular demand for hard alcoholic premium-class beverages. Scholar A.G. Salikhova [14] also points out that the Russian market is witnessing a shift in demand toward more expensive beverages with a lower alcohol content, which is causing declines in vodka consumption and increases in wine and beer consumption. According to scholars L.V.

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* Correspondence Author (s)

Elena Yurjevna Alekseicheva, Moscow City University, Moscow, Russia.

Zhanna Arakelovna Kevorkova, Financial University under the Government of the Russian Federation, Moscow, Russia.

Irina Petrovna Komissarova, National Research Nuclear University MEPhI (Moscow Engineering Physics Institute), Moscow, Russia.

Albina Nikolaevna Mayorova, Russian State Social University, Moscow, Russia.

Olga Vladimirovna Rozhnova, Financial University under the Government of the Russian Federation, Moscow, Russia.

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Basieva and O.R. Tegetaeva [4], consumers, on the contrary, tend to increasingly go for inexpensive and often low-quality alcohol beverages. The findings from a study into consumption in the private-label segment indicate that 96.8% of hard alcohol consumers and 92.3% of beer consumers prefer brand products over private-label ones [15].

Alcohol consumption is greatly influenced by its affordability [4], [9],[16],[17]. Furthermore, a major factor in the setting of prices for alcoholic beverages is excise duty rates [3]. Excise duties, on the one hand, have a major fiscal effect, and, on the other hand, are capable of regulating alcohol consumption. The fiscal function of excise duties lies in that they are one of the permanent sources of revenue in Russia's federal budget, and willful evasion of them is complicated. Their effect on consumption is associated with the fact that they are implicit taxes, i.e. they are included in the price of products and are paid by consumers [18].

At the same time, increases in excise duties for alcoholic products are facilitating the expansion of the shadow sector, i.e. the production, sale, and consumption of adulterated and counterfeit products. The distribution of this kind of products in Russia is also facilitated by a mismatch between statutory fines and sales receipts, insufficient legal protection for national producers, and imports of counterfeit products through the borders of the Customs Union member states [19]. To T.Iu. Glushko [13], among the causes behind the great number of counterfeit alcoholic products in the country are a lack of control over their distribution on the part of the government, a shortage of cheaper products due to high excise duties, and the complexity of certification and customs procedures. The illegal distribution of alcoholic products is posing a serious menace to people's health and resulting in losses in national revenue. For instance, at some point Russia's annual loss in national revenue caused by the illegal production of ethyl alcohol ranged between 5,767.2 and 5,917.0 million rubles [20].

A key issue in Russia is alcohol consumption by underage individuals. Based on official data, 5 million Russian adolescents aged 11 to 18 years consume alcoholic beverages on a regular basis [5]. Resolving this issue is viewed in the context of legal (administrative and criminal) liability for the retail sale of alcoholic products to underage individuals [12], [21]-[23]. However, despite the requirements set by legislation, the ban on the retail sale of alcoholic beverages to underage individuals is not observed at all times. With that said, existing research into social responsibility in retail [24]-[26] has had little to no focus on the role of retailers in restricting alcohol consumption among underage individuals, as well as in ensuring the high quality of alcoholic products sold to of-age individuals.

Thus, notwithstanding that the significance of issues related to alcohol consumption among the population of Russia has been recognized and acknowledged and despite the plethora of research on the subject, there are many issues that remain to be investigated. There has been ambiguity regarding the assessment of the trends of change in consumer demand for alcoholic beverages and the impact of excise duties on alcohol consumption, with greater elaboration required in respect of issues related to the responsibility of retailers for the sale of alcoholic products, including to underage individuals. In addition, in analyzing the

consumption of alcoholic products among Russia's population, insufficient attention has been devoted to forecasting.

III. METHODS

As their source materials for the analysis of trends in alcohol consumption among Russia's population and subsequent projections, the authors employed data from the Russian Federal State Statistics Service (Rosstat), namely data for the period 2000–2016 provided on the agency's official website in the 'Retail Trade, Services to the Public, and Tourism' section [2].

