Changes in Alcoholic Beverage Choice and Risky Drinking among Adolescents in Europe 1999–2019

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Abstract: This paper explores trends in beverage preference in adolescents, identifies related regional differences, and examines cluster differences in key drinking measures. Data were obtained from the European School Survey Project on Alcohol and Other Drugs (ESPAD), covering 24 European countries between 1999 and 2019. Trends in the distribution of alcoholic beverages on the participants’ most recent drinking occasion were analysed by sex and country using fractional multinomial logit regression. Clusters of countries based on trends and predicted beverage proportions were compared regarding the prevalence of drinkers, mean alcohol volume and prevalence of heavy drinking. Four distinct clusters each among girls and boys emerged. Among girls, there was not one type of beverage that was preferred across clusters, but the proportion of cider/alcopops strongly increased over time in most clusters. Among boys, the proportion of beer decreased, but was dominant across time in all clusters. Only northern European countries formed a geographically defined region with the highest prevalence of heavy drinking and average alcohol volume in both genders. Adolescent beverage preferences are associated with mean alcohol volume and heavy drinking at a country-level. Future approaches to drinking cultures need to take subpopulations such as adolescents into account.

Keywords: beverage proportions; temporal changes; drinking patterns; youth drinking; alcohol use

1. Introduction

Alcohol consumption is one of the most important risk factors for adverse health effects and mortality [1]. Adolescents are particularly vulnerable to alcohol-related brain damage and the acquisition of problematic drinking behaviours [2,3]. Beverage choice or preference are known to be associated with risky single-occasion drinking [4] or drinking to acute
intoxication [5], mean alcohol intake [4,6], self-reported health status, age and sex [7–10].

While adolescents’ alcohol consumption is declining in many European countries, little is known about how this is expressed in terms of the distribution of the different types of beverages they consume on specific drinking occasions. In addition, little is known about how the distribution of different beverages relates to key measures of alcohol consumption, such as mean alcohol volume and heavy drinking on recent drinking occasions, or how this varies among adolescents across European countries.

There is evidence for an association between the preference for different types of alcoholic beverages and several aspects of alcohol consumption among adolescents. Indicators of risky drinking such as high mean alcohol volume and heavy use are related to beverage choice. Consumers of beer and spirits typically drink more and show higher rates of heavy use as compared to wine drinkers. A preference for wine, in contrast, is known to be associated with less risky drinking [4,5,7,9,11,12]. Similarly, it has been shown that beverage preference among adolescents is also associated with health behaviour beyond alcohol consumption, such as smoking or healthy diet [4,13,14]. Furthermore, consumers preferring beer and spirits and all three beverage types were not only found to be heavier drinkers but were also more likely to engage in delinquent behaviour [13] and experience alcohol-related violence [15].

Beverage choice is subject to temporal changes and differs between countries [8,16–18]. Studies on beverage preferences in the general population have seen countries classified as predominantly wine-, beer- and/or spirit-drinking countries, later named wine-, beer- and former spirit-countries [8,19,20]. It has been suggested that the term ‘former spirits cultures’ be replaced by ‘present beer and wine countries’ [21]. Different framings of drinking culture have been used to classify countries. Countries characterized by low abstinence rates and low levels of heavy drinking (typically Mediterranean) have previously been denoted as having a ‘wet’ drinking culture, where alcohol is mainly consumed with meals and drinking is part of everyday social life, usually practised at home and generally involving the consumption of wine [8,22–24]. Countries with high levels of intoxication, where wine consumption is traditionally less common and where beer and spirits are the preferred beverages, have been classified as having a ‘dry’ drinking culture. These drinking patterns have often been found in northern European countries [25,26]. Importantly, in countries with high levels of intoxication, rates of alcohol-attributable harms were reported to be more prevalent [27]. Due to an increasing homogenisation of drinking patterns in Europe, the dry/wet distinction is no longer considered applicable [17,28,29]. This homogenisation also applies to beverage preferences [16], meaning that the classification of countries as having wine-, beer- and (former) spirit-drinking cultures may also no longer apply [21,28,29]. However, the recent literature on drinking cultures suggests that beverage choice is a decisive factor when describing different drinking behaviours among adults across Europe [28].

Studies on beverage choice in different drinking cultures have primarily been conducted in the adult population, while research among adolescents is lacking. As beverage choice and related drinking behaviour vary substantially across age and sex [30,31], large differences in the distribution of the different beverage types consumed within drinking occasions, and changes over time, are to be expected between population subgroups such as adolescents, younger or older adults, or females and males. This means that the variations in beverage choice evident in previous characterisations of drinking cultures fail to capture differences in drinking patterns across various sub-populations [18,29]. This is particularly the case for adolescents, as general-population alcohol surveys do not usually include persons younger than 18 years of age [28]. However, accounting for recent developments in youth drinking, such as a decrease in alcohol consumption in this population, beverage choice and changes over time are likely to be different from adults in this group. In this study, we address this research gap by focusing specifically on adolescents’ drinking.

Using an exploratory and data-driven approach, we (1) examined how the distribution of different alcoholic beverages (beer, wine, spirits and cider/alcopops) among girls and boys
on recent drinking occasions varied over time and across European countries; (2) clustered adolescent beverage choice in European countries according to common beverage type distributions and trends; and (3) compared the resulting clusters with the prevalence of drinkers, and the prevalence of heavy drinkers and mean alcohol volume consumed on the last drinking day.

2. Methods

2.1. Data

Data on alcohol consumption were obtained from six waves (1999, 2003, 2007, 2011, 2015, and 2019) of the European School Survey Project on Alcohol and Other Drugs (ESPAD). In brief, cross-sectional school surveys were conducted every 4th year since 1995 for 15- to 16-year-old students. With the exception of Germany (Bavaria), in each participating country, sampling was carried out nationwide, using a stratified cluster sampling design. Data were collected in classrooms with either paper-and-pencil or online questionnaires. Participation was anonymous and voluntary. Different school types were included, with the class constituting the last unit of the multi-stage stratified sampling design [32]. For 24 countries, data on alcohol consumption were available for at least five waves; these countries were included in this study. The countries included were Bulgaria (BG), Croatia (HR), Cyprus (CY), the Czech Republic (CZ), Denmark (DK), Estonia (EE), Finland (FI), Germany (Bavaria) (DE), Greece (GR), Hungary (HU), Iceland (IS), Italy (IT), Latvia (LV), Lithuania (LT), Malta (MT), the Netherlands (NL), Norway (NO), Poland (PO), Portugal (PT), Romania (RO), the Slovak Republic (SK), Slovenia (SI), Sweden (SE) and Ukraine (UA).

2.2. Measures

The consumption of five different types of alcoholic beverage, beer, cider, alcopops, wine and spirits, was assessed for the last drinking day. To this end, participants were asked for each beverage separately, ‘If you drank beer/cider/alcopops/wine/spirits the last day you drank alcohol, how much did you drink?’ Beer/cider/alcopops were categorised as ‘<50 cl’, ‘50–100 cl’, ‘101–200 cl’ and ‘>200 cl’. The response categories for wine were ‘<10 cl’, ‘10–30 cl’, ‘≥75 cl’ until 2003, and changed to ‘<20 cl’, ‘20–40 cl’, ‘41–74 cl’ and ‘≥75 cl’ in 2007; the response categories for spirits were ‘<5 cl’, ‘5–10 cl’, ‘11–25 cl’ and ‘≥30 cl’ until 2003, and ‘<8 cl’, ‘8–15 cl’, ‘16–24 cl’ and ‘>25 cl’ from 2007. Quantities of pure alcohol per beverage type were converted into centilitres of pure alcohol using midpoints of the range of beverage quantities multiplied by the following alcohol concentrations: 5 vol% for beer, cider, and alcopops, 12 vol% for wine and 38 vol% for spirits [33]. For the present analysis, cider and alcopops were considered together. From this, the total amount of pure alcohol consumed on the last drinking day, and the distribution of four different beverage types (beer, wine, spirits, cider/alcopops) as the proportion of total alcohol intake reported as being consumed on the last drinking day, was calculated. To capture the prevalence of ‘heavy drinking’, a dichotomous variable was created with a cut-off set at five standard drinks of 12 g of pure alcohol at the last drinking day. The prevalence of drinkers in the last 12 months was derived from a non-zero response to the question ‘On how many occasions (if any) have you had any alcoholic beverage to drink (…) during the past 12 months?’ A time variable with values ranging from 1 to 6 was generated for surveys conducted between 1999 and 2019 in four-year intervals.

2.3. Statistical Analyses

Due to the well-known sex differences in alcohol consumption, all analyses were conducted separately for girls and boys. Trends in the distribution of beverage types were analysed using fractional multinomial logit regression [34–37], a multivariate generalization of the fractional logit model proposed by Papke and Wooldridge [38]. Analyses were conducted using sample weights to control for the sample-specific characteristics of each country and using school as cluster variable for standard error adjustment (robust estimator
of variance) [39–41]. The models were applied for each country, assuming the survey year to be a linear predictor. The analysis of linear trends was considered sufficient to capture the direction of change (increasing vs. decreasing). Further, the model requires a function of the same degree for all beverage types, i.e., no mixture of linear and quadratic or cubic trends in the beverage types. The proportions of total consumption represented by each beverage can vary between 0 and 100, adding up to 100% across all four beverage types for each participant. Consequently, the measures are mutually dependent and need to be treated as compositional data [42]. Cider/alcopops was used as a reference category. The resulting coefficients reflect the change in the proportion of beer, wine, and spirits, and must be interpreted relative to the change in the reference category. The predicted proportions of total consumption for each beverage (beer, wine, spirits, cider/alcopops) were calculated by country.

Based on the results from the fractional multinomial logit regression models for each country and sex, the trend coefficients for beer, wine and spirits, and the average predicted beverage proportions of total consumption (beer, wine, spirits, cider/alcopops) across all waves were used as variables in a hierarchical cluster analysis. The Ward’s method for linking and the Squared Euclidian Distance, an agglomerative approach, were applied on the basis of the variance of clusters. In each step, the sum of the squared distance of the individual cases from the respective cluster centroid was calculated for all pairs of clusters that were possibly being merged. The two clusters with the smallest increase in the total sum of squared distances were merged in the respective step [43,44].

Data from countries in the resulting clusters were pooled and the trend analyses, as described above, were applied within all clusters in girls and boys. Changes in beverage proportions across time were further examined by the difference between the highest and lowest rate between 2019 and 1999. The cut-off of 10 percentage points (pp) was used to consider the observed changes as diverging (positive difference ≥ 10 pp) or converging (negative difference ≤ 10 pp). Clusters were compared in terms of the prevalence of 12-month drinkers, mean alcohol volume and prevalence of heavy drinking on the last drinking day. Except for the prevalence of drinkers, the estimates were based on the subsample of the last 12-month drinkers. To account for different, country-specific sample sizes, these indicators were calculated for each cluster as the mean of the arithmetic country’s means across the whole observation period.

3. Results

Table A1 provides an overview of sample size by country and year. Table A2 shows the prevalence of drinkers and mean consumption of pure alcohol (cl) by country and year. The total sample size across all surveys and countries comprised 434,476 students; of these, 345,408 students reported any drinking in the last 12 months prior to the surveys.

3.1. Analysis of Beverage Choice with Multinomial Logit Regression

The results of the fractional multinominal regression analyses, as well as the model-predicted beverage choice by beverage, country and year, on which the following analyses are based, are depicted in Tables A3–A6. Across all countries, coefficients among girls and boys, respectively, ranged from −0.62 to 0.52 and −0.56 to 0.66 for beer, from −0.51 to 0.69 and −0.58 to 0.70 for wine, and from −0.95 to 0.91 and −0.70 to 0.95 for spirits. Regarding beverage choice, the predicted beverage proportions differed for girls and boys, respectively, and ranged from 7.5% to 78.5% and 31.1% to 84.0% for beer, 4.5% to 40.1% for wine, 2.2% to 43.0% and 1.6% to 24.7% for spirits and 1.6% to 61.8% and 1.4% to 46.3% for cider/alcopops.

3.2. Clusters of Country-Specific-Trends in Beverage Choice

The cluster analysis, which was conducted using the trend coefficients for each beverage type and the predicted proportions of beverage choice, yielded four distinct clusters for both girls and boys (Figures 1 and 2). Among the girls (Figure 1), the first cluster, compris-
ing Bulgaria, Cyprus, Iceland, Italy, Latvia, the Netherlands, Poland and Portugal, included the largest number of countries (Table 1). Over the twenty-year period, the proportion of cider/alcopops increased (+18 pp), while the proportion of beer declined (−15 pp) in this cluster. The second cluster, including Croatia, Greece, Lithuania, Romania and Germany, was characterised by a decrease in cider/alcopops over time (−14 pp). In the third cluster, comprising the Czech Republic, Hungary, Malta, Slovak Republic and Slovenia, beverage proportions converged over time. Here, the proportion of cider/alcopops increased over the twenty years (+18 pp), while the proportion of wine decreased (−7 pp). However, the wine proportion remained the highest proportion in this cluster. Finally, Denmark, Estonia, Finland, Norway, Sweden, and Ukraine constituted the fourth cluster, with a decreasing proportion of beer (−17 pp) and an increasing proportion of cider/alcopops (+21 pp) over time. The latter was the dominant beverage category across the observed period. This was the only case in which trends in beverage proportions were generally diverging.

**Figure 1.** Clusters of trends in distribution of beverages consumed on most recent drinking occasions for girls.
Figure 2. Clusters of trends in distribution of beverages consumed on most recent drinking occasions for boys.

Table 1. Clusters by country, dominant beverage(s), trends, and difference between highest and lowest in 2019 and highest and lowest in 1999 for girls.

| Cluster | Countries | Dominant Beverage(s) (over Years) | Trends ¹ | Difference (Highest–Lowest 2019 Beverage Minus Highest–Lowest Beverage in 1999) |
|---------|-----------|----------------------------------|---------|---------------------------------------------------------------------------------|
| 1       | Bulgaria, Cyprus, Iceland, Italy, Latvia, Netherlands, Poland, and Portugal | Beer (40%) Cider/alcopops emerging (20%) Wine (32%) | Beer ↓ Cider/alcopops ↑ | −26.06 pp; converging |
| 2       | Croatia, Greece, Lithuania, Romania, Germany | Beer (31%) Spirits (16%) Wine (32%) | Cider/alcopops ↓ | 3.18 pp; stable |
| 3       | Czech Republic, Hungary, Malta, Slovak Republic, and Slovenia | Wine (39%) Spirits (24%) | Wine ↓ Cider/alcopops ↑ | −41.53 pp; converging |
| 4       | Denmark, Estonia, Finland, Norway, Sweden, and Ukraine | Cider/alcopops (47%) | Cider/alcopops ↑ Beer ↓ | 24.48 pp; diverging |

¹ Presentation of a selection of trends that particularly shape the development in the respective clusters; ↓ decreasing trend; ↑ increasing trend.

Among boys (Figure 2), the first identified cluster included Bulgaria, Cyprus, Czech Republic, Latvia, the Netherlands, and Poland, with all countries other than Czech Republic also in the first cluster identified among girls (Table 2). In this cluster, the proportion of cider/alcopops increased (+16 pp) and the proportion of beer decreased (−19 pp) over time. Despite the decrease, beer remained the dominant beverage, with a mean share of 62% across all years. The second cluster, comprising Greece, Iceland, Lithuania, Portugal, Romania and Germany, was characterised by a high proportion of wine, second to beer, as the dominant beverage. The third cluster, including Croatia, Estonia, Hungary, Italy, Malta, Slovak Republic, Slovenia and Ukraine, was the cluster with the largest number of countries. Although the proportions of cider/alcopops increased over time (+12 pp), in
this cluster, beer remained the dominant beverage. Finally, a fourth cluster, with Denmark, Finland, Norway and Sweden in common with the fourth cluster in girls, was identified. However, the characteristics of the clusters differed considerably between both sexes. Beer and cider/alcopops were the dominant beverages in boys. In girls, the proportion of cider/alcopops increased (16 pp) and the proportion of beer decreased (−11 pp); the levels of these beverages were also much lower and higher, respectively.

Table 2. Clusters by country, dominant beverage(s), trends, and difference between highest–lowest 2019 and highest–lowest in 1999 for boys.

| Cluster | Countries                                      | Dominant Beverage(s) (over Years) | Trends | Difference (Highest–Lowest 2019 Beverage Minus Highest–Lowest Beverage in 1999) |
|---------|------------------------------------------------|----------------------------------|--------|---------------------------------------------------------------------------------|
| 1       | Bulgaria, Cyprus, Czech Republic, Latvia, Netherlands, Poland | Beer (62%) Cider/alcopops (11%) | Beer ↓ | −22.63 pp; converging                                                           |
| 2       | Greece, Iceland, Lithuania, Portugal, Romania, Germany Croatia, Estonia, Hungary | Beer (43%) Wine (29%) Cider/alcopops ↑ | −9.52 pp; converging |
| 3       | Italy, Malta, Slovak Republic, Slovenia Ukraine | Beer (52%) Cider/alcopops ↓ | −3.64 pp; stable |
| 4       | Denmark, Finland, Norway, and Sweden            | Beer (47%) Cider/alcopops (30%) | Beer ↓ | −8.17 pp; converging                                                            |

Figure 3 graphically shows the classification of countries into clusters for girls and boys. Apart from the northern European countries (boys), including Estonia and Ukraine (girls), forming one cluster, no other cluster matched an approximate geographically defined region. Although this cluster comprised almost the same countries for both girls and boys, there are large sex differences with regard to beverage choice. In girls, cider and alcopops were the most preferred beverage over the 20-years period, while, for boys, beer was the beverage of choice. In general, the variability between clusters was larger for girls than boys. Various beverages emerged as dominant in the clusters for girls, while for boys, beer was the dominant beverage in all four clusters, with the proportion never falling below 40%. All other beverage types barely exceeded 25%; only wine (cluster 2) and cider/alcopops (cluster 4) temporarily exceeded this level (Figures 1 and 2).