In the first stage, the authors analyzed the trends of change in the nation's consumption of alcoholic products in absolute alcohol per capita, overall consumption of alcoholic products in physical terms (exclusive of low-alcohol and other beverages, which account for around 1% of total alcohol consumption in the country), consumption of particular types of alcoholic products in physical terms, more specifically that of beer and beer-based beverages, vodka, spirit and liqueur products, wine products, including champagne and sparkling wines, and cognac and brandy spirits, including brandy and calvados.

In the second stage, the authors employed Excel to construct a set of regression equations aligned with the trend lines for the above indicators. To be able to detect as accurate relationships as possible, the authors examined a set of exponential, linear, logarithmic, power, and (second- and third-degree) polynomial trends and assessed the accuracy of the approximation. The equations constructed helped compute the nation's projected alcohol consumption overall and per capita, as well as its consumption of particular types of alcoholic products, in 2020.

In the third stage, the authors assessed the relationship between alcohol consumption and prices. To assess this relationship across particular types of alcoholic products (vodka, cognac, beer, and wine), the authors constructed relevant scatter plots and computed the coefficient of determination (r^2) and the linear pair correlation coefficient (r):

$$r = \frac{\sum(C - \bar{C}) * (P - \bar{P})}{\sqrt{\sum(C - \bar{C})^2 * \sum(P - \bar{P})^2}}$$

where

r was the coefficient of correlation;

C was the alcohol consumption, million daL per year;

\bar{C} was the average alcohol consumption, million daL per year;

P was the price for alcoholic products, rubles per liter;

\bar{P} was the average price for alcoholic products, rubles per liter.

To interpret the results and measure the strength of the relationship between alcohol consumption and prices, the authors employed the Chaddock scale.



IV. RESULTS

Starting in 2000, overall alcohol consumption among the population of Russia had been growing, exceeding in the period 2007–2008 1,400 million daL (exclusive of low-alcohol and other beverages, the share of which was about 1%). In subsequent years, the nation witnessed a trend of declines in alcohol consumption, which was most pronounced in 2009 and between 2014 and 2016. Per capita alcohol consumption (in absolute alcohol) changed in a similar fashion – it grew up until the period 2007–2008, and then it declined, with the exception of 2012. In 2016, overall alcohol consumption among the population of Russia matched the 2003 level, whereas per capita consumption was the lowest in the entire period under review. The change in overall and per capita alcohol consumption is aligned with the polynomial trend lines (Fig. 1). The structure of alcohol consumption in Russia is dominated by beer and beer-based beverages – in 2016, they accounted for 79.9% of all alcohol beverages consumed in the country. Placed second was vodka, but its share in alcohol consumption was gradually decreasing.

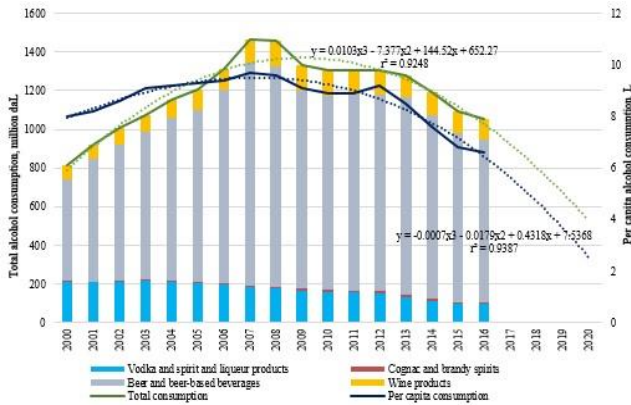


Fig. 1. Alcohol consumption among Russia's population. Data from Rosstat [2]. Calculated by the authors.

The nation's consumption of beer and beer-based beverages increased steadily in the period 2000–2007, exceeding 1,100 million daL between 2007 and 2008. In the period 2009–2013, it was steady and totaled a little over 1,000 million daL. In the period 2014–2016, there was a trend of declines in the population's consumption of beer and beer-based beverages. Among the rest of the alcoholic products, the greatest levels of consumption were posted by vodka and spirit and liqueur products. However, while in 2000 the consumption of vodka and spirit and liqueur products totaled over 200 million daL and exceeded by much the consumption of wine products and cognac, by 2016 its volume decreased significantly and totaled less than 100 million daL, which was less than the consumption of wine products, including champagne and sparkling wines.