3.3. Differences in Indicators of Drinking between Clusters

Compared to the remaining clusters, the fourth cluster for both sexes, largely representing northern European countries, showed a higher overall mean alcohol volume and a higher prevalence of heavy drinking (Tables 3 and 4). Conversely, the prevalence of drinkers was statistically significantly lower. Mean alcohol volume and the prevalence of heavy drinking in the remaining clusters were similar. However, in the first cluster of boys, both mean alcohol volume and the prevalence of heavy drinking were higher than in the second and third cluster, but lower than in the fourth cluster. Overall, the estimates for the two risky drinking indicators were considerably higher in boys than girls.
sexes. Beer and cider/alcopops were the dominant beverages in boys. In girls, the proportion of cider/alcopops increased (16 pp) and the proportion of beer decreased (−11 pp); the levels of these beverages were also much lower and higher, respectively.

Table 2. Clusters by country, dominant beverage(s), trends, and difference between highest–lowest 2019 and highest–lowest in 1999 for boys.

| Cluster | Countries               | Dominant Beverage(s) | Trends          | Difference (Highest–Lowest 2019 Beverage Minus Highest–Lowest Beverage in 1999) |
|---------|-------------------------|-----------------------|-----------------|--------------------------------------------------------------------------------|
| 1       | Bulgaria, Cyprus, Iceland, Italy, Latvia, Netherlands, Poland, Portugal | Beer (62%)           | Cider/alcopops  | ↑ −22.63 pp; converging                                                      |
| 2       | Croatia, Greece, Lithuania, Romania, Germany | Beer (43%) Wine (29%) | Cider/alcopops  | ↑ −9.52 pp; converging                                                      |
| 3       | Czech Rep., Hungary, Malta, Slovak Rep., Slovenia | Cider/alcopops  | ↑ −3.64 pp; stable |                                                                 |
| 4       | Denmark, Estonia, Finland, Norway, Sweden, Ukraine | Cider/alcopops  | ↑ −8.17 pp; converging |                                                                 |

Figure 3 graphically shows the classification of countries into clusters for girls and boys. Apart from the northern European countries (boys), including Estonia and Ukraine (girls), forming one cluster, no other cluster matched an approximate geographically defined region. Although this cluster comprised almost the same countries for both girls and boys, there are large sex differences with regard to beverage choice. In girls, cider and alcopops were the most preferred beverage over the 20-years period, while, for boys, beer was the beverage of choice. In general, the variability between clusters was larger for girls than boys. Various beverages emerged as dominant in the clusters for girls, while for boys, beer was the dominant beverage in all four clusters, with the proportion never falling below 40%. All other beverage types barely exceeded 25%; only wine (cluster 2) and cider/alcopops (cluster 4) temporarily exceeded this level (Figures 1 and 2).

Table 3. Clusters by country and indicators of drinking for girls.

| Cluster | Country          | Prevalence of Drinkers (%), SD | Heavy Drinking (%), SD | Alcohol Volume (Mean, SD) |
|---------|------------------|--------------------------------|------------------------|---------------------------|
| 1       | Bulgaria, Cyprus, Iceland, Italy, Latvia, Netherlands, Poland, Portugal | 71.96 (7.41) | 14.08 (8.08) | 3.47 (0.97) |
| 2       | Croatia, Greece, Lithuania, Romania, Germany | 84.27 (5.76) | 11.92 (5.62) | 3.37 (0.79) |
| 3       | Czech Rep., Hungary, Malta, Slovak Rep., Slovenia | 86.85 (2.95) | 10.66 (2.91) | 3.12 (0.41) |
| 4       | Denmark, Estonia, Finland, Norway, Sweden, Ukraine | 78.93 (7.33) | 26.37 (9.45) | 5.03 (0.96) |

Table 3. Clusters by country and indicators of drinking for girls.

1 Drinkers only.
Table 4. Clusters by country and indicators of drinking for boys.

| Cluster | Country       | Prevalence of Drinkers (%, SD) | Heavy Drinking (%) | Alcohol Volume (Mean, SD) |
|---------|---------------|-------------------------------|-------------------|--------------------------|
| 1       | Bulgaria      | 81.27 (7.09)                  | 30.54 (7.64)      | 5.36 (0.54)              |
|         | Cyprus        |                               |                   |                          |
|         | Czech Rep.    |                               |                   |                          |
|         | Latvia        |                               |                   |                          |
|         | Netherlands   |                               |                   |                          |
|         | Poland        |                               |                   |                          |
| 2       | Greece        | 78.63 (12.23)                 | 25.04 (8.48)      | 4.85 (0.94)              |
|         | Iceland       |                               |                   |                          |
|         | Lithuania     |                               |                   |                          |
|         | Portugal      |                               |                   |                          |
|         | Romania       |                               |                   |                          |
|         | Germany       |                               |                   |                          |
| 3       | Croatia       | 85.92 (2.06)                  | 24.91 (5.41)      | 5.11 (0.69)              |
|         | Estonia       |                               |                   |                          |
|         | Hungary       |                               |                   |                          |
|         | Italy         |                               |                   |                          |
|         | Malta         |                               |                   |                          |
|         | Slovak Rep.   |                               |                   |                          |
|         | Slovenia      |                               |                   |                          |
|         | Ukraine       |                               |                   |                          |
| 4       | Denmark       | 76.47 (10.07)                 | 43.89 (6.92)      | 6.75 (0.84)              |
|         | Finland       |                               |                   |                          |
|         | Norway        |                               |                   |                          |
|         | Sweden        |                               |                   |                          |

1 Drinkers only.

4. Discussion

We examined the beverage choices of 15–16-year-old adolescents on recent drinking occasions in 24 European countries and how they evolved over time. We investigated these changes separately for girls and boys and performed a cluster analysis to detect commonalities and differences between countries. Four clusters emerged for both sexes. Remarkably, in the majority of clusters, the preference for cider/alcopops increased over time, while the preference for more traditional beverages decreased. We found that risky drinking behaviours, in terms of high mean alcohol volume and high prevalence of heavy drinking on the most recent drinking day, were more common in northern European countries, Estonia, and Ukraine (in the latter two countries only among girls), the cluster where cider/alcopops were most (and, for boys, second most) preferred.

Previous research has found an association between a preference for spirits and heavy use in adolescents [5,9] and adults [28]. In contrast with the findings from Kilian and colleagues’ adult sample, spirits were not identified as the most preferred beverage in any cluster. In all clusters, the preference for spirits almost constantly ranked 3rd or 4th, indicating that, among 15–16-year-old adolescents in Europe, spirits are not typically preferred. Even though, as known from previous studies, drinking spirits is associated with a higher alcohol intake at the individual level, the present clusters may not differ in terms of indicators of risky drinking due to the generally low proportions of spirit consumption. This is not surprising, as the availability of spirits is limited for adolescents by youth protection legislation and for financial reasons.

Among girls in northern European countries (cluster 4), high and increasing proportions of cider/alcopops were associated with higher mean alcohol volume and a higher prevalence of heavy drinking on participants’ most recent drinking occasion. An increase in the proportion of cider and alcopops among the youngest cohort could also be found in a recent study on beverage preferences according to age, period and cohort in Sweden [30].
In contrast, a preference for beer—known to be associated with a higher alcohol intake and more alcohol-related problems [45–47]—was found to be comparatively low. The picture was different for boys: clusters with a high mean alcohol consumption and a high prevalence of heavy drinking, including the northern European countries (cluster 4), were characterised by a strong preference for beer, in combination with a high or increasing preference for cider/alcopops. Although the prevalence of monthly heavy drinking among adolescents has sharply declined in northern European countries, the level of heavy drinking is still comparable to those in other regions [48]. Despite these changes, adolescents in northern European countries seem to match the adult drinking habits that are traditionally described as a dry drinking culture [25,26]. Our findings on heavy drinking in northern European countries are similar to those reported by Bye and Rossow [49], who classified 13 European countries in terms of the incidence of intoxication. They found that Finland, Norway, and Sweden formed the group with the highest rates of intoxication [49]. Apart from the northern European cluster for girls and boys, there was little overlap between our clusters and descriptions of geographically distinct drinking cultures in terms of beverage preference. For instance, no cluster showed the typically Mediterranean beverage preference for wine. Our findings highlight the importance of looking at young people separately.

Beverage choice among adolescents is a function of various aspects, including taste or predilection, as well as the availability of specific beverages. Accordingly, the distribution of the beverage types consumed on drinking occasions may reflect changes in availability. In Sweden, Norway and Finland, alcohol, with the exception of low-alcohol beverages, can only be purchased in government-run alcohol monopoly stores, where age limits are controlled more strictly than in grocery stores, in which beverages with a low alcohol content are sold [50]. Laws on alcopops have been eased in Norway over the observed time period; since 2003, they can be sold in grocery stores under the same conditions as low-alcohol beverages [51]. In Finland, the maximum alcohol content of beverages sold in grocery stores was raised from 4.7% to 5.5% in 2018. Such changes may partly underpin the evident increase in the preference for cider/alcopops over time, particularly in the northern European countries (cluster 4). From a public-health perspective, these developments may be problematic. We found increasing and, particularly in girls, high proportions of cider and alcopop consumption. This was most evident in cluster 4, which also showed the highest average prevalence of heavy drinking and mean consumption. These are likely to lead to corresponding increases in harm. These results have implications for prevention strategies and policies aimed at reducing alcohol-related harms, such as increasing alcohol excise duties to reduce the affordability of alcoholic beverages. For example, the work of Meier and colleagues [52] suggests that these interventions have differential effects according to gender, age, drinking level and context; increasing the price of cheap on-trade or on-trade and off-trade alcohol affects young, male heavy drinkers. Similarly, beverage-specific taxes such as the so-called ‘alcopops’ taxes have been shown to reduce the consumption of alcopops [53]. However, the taxation of alcopops should be part of a holistic alcohol taxation strategy in which all alcoholic beverages are taxed according to their alcohol content, so that a reduction in overall consumption is a priority, and major shifts towards cheaper products are avoided. Reducing the alcohol content of the respective drinks, so that less alcohol is consumed with the same fluid intake [54], or increasing the minimum age of consumption from 16 to 18 years could also be effective [55]. Importantly, these beverage-specific, tailored and targeted strategies can have wider benefits across consumption, including broader alcohol consumption levels and links to related outcomes, such as sexually transmitted infections [56] and other harms [57].

Most importantly, recent discussions on drinking cultures have already extended beyond the subject of traditionally preferred beverages [18,29,58]. When describing and distinguishing drinking cultures in adults as well as adolescents, several aspects must be considered, with beverage preference being only one of them. These include, but are not limited to, the proportion of abstainers, the prevalence of heavy drinking, average alcohol intake per drinking day and the drinking context [18,28]. In terms of beverage preference,
our results indicate that adolescents’ choices do not mirror population-level approaches to drinking culture or classifications by dominant beverages. The traditional geographical division between countries does not neatly apply to our findings with adolescents. Additionally, viewing drinking cultures as homogeneous units is not satisfactory. While the distinction between dry/wet drinking cultures considers supranational similarities, it neglects within-country differences [29]. This implies that the traditional concepts of drinking cultures may not apply to adolescents, and suggests a need to broaden the understanding of drinking culture and develop new concepts and theories.

A generic view of drinking cultures tends to result in stereotypes that do not reflect the variation in actual consumption behaviour. The notion of there being ‘many drinking cultures’ within a society has recently come to the fore. Kilian and colleagues postulated the existence of several combinations of drinking cultures within a country rather than only one [28]. Descriptions below the macro-level that consider sub-societal entities already exist. However, they primarily refer to ethnic subgroups [29,59,60], sex e.g., [8,61], social class [62] or subcultures, such as lifestyle or music taste [29,63,64], rather than adolescents. The findings of Kraus and colleagues [30] point towards strong age effects regarding beverage choice. We would thus argue that adolescents represent a subgroup whose drinking behaviour is subject to specific influences from their peer group, social media, or celebrities, which need to be considered separately. In addition, there are changes related to external influences that are independent of age, such as technical developments, the economic situation or globalisation [65]. These may affect some groups more than others, and may particularly affect adolescents, as they are in their formative years [66,67]. This might eventually lead to the observed variations in adults’ and adolescents’ beverage preferences.

Limitations

ESPAD data on alcohol consumption derive from self-reported consumption on the last drinking day. Hence, the reported amount and type of alcohol consumed may not be representative of an individual’s drinking behaviour [68,69] and may be underreported [70,71]. However, trends in beverage choice will be unaffected, as long as underreporting by beverage type does not change considerably over time [72]. Second, hierarchical cluster analysis lacks statistical decision criteria, leading to an arbitrary number of clusters. However, comparisons with solutions with more or fewer clusters did not result in geographically distinct clusters or clusters with a high mean alcohol volume that did not contain northern European countries, Estonia and Ukraine (data available on request). Third, in 2007, some response categories regarding quantities of wine and spirits consumption were slightly changed, with shifts to higher and lower quantities, respectively. However, no systematic biases are expected to affect the main results because individual beverage proportions are calculated based on total alcohol volume, which is modified by the changed categories to the same extent as the volume of the specific beverage (i.e., wine, spirits) that was consumed. Thus, we expect only minor shifts in the beverage proportions. Moreover, as these changes equally apply to all countries, between-country comparisons are not affected. Fourth, the weight of individual countries in the clusters varies according to sample size. As the fractional multinomial logit regression model for calculating within-cluster trends contains country-specific weights to control for sample characteristics and adjust for the standard error individuals nested within schools, additional weighting by sample size was not possible. Similarly, using the mean of the arithmetic country means that the regression analysis of each cluster results in model overspecification. However, sensitivity analyses based on the raw data revealed only marginal differences, justifying the use of pooled data. Finally, clusters of trends in beverage preference were compared with indicators of drinking (prevalence of drinking, mean alcohol volume and prevalence of heavy drinking) across the entire observation period. Hence, the associations between changes in beverage preferences and average consumption indicators need to be cautiously interpreted.
5. Conclusions

Temporal trends in beverage preferences among adolescents vary considerably between European countries and between girls and boys. Adolescent beverage choices and changes in beverage choice are associated with alcohol volume and heavy drinking, particularly with the high and increasing proportions of the use of cider/alcopops. This points to the necessity of considering beverage choice in alcohol policies. Measures such as the adaptation of taxes, and minimum pricing policies for beverages associated with risky drinking behaviour, might be effective here. In addition to clusters consisting of primarily northern European countries, the resulting clusters do not match the previous findings of geographically distinct regions, representing particular drinking cultures. The present results support the recent debate on drinking cultures, suggesting the importance of beverage choice and considering various drinking patterns within countries. Future approaches to the study of drinking cultures should broaden their scope by acknowledging adolescents as a distinct subpopulation.

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Data Availability Statement: The ESPAD trend data are archived at the Italian National Research Council (CNR) where data can be applied for research purposes.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Sample size, by country and year (1999–2019), including abstainers.

| Country         | 1999 | 2003 | 2007 | 2011 | 2015 | 2019 |
|-----------------|------|------|------|------|------|------|
| Bulgaria        | –    | 2666 | 2353 | 2217 | 2922 | 2864 |
| Croatia         | 3555 | 2852 | 3008 | 3002 | 2558 | 2772 |
| Cyprus          | –    | 2142 | 6340 | 4243 | 2098 | 1224 |
| Czech Republic  | 3543 | 3149 | 3901 | 3913 | 2738 | 2778 |
| Denmark         | 1546 | 2504 | 877  | 2181 | 1670 | 2488 |
| Estonia         | –    | 2431 | 2372 | 2460 | 2452 | 2520 |
| Finland         | 3003 | 3219 | 4988 | 3744 | 4049 | 4594 |
| Germany         | –    | 4219 | 5011 | 2796 | 862  | 1459 |
| Greece          | 2195 | 1891 | 3060 | 5908 | 3202 | 5988 |
| Hungary         | 2726 | 3109 | 2817 | 3063 | 2735 | 2423 |
| Iceland         | 3457 | 3313 | 3510 | 3333 | 2663 | 2534 |
| Italy           | 4073 | 4818 | 9981 | 4837 | 4059 | 2542 |
Table A1. Cont.

| Country | 1999 | 2003 | 2007 | 2011 | 2015 | 2019 |
|---------|------|------|------|------|------|------|
| Latvia  | 2296 | 2816 | –    | –    | –    | –    |
| Lithuania | – | 5028 | 2411 | 2476 | 2573 | 2733 |
| Malta   | 3635 | 3443 | 3668 | 3377 | 3326 | 3043 |
| Netherlands | 2613 | 2068 | 2091 | 2044 | 1684 | 1288 |
| Norway  | 3753 | 3745 | 3482 | 2876 | 2393 | 2393 |
| Poland  | 3269 | 5842 | 2120 | 8934 | 11,822 | 5047 |
| Portugal | 3577 | 2919 | 3141 | 1965 | 3456 | 4365 |
| Romania | 2368 | 4323 | 2298 | 2770 | 3500 | 3764 |
| Slovak Republic | 2437 | 2122 | 2468 | 2009 | 2208 | 2546 |
| Slovenia | 2347 | 2758 | 3085 | 3186 | 3484 | 3413 |
| Sweden  | 3271 | 3212 | 3179 | 2569 | 2551 | 2546 |
| Ukraine | 2958 | 4114 | 2447 | 2210 | 2731 | 2731 |

Table A2. Prevalence of drinkers and mean consumption (drinkers only) in pure alcohol (cl) by country and year (1999–2019).