The total consumption of wine products, including champagne and sparkling wines, in the period under review

increased from 70.7 million daL in 2000 to 106.9 million daL in 2016. The largest volume of wine products was consumed in the period 2008–2010 – over 128 million daL. The share of champagne and sparkling wines in the total consumption of wine products in the period under review totaled between 20% and 26%. The nation's sales of cognac and brandy spirits changed from 5.9 million daL in 2000 to 10.3 million daL in 2016 r. With that said, the growth continued up until 2012, with a steady decline ensuing afterwards.

On the whole, the change in the consumption of beer and beer-based beverages, vodka, spirit and liqueur products, wine products, and cognac and brandy spirits is aligned with the polynomial trend lines. The approximation accuracy values, which are above 0.9, attest to the level of accuracy of the regression equations being acceptable (Fig. 2).

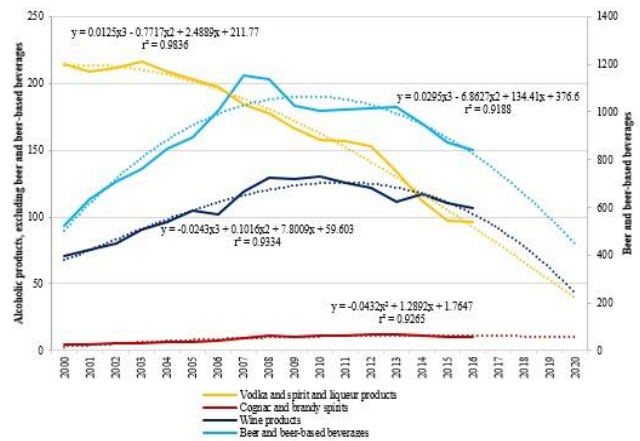


Fig. 2. Consumption of certain types of alcoholic products among Russia's population, million daL. Data from Rosstat [2]. Calculated by the authors

The authors' regression equations, constructed in Excel, helped forecast alcohol consumption in Russia for 2020 (Table I). By 2020, alcohol consumption among the population of Russia is projected to drop two times and total 529.3 million daL, with per capita consumption in absolute alcohol projected to decrease three times and total 2.2 liters. Based on the authors' projection, the nation's consumption of beer and beer-based beverages, which, combined, account for the largest share of all alcoholic products consumed in Russia at the moment, will have dropped 46.9% by 2020 relative to 2016. The nation's consumption of wine products, vodka, and spirit and liqueur products is projected to total around 40% of the figure posted in 2016. The consumption of cognac and brandy spirits will have decreased insignificantly – by 5%. Based on the authors' projection, in 2020 the consumption of alcoholic products, exclusive of cognac and brandy spirits, will be minimal in the entire period under review (2000–2016). The consumption of cognac and brandy spirits will have decreased by 2020 versus the consumption levels registered in the period 2008–2016, but will have exceeded the figures for the period 2000–2007.



Table I. Projected Alcohol Consumption among Russia’s Population in 2020

| Type of alcoholic products | Regression equation | Coefficient of determination | 2020 | Rate of growth (2020/2016), % |
|--|--|------------------------------|-------|-------------------------------|
| Total, million daL | $y = 0.0103x^3 - 7.377x^2 + 144.52x + 652.27$ | 0.9248 | 529.3 | 50.2 |
| Per capita (in absolute alcohol), L | $y = -0.0007x^3 - 0.018x^2 + 0.432x + 7.5368$ | 0.9387 | 2.2 | 33.2 |
| Beer and beer-based beverages, million daL | $y = 0.0295x^3 - 6.8627x^2 + 134.41x + 376.6$ | 0.9188 | 446.0 | 53.1 |
| Vodka and spirit and liqueur products, million daL | $y = 0.0125x^3 - 0.7717x^2 + 2.4889x + 211.77$ | 0.9836 | 39.5 | 40.9 |
| Cognac and brandy spirits, million daL | $y = -0.0432x^2 + 1.2892x + 1.7647$ | 0.9265 | 9.8 | 95.0 |
| Wine products, million daL | $y = -0.0243x^3 + 0.102x^2 + 7.801x + 59.603$ | 0.9334 | 43.4 | 40.6 |

Data from Rosstat [2]. Calculated by the authors.