| Country      | Prevalence of Drinkers | Mean Consumption |
|--------------|------------------------|------------------|
|              | 1999 2003 2007 2011 2015 2019 | 1999 2003 2007 2011 2015 2019 |
| Bulgaria     | – 80% 86% 87% 86% 81% – | 3.49 4.20 3.88 4.22 3.66 |
| Croatia      | 80% 88% 86% 88% 85% 81% | 4.28 5.31 3.88 4.22 3.66 |
| Cyprus       | – 85% 65% 85% 84% 78% – | 5.23 3.16 4.30 4.28 3.67 |
| Czech Republic | 91% 94% 93% 93% 91% 4.74 | 5.07 5.14 5.00 4.74 4.72 |
| Denmark      | 95% 94% 92% 90% 88% 6.45 | 7.67 6.89 7.90 7.94 6.38 |
| Estonia      | – 92% 92% 93% 85% 80% | 5.47 5.87 4.50 4.11 4.64 |
| Finland      | 90% 84% 81% 80% 69% 67% | 7.07 6.32 6.02 6.09 5.05 4.73 |
| Germany      | – 91% 92% 81% 79% 83% – | 6.96 4.74 4.68 4.65 4.32 |
| Greece       | 92% 93% 88% 90% 91% 86% | 3.07 4.34 2.98 3.09 3.09 |
| Hungary      | 76% 84% 87% 91% 89% 88% | 2.47 3.62 4.19 4.04 4.25 |
| Iceland      | 78% 72% 63% 49% 30% 31% | 6.08 6.57 5.72 3.92 3.78 |
| Italy        | 80% 81% 85% 82% 81% 80% | 2.75 3.38 4.09 4.16 4.35 |
| Latvia       | 82% 86% – 89% 78% 82% | 2.90 4.48 – 4.61 4.21 3.62 |
| Lithuania    | – 96% 91% 93% 81% 69% – | 5.74 4.35 4.44 3.28 2.33 |
| Malta        | 91% 89% 88% 86% 82% 77% | 4.50 5.00 3.39 3.35 2.91 3.07 |
| Netherlands  | 75% 66% 88% 82% 67% 68% | 5.11 5.90 3.67 3.62 3.34 3.34 |
| Norway       | 82% 80% 74% 66% 55% 49% | 5.25 5.71 7.06 6.02 5.19 4.59 |
| Polan        | 80% 81% 81% 81% 76% 75% | 4.73 5.18 4.19 4.65 4.24 4.11 |
| Portugal     | 71% 63% 73% 80% 67% 62% | 3.22 3.09 2.10 2.52 2.44 2.86 |
| Romania      | 82% 87% 79% 75% 67% 73% | 2.98 4.59 3.41 3.29 2.81 2.77 |
| Slovak Republic | 87% 88% 89% 87% 86% 87% | 3.01 3.55 3.67 3.87 3.87 4.11 |
| Slovenia     | 85% 86% 91% 89% 84% 79% | 4.35 4.82 4.99 4.77 3.92 3.78 |
| Sweden       | 84% 79% 75% 68% 57% 51% | 6.05 5.80 5.37 5.67 4.65 3.34 |
| Ukraine      | 85% 84% 82% 86% 70% 82% | 3.46 3.52 3.89 3.70 3.43 5.10 |

Table A3. Regression coefficients of time trends in beverage proportions with reference category cider/alcopops for girls.

| Country      | Alcohol Consumption |
|--------------|---------------------|
|              | Coefficient | SE   | Country   | Alcohol Consumption |
|              |            |     |           | Coefficient | SE   |
| Bulgaria     | spirits    | –0.191*** | –0.047 | Latvia     | spirits    | –0.245*** | –0.027 |
|              | beer       | –0.511*** | –0.037 |           | beer       | –0.357*** | –0.021 |
|              | wine       | 0.04  | –0.045   |           | wine       | –0.338*** | –0.024 |
| Croatia      | spirits    | 0.247*** | –0.024 | Lithuania | spirits    | 0.493***  | –0.038 |
|              | beer       | 0.121*** | –0.025 |           | beer       | 0.061**   | –0.030 |
|              | wine       | 0.200*** | –0.024 |           | wine       | 0.290***  | –0.024 |
| Cyprus       | spirits    | –0.497*** | –0.067 | Malta     | spirits    | –0.280*** | –0.028 |
|              | beer       | –0.584*** | –0.084 |           | beer       | –0.332*** | –0.026 |
|              | wine       | –0.482*** | –0.070 |           | wine       | –0.334*** | –0.023 |
| Czech Rep.   | spirits    | –0.545*** | –0.030 | Netherlands | spirits    | –0.947*** | –0.057 |
|              | beer       | –0.523*** | –0.026 |           | beer       | –0.623*** | –0.042 |
|              | wine       | –0.513*** | –0.030 |           | wine       | –0.241*** | –0.029 |
| Country      | Coefficient | SE     | Country     | Coefficient | SE     |
|--------------|-------------|--------|-------------|-------------|--------|
| **Denmark**  |             |        | **Czech Rep.** |             |        |
| spirits      | 0.122 **    | −0.065 | beer        | −0.091 **   | −0.027 |
| beer         | −0.201 **   | −0.081 | wine        | −0.080 **   | −0.034 |
| **Estonia**  |             |        |             |             |        |
| spirits      | 0.029       | −0.029 | beer        | −0.180 **   | −0.040 |
| beer         | −0.159 ***  | −0.032 | wine        | −0.301 **   | −0.038 |
| **Finland**  |             |        |             |             |        |
| spirits      | 0.035       | −0.024 | beer        | −0.100 ***  | −0.019 |
| beer         | −0.127 ***  | −0.017 | wine        | −0.124 ***  | −0.024 |
| **Germany**  |             |        |             |             |        |
| spirits      | 0.029       | −0.035 | beer        | 0.912 **    | −0.049 |
| beer         | 0.134 ***   | −0.028 | wine        | 0.522 **    | −0.037 |
| **Greece**   |             |        |             |             |        |
| spirits      | −0.014      | −0.025 | beer        | 0.391 **    | −0.028 |
| beer         | 0.049 *     | −0.027 | wine        | 0.341 **    | −0.030 |
| **Hungary**  |             |        |             |             |        |
| spirits      | −0.319 ***  | −0.031 | beer        | −0.027      | −0.023 |
| beer         | −0.081 ***  | −0.025 | wine        | −0.089 ***  | −0.023 |
| **Iceland**  |             |        |             |             |        |
| spirits      | −0.107 ***  | −0.034 | beer        | −0.018      | −0.027 |
| beer         | −0.284 ***  | −0.02  | wine        | −0.327 ***  | −0.021 |
| **Italy**    |             |        |             |             |        |
| spirits      | −0.701 ***  | −0.033 | beer        | −0.059 ***  | −0.018 |
| beer         | −0.359 ***  | −0.024 | wine        | 0.043 **    | −0.017 |

*p < 0.1; **p < 0.05; ***p < 0.001.

Table A4. Regression coefficients of time trends in beverage proportions with reference category cider/alcopops for boys.

| Country       | Coefficient | SE     | Country       | Coefficient | SE     |
|---------------|-------------|--------|---------------|-------------|--------|
| **Bulgaria**  |             |        | **Latvia**    |             |        |
| spirits       | −0.122 **   | −0.054 | beer          | −0.159 ***  | −0.033 |
| beer          | −0.498 ***  | −0.035 | wine          | −0.315 ***  | −0.023 |
| wine          | −0.241 ***  | −0.043 | **Croatia**   |             |        |
| spirits       | 0.072 **    | −0.028 | beer          | −0.123 ***  | −0.026 |
| beer          | −0.017      | −0.023 | wine          | −0.250 ***  | −0.021 |
| **Cyprus**    |             |        | **Malta**     |             |        |
| spirits       | −0.587 ***  | −0.055 | beer          | −0.267 ***  | −0.025 |
| beer          | −0.545 ***  | −0.045 | wine          | −0.250 ***  | −0.021 |
| **Czech Rep.**|             |        | **Netherlands**|             |        |
| spirits       | −0.435 ***  | −0.031 | beer          | −0.703 ***  | −0.057 |
| beer          | −0.555 ***  | −0.027 | wine          | −0.440 ***  | −0.028 |
| **Denmark**   |             |        | **Norway**    |             |        |
| spirits       | 0.231 ***   | −0.058 | beer          | 0.223 ***   | −0.032 |
| beer          | 0.031       | −0.044 | wine          | 0.105 ***   | −0.024 |
| **Estonia**   |             |        | **Poland**    |             |        |
| spirits       | 0.018       | −0.029 | beer          | −0.188 ***  | −0.043 |
| beer          | −0.156 ***  | −0.022 | wine          | −0.300 ***  | −0.04  |
| **Finland**   |             |        | **Portugal**  |             |        |
| spirits       | 0.025       | −0.028 | beer          | −0.034 *    | −0.02  |
| beer          | 0.004       | −0.016 | wine          | −0.069 ***  | −0.019 |
Table A4. Cont.

| Country   | Coefficient | SE  | Country   | Coefficient | SE  |
|-----------|-------------|-----|-----------|-------------|-----|
| Germany   |             |     |           |             |     |
| spirits   | 0.059       | −0.045 | spirits   | 0.952 ***   | −0.051 |
| beer      | 0.096 ***   | −0.035 | beer      | 0.658 ***   | −0.039 |
| wine      | −0.038      | −0.046 | wine      | 0.701 ***   | −0.041 |
| Greece    |             |     |           |             |     |
| spirits   | 0.049 *     | −0.026 | spirits   | −0.376 ***  | −0.039 |
| beer      | 0.057 **    | −0.026 | beer      | −0.405 ***  | −0.035 |
| wine      | 0.010       | −0.023 | wine      | −0.540 ***  | −0.039 |
| Hungary   |             |     |           |             |     |
| spirits   | −0.222 ***  | −0.032 | spirits   | 0.140 ***   | −0.029 |
| beer      | −0.116 ***  | −0.024 | beer      | −0.011      | −0.018 |
| wine      | −0.205 ***  | −0.024 | wine      | −0.086 ***  | −0.02 |
| Iceland   |             |     |           |             |     |
| spirits   | 0.011       | −0.031 | spirits   | −0.012      | −0.024 |
| beer      | −0.097 ***  | −0.023 | beer      | −0.186 ***  | −0.017 |
| wine      | 0.052       | −0.034 | wine      | −0.170 ***  | −0.031 |
| Italy     |             |     |           |             |     |
| spirits   | −0.507 ***  | −0.029 | spirits   | −0.434 ***  | −0.035 |
| beer      | −0.285 ***  | −0.021 | beer      | −0.103 ***  | −0.022 |
| wine      | −0.334 ***  | −0.025 | wine      | −0.008      | −0.022 |

*p < 0.1; ** p < 0.05; *** p < 0.001.