Based on the authors’ projections, the structure of alcohol consumption in Russia will still be dominated by beer and beer-based beverages, with their share projected to rise from 79.7% in 2016 to 84.3% in 2020. Cognac and brandy spirits will account for the smallest share of the nation’s total alcohol consumption, the figure projected to increase from 1% in 2016 to 1.8% in 2020. The share of vodka and spirit and liqueur products and wine products will decrease insignificantly – to 7.5% and 8.2%, respectively. The divergence in the nation’s overall projected alcohol consumption and its projected combined consumption of certain types of alcoholic products is 1.7%, which attests to the forecast being quite accurate.

Figure 3 illustrates the relationship between the prices and consumption of certain types of alcoholic products in Russia. Vodka is characterized by a very strong reverse linear relationship (coefficient of correlation – 0.98; coefficient of determination – 0.95), i.e. increases in vodka prices correspond to decreases in vodka consumption. Having said that, the interrelationship between the prices and consumption of cognac, beer, and wine is linear too, but it is changing its direction. The relationship between cognac prices and consumption was a strong direct one up until 2012, for beer – until 2007, and for wine – until 2008 (in all the cases, the coefficients of correlation and determination were above 0.9). In subsequent years, the relationship changed from reverse to linear. Since the reverse relationship is observed over quite short time periods, it is impossible to use it in computing forecast values. However, given the rise in prices for all types of alcoholic products, the relationships established are substantiating the projected trend of declines in consumption.

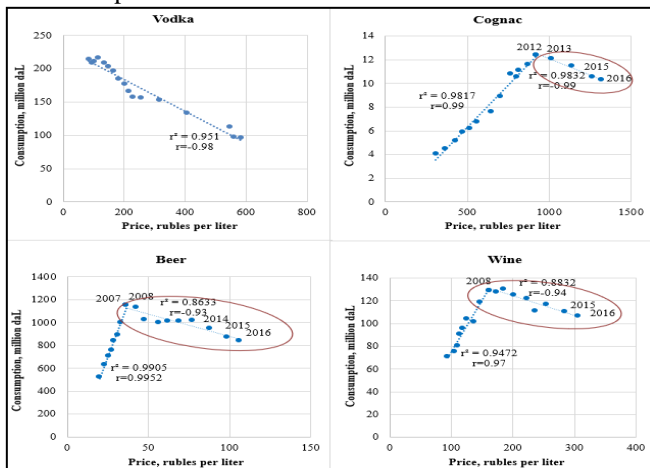


Fig. 3. Relationship between the prices and consumption of certain types of alcoholic products. Data from Rosstat [2]. Calculated by the authors.

V. DISCUSSION

The trends of alcohol consumption declining among Russia’s population are, above all, associated with tightening of government regulation. In particular, the government has lifted its ban on alcohol advertising in the media, introduced a requirement to submit information on alcohol (coming in and sold) to the Unified State Automated Information System, increased excise duties, and prohibited the sale of alcoholic beverages in vessels with a volume of over one and a half liters. The above measures are aimed both at tightening control over the distribution of alcoholic products and combating the sale of counterfeit products and at reducing alcohol consumption among Russia’s population in general. Regulating alcohol production and consumption is a key objective for the government to address, the issue drawing a great deal of attention in the nation at the moment. The modernization of public administration in Russia is predicated on social principles [27]. With that said, it is worth taking into account that the Russian economy is different from its Western counterparts and will not let the government copy most of their models and methods [28], including in the context of resolving the issue of alcohol consumption.

A key tool for government regulation of alcohol consumption is excise duties, which make it possible to raise consumer prices. For instance, in the structure of prices for vodka with a potency of 40% alcohol and up the share of excise duties is 36.5% [2]. The study’s findings confirm that alcohol prices have an effect on alcohol consumption [3], [4],[9],[16],[17]. However, the authors have detected a change in the direction of the relationship between consumption and prices for certain types of alcoholic products. A reverse linear relationship of vodka consumption and prices is observed throughout the period under review. However, when it comes to cognac, beer, and wine, the relationship has changed from linear direct to linear reverse. Declines in consumption in company with increases in price were first recorded in 2008 (beer), 2009 (wine), and 2013 (cognac) and persisted up until 2016. The authors are of the view that a key factor in the shift to a reverse relationship was a decline in real household disposable income – in the period 2008–2009 due to the world financial crisis, and in 2014 due to the economic sanctions imposed by the West. In the second half of 2018, household income stabilized, but it failed to reach the pre-crisis level [2], while prices for alcoholic products continued to rise, which substantiated the projected trend of alcohol consumption declining.