Table A5. Model predictions of beverage proportions for girls, 1999–2019 (margins, SE).

| Country | Year | 1999 | 2003 | 2007 | 2011 | 2015 | 2019 |
|---------|------|------|------|------|------|------|------|
| BG      |      |      |      |      |      |      |      |
| spirits | 0.101 | 0.125 | 0.147 | 0.164 | 0.173 | 0.172 |
|         | −0.015 | −0.013 | −0.010 | −0.007 | −0.006 | −0.010 |
| wine    | 0.0549 | 0.0853 | 0.127 | 0.178 | 0.237 | 0.297 |
|         | −0.008 | −0.009 | −0.009 | −0.007 | −0.007 | −0.012 |
| beer    | 0.785 | 0.702 | 0.600 | 0.487 | 0.372 | 0.269 |
|         | −0.020 | −0.018 | −0.014 | −0.009 | −0.008 | −0.011 |
| cider/alcop. | 0.0594 | 0.0885 | 0.126 | 0.171 | 0.218 | 0.262 |
|         | −0.008 | −0.008 | −0.008 | −0.007 | −0.007 | −0.011 |
| HR      |      |      |      |      |      |      |      |
| spirits | 0.156 | 0.173 | 0.190 | 0.208 | 0.226 | 0.245 |
|         | −0.007 | −0.006 | −0.006 | −0.006 | −0.008 | −0.011 |
| wine    | 0.330 | 0.348 | 0.366 | 0.382 | 0.396 | 0.408 |
|         | −0.010 | −0.009 | −0.008 | −0.009 | −0.010 | −0.012 |
| beer    | 0.297 | 0.291 | 0.282 | 0.272 | 0.261 | 0.248 |
|         | −0.010 | −0.007 | −0.005 | −0.005 | −0.007 | −0.009 |
| cider/alcop. | 0.217 | 0.188 | 0.162 | 0.138 | 0.117 | 0.0991 |
|         | −0.009 | −0.006 | −0.005 | −0.006 | −0.006 | −0.007 |
| CY      |      |      |      |      |      |      |      |
| spirits | 0.197 | 0.195 | 0.187 | 0.170 | 0.147 | 0.118 |
|         | −0.028 | −0.019 | −0.011 | −0.007 | −0.009 | −0.012 |
| wine    | 0.232 | 0.233 | 0.226 | 0.210 | 0.183 | 0.149 |
|         | −0.029 | −0.020 | −0.013 | −0.009 | −0.010 | −0.014 |
| beer    | 0.495 | 0.449 | 0.394 | 0.330 | 0.260 | 0.191 |
|         | −0.039 | −0.026 | −0.016 | −0.015 | −0.022 | −0.028 |
| cider/alcop. | 0.0756 | 0.123 | 0.193 | 0.290 | 0.410 | 0.542 |
|         | −0.016 | −0.018 | −0.019 | −0.021 | −0.029 | −0.040 |
| CZ      |      |      |      |      |      |      |      |
| spirits | 0.213 | 0.204 | 0.193 | 0.179 | 0.161 | 0.138 |
|         | −0.008 | −0.006 | −0.004 | −0.004 | −0.005 | −0.006 |
| wine    | 0.385 | 0.381 | 0.372 | 0.356 | 0.330 | 0.293 |
|         | −0.010 | −0.007 | −0.006 | −0.006 | −0.008 | −0.011 |
| beer    | 0.372 | 0.365 | 0.353 | 0.335 | 0.307 | 0.270 |
|         | −0.010 | −0.007 | −0.005 | −0.006 | −0.007 | −0.008 |
| cider/alcop. | 0.030 | 0.050 | 0.082 | 0.130 | 0.202 | 0.299 |
|         | −0.003 | −0.004 | −0.004 | −0.005 | −0.006 | −0.011 |
| Country | 1999 | 2003 | 2007 | 2011 | 2015 | 2019 |
|---------|------|------|------|------|------|------|
| DK      |      |      |      |      |      |      |
| spirits | 0.066 | 0.077 | 0.089 | 0.102 | 0.115 | 0.128 |
| wine    | 0.045 | 0.058 | 0.074 | 0.093 | 0.114 | 0.139 |
| beer    | 0.317 | 0.270 | 0.227 | 0.188 | 0.153 | 0.124 |
| cider/alcop. | 0.572 | 0.595 | 0.610 | 0.618 | 0.617 | 0.609 |
| EE      |      |      |      |      |      |      |
| spirits | 0.108 | 0.111 | 0.115 | 0.117 | 0.120 | 0.122 |
| wine    | 0.265 | 0.282 | 0.298 | 0.313 | 0.328 | 0.343 |
| beer    | 0.166 | 0.142 | 0.122 | 0.104 | 0.088 | 0.075 |
| cider/alcop. | 0.461 | 0.465 | 0.466 | 0.466 | 0.464 | 0.460 |
| FI      |      |      |      |      |      |      |
| spirits | 0.102 | 0.101 | 0.101 | 0.099 | 0.098 | 0.096 |
| wine    | 0.137 | 0.145 | 0.153 | 0.160 | 0.167 | 0.175 |
| beer    | 0.258 | 0.233 | 0.209 | 0.187 | 0.167 | 0.149 |
| cider/alcop. | 0.511 | 0.523 | 0.534 | 0.543 | 0.550 | 0.556 |
| DE      |      |      |      |      |      |      |
| spirits | 0.296 | 0.283 | 0.270 | 0.257 | 0.245 | 0.232 |
| wine    | 0.219 | 0.233 | 0.248 | 0.264 | 0.280 | 0.296 |
| beer    | 0.280 | 0.285 | 0.290 | 0.294 | 0.297 | 0.300 |
| cider/alcop. | 0.204 | 0.198 | 0.192 | 0.185 | 0.178 | 0.172 |
| GR      |      |      |      |      |      |      |
| spirits | 0.368 | 0.313 | 0.263 | 0.218 | 0.178 | 0.144 |
| wine    | 0.357 | 0.379 | 0.396 | 0.408 | 0.416 | 0.419 |
| beer    | 0.147 | 0.158 | 0.169 | 0.177 | 0.184 | 0.189 |
| cider/alcop. | 0.128 | 0.150 | 0.173 | 0.197 | 0.222 | 0.247 |
| HU      |      |      |      |      |      |      |
| spirits | 0.150 | 0.159 | 0.167 | 0.172 | 0.174 | 0.174 |
| wine    | 0.0897 | 0.0973 | 0.104 | 0.109 | 0.113 | 0.116 |
| beer    | 0.531 | 0.472 | 0.414 | 0.357 | 0.304 | 0.254 |
| cider/alcop. | 0.229 | 0.271 | 0.316 | 0.362 | 0.409 | 0.435 |

Table A5. Cont.
### Table A5. Cont.

| Country | Year | 1999 | 2003 | 2007 | 2011 | 2015 | 2019 |
|---------|------|------|------|------|------|------|------|
| IT      | spirits | 0.353 | 0.270 | 0.197 | 0.137 | 0.091 | 0.058 |
|         | wine    | 0.211 | 0.221 | 0.222 | 0.213 | 0.194 | 0.168 |
|         | beer    | 0.351 | 0.378 | 0.389 | 0.381 | 0.355 | 0.316 |
|         | cider/alcop. | 0.085 | 0.130 | 0.192 | 0.269 | 0.360 | 0.458 |
| LV      | spirits | 0.126 | 0.130 | 0.132 | 0.130 | 0.126 | 0.119 |
|         | wine    | 0.395 | 0.371 | 0.342 | 0.308 | 0.272 | 0.233 |
|         | beer    | 0.331 | 0.305 | 0.275 | 0.244 | 0.210 | 0.177 |
|         | cider/alcop. | 0.148 | 0.194 | 0.251 | 0.318 | 0.392 | 0.471 |
| LT      | spirits | 0.0372 | 0.054 | 0.077 | 0.107 | 0.144 | 0.189 |
|         | wine    | 0.254 | 0.301 | 0.350 | 0.396 | 0.435 | 0.465 |
|         | beer    | 0.267 | 0.252 | 0.233 | 0.210 | 0.183 | 0.156 |
|         | cider/alcop. | 0.441 | 0.392 | 0.340 | 0.288 | 0.237 | 0.190 |
| MT      | spirits | 0.331 | 0.335 | 0.335 | 0.332 | 0.324 | 0.312 |
|         | wine    | 0.418 | 0.400 | 0.379 | 0.355 | 0.329 | 0.299 |
|         | beer    | 0.183 | 0.175 | 0.166 | 0.156 | 0.145 | 0.132 |
|         | cider/alcop. | 0.0676 | 0.0902 | 0.119 | 0.156 | 0.202 | 0.257 |
| NL      | spirits | 0.412 | 0.289 | 0.180 | 0.100 | 0.0505 | 0.0235 |
|         | wine    | 0.143 | 0.204 | 0.258 | 0.290 | 0.296 | 0.279 |
|         | beer    | 0.353 | 0.342 | 0.295 | 0.227 | 0.158 | 0.102 |
|         | cider/alcop. | 0.0918 | 0.166 | 0.267 | 0.383 | 0.496 | 0.596 |
| NO      | spirits | 0.0883 | 0.105 | 0.123 | 0.145 | 0.169 | 0.195 |
|         | wine    | 0.141 | 0.132 | 0.124 | 0.115 | 0.107 | 0.098 |
|         | beer    | 0.252 | 0.234 | 0.217 | 0.200 | 0.183 | 0.166 |
|         | cider/alcop. | 0.519 | 0.529 | 0.536 | 0.540 | 0.542 | 0.540 |
| Country | 1999 | 2003 | 2007 | 2011 | 2015 | 2019 |
|---------|------|------|------|------|------|------|
| PO      |      |      |      |      |      |      |
| spirits | 0.097| 0.106| 0.117| 0.127| 0.139| 0.150|
| wine    | 0.214| 0.215| 0.217| 0.217| 0.216| 0.215|
| beer    | 0.674| 0.657| 0.639| 0.619| 0.597| 0.573|
| cider/alcop. | 0.016| 0.021| 0.028| 0.037| 0.048| 0.062|
| PT      |      |      |      |      |      |      |
| spirits | 0.430| 0.421| 0.409| 0.397| 0.382| 0.367|
| wine    | 0.0737| 0.0866| 0.101| 0.118| 0.137| 0.158|
| beer    | 0.340| 0.325| 0.309| 0.292| 0.275| 0.257|
| cider/alcop. | 0.156| 0.168| 0.181| 0.193| 0.206| 0.218|
| RO      |      |      |      |      |      |      |
| spirits | 0.0225| 0.0382| 0.0600| 0.0883| 0.124| 0.166|
| wine    | 0.150| 0.204| 0.257| 0.304| 0.341| 0.368|
| beer    | 0.413| 0.474| 0.504| 0.503| 0.476| 0.434|
| cider/alcop. | 0.415| 0.283| 0.178| 0.106| 0.0593| 0.0320|
| SK      |      |      |      |      |      |      |
| spirits | 0.229| 0.233| 0.237| 0.238| 0.237| 0.232|
| wine    | 0.150| 0.204| 0.257| 0.304| 0.341| 0.368|
| beer    | 0.413| 0.474| 0.504| 0.503| 0.476| 0.434|
| cider/alcop. | 0.415| 0.283| 0.178| 0.106| 0.0593| 0.0320|
| SI      |      |      |      |      |      |      |
| spirits | 0.171| 0.184| 0.198| 0.212| 0.227| 0.243|
| wine    | 0.432| 0.410| 0.388| 0.366| 0.344| 0.323|
| beer    | 0.193| 0.195| 0.196| 0.197| 0.197| 0.197|
| cider/alcop. | 0.204| 0.211| 0.218| 0.225| 0.232| 0.238|
| SE      |      |      |      |      |      |      |
| spirits | 0.143| 0.162| 0.180| 0.196| 0.209| 0.219|
| wine    | 0.193| 0.170| 0.147| 0.125| 0.104| 0.085|
| beer    | 0.311| 0.259| 0.212| 0.169| 0.132| 0.102|
| cider/alcop. | 0.353| 0.408| 0.461| 0.511| 0.555| 0.594|
| Country | 1999 | 2001 | 2003 | 2007 | 2011 | 2015 | 2019 |
|---------|------|------|------|------|------|------|------|
| DK      |      |      |      |      |      |      |      |
| wine    | 0.045| 0.053| 0.062| 0.071| 0.082| 0.091| 0.108|
| beer    | 0.441| 0.439| 0.435| 0.428| 0.420| 0.409| 0.369|
| cider/alcop | 0.463| 0.447| 0.429| 0.411| 0.390| 0.369| 0.264|
| HR      |      |      |      |      |      |      |      |
| spirits | 0.072| 0.078| 0.083| 0.089| 0.096| 0.113| 0.172|
| wine    | 0.308| 0.311| 0.314| 0.317| 0.320| 0.323| 0.328|
| beer    | 0.525| 0.516| 0.507| 0.498| 0.489| 0.480| 0.472|
| cider/alcop | 0.095| 0.095| 0.095| 0.095| 0.095| 0.095| 0.095|
| CY      |      |      |      |      |      |      |      |
| spirits | 0.183| 0.173| 0.160| 0.144| 0.124| 0.110| 0.101|
| wine    | 0.168| 0.160| 0.150| 0.137| 0.119| 0.098| 0.098|
| beer    | 0.612| 0.604| 0.584| 0.549| 0.493| 0.417| 0.272|
| cider/alcop | 0.037| 0.063| 0.105| 0.170| 0.264| 0.384| 0.012|
| CZ      |      |      |      |      |      |      |      |
| spirits | 0.097| 0.105| 0.113| 0.120| 0.125| 0.126| 0.126|
| wine    | 0.192| 0.197| 0.201| 0.201| 0.202| 0.199| 0.191|
| beer    | 0.696| 0.671| 0.641| 0.604| 0.557| 0.499| 0.168|
| cider/alcop | 0.016| 0.027| 0.045| 0.074| 0.118| 0.184| 0.022|
| UA      |      |      |      |      |      |      |      |
| spirits | 0.152| 0.106| 0.0723| 0.049| 0.033| 0.022| 0.011|
| wine    | 0.290| 0.318| 0.344| 0.367| 0.388| 0.406| 0.175|
| beer    | 0.207| 0.206| 0.201| 0.193| 0.184| 0.175| 0.175|
| cider/alcop | 0.351| 0.370| 0.383| 0.391| 0.395| 0.397| 0.397|

Table A6. Model predictions of beverage proportions in boys, 1999-2019 (margins, SE).
Table A6. Cont.