In interpreting the results obtained, it is necessary to take into account that official statistical data may cover not all of the consumption of alcoholic products in the country. At present, Russia lacks appropriate control over moonshining, which has gained momentum in recent years due to the open sale of enhanced home-based factory-manufactured moonshine units. Statistical reporting has failed to factor in sellers of contraband and counterfeit alcohol operating in the shadow market [8].

Concurrently, the Russian market is exhibiting a positive trend of improvement in the quality of alcoholic products. Based on data from the Federal Service for Supervision of Consumer Protection and Welfare, provided by the Federal State Statistics Service [2], in 2016 6% of the entire volume of domestic and 8% of imported spirit and liqueur products and vodka in the Russian market were found to be of improper quality. In 2017, the share of low-grade beverages dropped to 1% and 2%, respectively. In 2017, improper quality was detected in 5% of the total volume of inspected imported wine, as well as in 3% of beer produced domestically and in 6% of imported beer. With that said, in 2017 the authorities detected no low-grade champagne and sparkling wine and cognac, brandy spirits, and cognac spirits.

Thus, the measures undertaken by the government to minimize the consumption of alcoholic products and tighten up control over their distribution are producing positive results. However, they are complicating the activity of entities operating in the market, including trade ones. The new requirements, like the introduction of the Unified State Automated Information System and an increase in prices based on excise duties and VAT, are causing significant increases in expenditure and constraining trade organizations in the economic sphere. With that said, trade activity implies a number of significant social functions, including the satisfaction of people's need for goods and employment and replenishment of the government budget [29]-[31]. In this regard, a key area for further regulation of the distribution and consumption of alcoholic products in Russia is ensuring a balance between measures aimed at restricting their sale to the population and creating an appropriate environment for entities operating in the market.

VI. CONCLUSION

The study has produced the following findings and conclusions with regard to alcohol consumption among Russia's population.

1. The nation has exhibited a downward trend in terms of its per capita consumption of alcoholic products (in absolute alcohol) and overall consumption of alcoholic products (in physical terms). Based on the authors' projections, in 2020, versus 2016, per capita alcohol consumption will drop 3 times and will total 2.2 L, while overall alcohol consumption in physical terms will drop 2 times and will total 529.3 L.

2. The nation's consumption of all types of alcoholic products in physical terms is declining. The consumption of wine products, vodka, and spirit and liqueur products will have decreased nearly 60% by 2020 relative to 2016, and of beer and beer-based beverages – 46.9%. The most stable is the consumption of cognac and brandy spirits, its projected decline being 5%. The consumption of alcoholic products,

exclusive of cognac and brandy spirits, is projected to be minimal by 2020 in the period starting in 2000. The consumption of cognac and brandy spirits will have decreased by 2020 versus the consumption levels registered in the period 2008–2016, but will have exceeded the figures for the period 2000–2007.

3. Russia's alcohol consumption will still be dominated by beer and beer-based beverages, with their share projected to rise – from 79.7% in 2016 to 84.3% in 2020. Cognac and brandy spirits will invariably account for the least share of alcohol consumption, with the figure expected to rise from 1% in 2016 to 1.8% in 2020. The share of vodka and spirit and liqueur products and wine products will decrease insignificantly – to 7.5% and 8.2%, respectively.

4. There is a strong linear relationship between Russia's alcohol consumption and prices. With vodka, this relationship is reverse, i.e. increases in vodka prices correspond to decreases in its consumption. However, the authors have established that the relationship between the consumption and prices of cognac, beer, and wine has changed from direct linear to reverse linear. The authors associate this change with a decline in real household disposable income. Factoring in the rise in prices, the relationships established substantiate the projected trend of alcohol consumption declining.

On the whole, the trends and interrelationships established by the authors may be viewed as positive. However, considering the dual effect of the alcohol industry on the nation's social and economic development, further regulation of alcohol production, distribution, and consumption must ensure a balance between the government's measures aimed at restricting alcohol consumption by the population and its efforts to create a favorable environment for entities operating in the market, with a focus on the replenishment of the national budget.

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