|       | 1999  | 2003  | 2007  | 2011  | 2015  | 2019  |
|-------|-------|-------|-------|-------|-------|-------|
| EE    |       |       |       |       |       |       |
| cider/alcop. | 0.243 | 0.261 | 0.279 | 0.297 | 0.313 | 0.329 |
| beer  | -0.014 | -0.010 | -0.007 | -0.006 | -0.005 | -0.007 |
| wine  | 0.502  | 0.462 | 0.423 | 0.384 | 0.347 | 0.311 |
| spirits | 0.014  | 0.010  | 0.007  | 0.006  | 0.005  | 0.007  |
| cider/alcop. | 0.223 | 0.212 | 0.202 | 0.191 | 0.180 | 0.170 |
| beer  | -0.009 | -0.007 | -0.006 | -0.005 | -0.005 | -0.007 |
| spirits | 0.100 | 0.102 | 0.103 | 0.105 | 0.107 | 0.109 |
| wine  | 0.114 | 0.116 | 0.118 | 0.118 | 0.121 | 0.125 |
| beer  | 0.496 | 0.494 | 0.492 | 0.490 | 0.488 | 0.486 |
| spirits | 0.191 | 0.175 | 0.160 | 0.146 | 0.133 | 0.121 |
| wine  | 0.113 | 0.087 | 0.055 | 0.046 | 0.037 | 0.029 |
| beer  | 0.515 | 0.540 | 0.565 | 0.589 | 0.613 | 0.636 |
| cider/alcop. | 0.290 | 0.288 | 0.286 | 0.284 | 0.282 | 0.280 |
| beer  | -0.009 | -0.006 | -0.005 | -0.005 | -0.007 | -0.010 |
| spirits | 0.100 | 0.102 | 0.103 | 0.105 | 0.107 | 0.109 |
| wine  | 0.114 | 0.116 | 0.118 | 0.118 | 0.121 | 0.125 |
| beer  | 0.496 | 0.494 | 0.492 | 0.490 | 0.488 | 0.486 |
| spirits | 0.014 | 0.010 | 0.007 | 0.006 | 0.005 | 0.007 |
| wine  | 0.007 | 0.004 | 0.003 | 0.004 | 0.005 | 0.007 |
| beer  | 0.462 | 0.423 | 0.384 | 0.347 | 0.311 | 0.279 |
| cider/alcop. | 0.223 | 0.212 | 0.202 | 0.191 | 0.180 | 0.170 |
| beer  | -0.009 | -0.006 | -0.005 | -0.005 | -0.007 | -0.010 |
| spirits | 0.190 | 0.193 | 0.196 | 0.198 | 0.201 | 0.203 |
| wine  | 0.246 | 0.240 | 0.234 | 0.228 | 0.222 | 0.216 |
| beer  | 0.397 | 0.406 | 0.415 | 0.424 | 0.433 | 0.442 |
| spirits | 0.011 | 0.007 | 0.005 | 0.005 | 0.004 | 0.006 |
| wine  | 0.167 | 0.161 | 0.155 | 0.150 | 0.145 | 0.139 |
| beer  | 0.397 | 0.379 | 0.361 | 0.341 | 0.322 | 0.301 |
| cider/alcop. | 0.167 | 0.161 | 0.155 | 0.150 | 0.145 | 0.139 |
| beer  | -0.014 | -0.010 | -0.007 | -0.006 | -0.008 | -0.011 |
| spirits | 0.170 | 0.160 | 0.149 | 0.139 | 0.129 | 0.118 |
| wine  | 0.397 | 0.379 | 0.361 | 0.341 | 0.322 | 0.301 |
| beer  | 0.397 | 0.379 | 0.361 | 0.341 | 0.322 | 0.301 |
| cider/alcop. | 0.074 | 0.086 | 0.101 | 0.117 | 0.135 | 0.156 |
| beer  | -0.005 | -0.004 | -0.004 | -0.004 | -0.005 | -0.006 |
| spirits | 0.138 | 0.147 | 0.157 | 0.166 | 0.176 | 0.185 |
| wine  | 0.077 | 0.085 | 0.095 | 0.105 | 0.115 | 0.126 |
| beer  | 0.397 | 0.379 | 0.361 | 0.341 | 0.322 | 0.301 |
| cider/alcop. | 0.149 | 0.158 | 0.166 | 0.174 | 0.182 | 0.190 |
| beer  | -0.006 | -0.004 | -0.005 | -0.005 | -0.007 | -0.009 |
| spirits | 0.180 | 0.147 | 0.119 | 0.094 | 0.073 | 0.055 |
| wine  | 0.278 | 0.271 | 0.259 | 0.244 | 0.225 | 0.202 |
| beer  | 0.461 | 0.471 | 0.474 | 0.469 | 0.454 | 0.429 |
| cider/alcop. | 0.081 | 0.110 | 0.148 | 0.194 | 0.249 | 0.313 |
| beer  | -0.004 | -0.004 | -0.003 | -0.004 | -0.006 | -0.011 |
|       | 1999   | 2003   | 2007   | 2011   | 2015   | 2019   |
|-------|--------|--------|--------|--------|--------|--------|
| LV    |        |        |        |        |        |        |
| cider/alcop. | 0.073  | 0.096  | 0.124  | 0.158  | 0.199  | 0.247  |
|        | -0.005 | -0.005 | -0.005 | -0.005 | -0.007 | -0.011 |
| beer  | 0.648  | 0.616  | 0.581  | 0.541  | 0.497  | 0.450  |
|        | -0.011 | -0.009 | -0.007 | -0.008 | -0.010 | -0.012 |
| wine  | 0.177  | 0.175  | 0.171  | 0.166  | 0.158  | 0.149  |
|        | -0.009 | -0.007 | -0.006 | -0.006 | -0.007 | -0.009 |
| spirits | 0.102  | 0.113  | 0.125  | 0.136  | 0.146  | 0.154  |
|        | -0.007 | -0.006 | -0.005 | -0.005 | -0.007 | -0.010 |
| MT    |        |        |        |        |        |        |
| cider/alcop. | 0.263  | 0.230  | 0.199  | 0.169  | 0.142  | 0.116  |
|        | -0.012 | -0.008 | -0.006 | -0.005 | -0.006 | -0.007 |
| beer  | 0.546  | 0.541  | 0.530  | 0.510  | 0.483  | 0.447  |
|        | -0.012 | -0.008 | -0.006 | -0.005 | -0.007 | -0.010 |
| wine  | 0.146  | 0.164  | 0.182  | 0.199  | 0.214  | 0.225  |
|        | -0.008 | -0.006 | -0.005 | -0.005 | -0.008 | -0.012 |
| spirits | 0.046  | 0.064  | 0.089  | 0.121  | 0.162  | 0.212  |
|        | -0.004 | -0.004 | -0.004 | -0.004 | -0.007 | -0.012 |
| NL    |        |        |        |        |        |        |
| cider/alcop. | 0.051  | 0.080  | 0.123  | 0.183  | 0.262  | 0.358  |
|        | -0.005 | -0.006 | -0.007 | -0.007 | -0.010 | -0.016 |
| beer  | 0.673  | 0.683  | 0.674  | 0.645  | 0.594  | 0.524  |
|        | -0.022 | -0.014 | -0.010 | -0.009 | -0.010 | -0.014 |
| wine  | 0.354  | 0.336  | 0.317  | 0.297  | 0.276  | 0.254  |
|        | -0.011 | -0.009 | -0.007 | -0.007 | -0.008 | -0.010 |
| spirits | 0.168  | 0.184  | 0.200  | 0.217  | 0.232  | 0.247  |
|        | -0.007 | -0.006 | -0.005 | -0.006 | -0.008 | -0.011 |
| NO    |        |        |        |        |        |        |
| cider/alcop. | 0.457  | 0.429  | 0.402  | 0.374  | 0.345  | 0.317  |
|        | -0.016 | -0.012 | -0.009 | -0.009 | -0.011 | -0.014 |
| beer  | 0.339  | 0.354  | 0.368  | 0.380  | 0.391  | 0.399  |
|        | -0.016 | -0.012 | -0.010 | -0.010 | -0.013 | -0.017 |
| wine  | 0.111  | 0.106  | 0.101  | 0.096  | 0.090  | 0.085  |
|        | -0.010 | -0.009 | -0.008 | -0.007 | -0.009 | -0.013 |
| spirits | 0.094  | 0.110  | 0.129  | 0.150  | 0.174  | 0.199  |
|        | -0.010 | -0.009 | -0.008 | -0.007 | -0.009 | -0.013 |
| PO    |        |        |        |        |        |        |
| cider/alcop. | 0.018  | 0.024  | 0.032  | 0.042  | 0.054  | 0.071  |
|        | -0.003 | -0.003 | -0.002 | -0.002 | -0.003 | -0.006 |
| beer  | 0.727  | 0.712  | 0.696  | 0.678  | 0.658  | 0.634  |
|        | -0.009 | -0.007 | -0.006 | -0.005 | -0.007 | -0.010 |
| wine  | 0.160  | 0.159  | 0.158  | 0.156  | 0.153  | 0.150  |
|        | -0.007 | -0.005 | -0.004 | -0.004 | -0.005 | -0.006 |
| spirits | 0.096  | 0.105  | 0.115  | 0.125  | 0.135  | 0.146  |
|        | -0.005 | -0.004 | -0.003 | -0.003 | -0.004 | -0.006 |
| NL    |        |        |        |        |        |        |
| cider/alcop. | 0.018  | 0.024  | 0.032  | 0.042  | 0.054  | 0.071  |
|        | -0.003 | -0.003 | -0.002 | -0.002 | -0.003 | -0.006 |
| beer  | 0.515  | 0.498  | 0.481  | 0.464  | 0.446  | 0.428  |
|        | -0.011 | -0.008 | -0.007 | -0.007 | -0.008 | -0.011 |
| wine  | 0.0897 | 0.100  | 0.112  | 0.124  | 0.138  | 0.153  |
|        | -0.007 | -0.005 | -0.004 | -0.004 | -0.006 | -0.008 |
| spirits | 0.246  | 0.247  | 0.247  | 0.247  | 0.246  | 0.244  |
|        | -0.009 | -0.007 | -0.006 | -0.005 | -0.007 | -0.009 |
| PT    |        |        |        |        |        |        |
| cider/alcop. | 0.149  | 0.155  | 0.160  | 0.166  | 0.171  | 0.175  |
|        | -0.007 | -0.005 | -0.005 | -0.005 | -0.006 | -0.008 |
Table A6. Cont.

|        | 1999  | 2003  | 2007  | 2011  | 2015  | 2019  |
|--------|-------|-------|-------|-------|-------|-------|
| spirits| 0.163 | 0.174 | 0.185 | 0.194 | 0.201 | 0.204 |
| wine   | 0.401 | 0.365 | 0.328 | 0.293 | 0.257 | 0.222 |
| beer   | 0.422 | 0.439 | 0.453 | 0.462 | 0.465 | 0.459 |
| cider/alcop. | 0.014 | 0.022 | 0.034 | 0.052 | 0.078 | 0.115 |

|        | 1999  | 2003  | 2007  | 2011  | 2015  | 2019  |
|--------|-------|-------|-------|-------|-------|-------|
| spirits| 0.063 | 0.0745| 0.088 | 0.103 | 0.121 | 0.140 |
| wine   | 0.373 | 0.351 | 0.330 | 0.308 | 0.287 | 0.266 |
| beer   | 0.410 | 0.417 | 0.422 | 0.425 | 0.427 | 0.426 |
| cider/alcop. | 0.153 | 0.157 | 0.161 | 0.164 | 0.166 | 0.168 |

|        | 1999  | 2003  | 2007  | 2011  | 2015  | 2019  |
|--------|-------|-------|-------|-------|-------|-------|
| spirits| 0.127 | 0.140 | 0.154 | 0.167 | 0.181 | 0.194 |
| wine   | 0.101 | 0.095 | 0.089 | 0.083 | 0.076 | 0.070 |
| beer   | 0.524 | 0.486 | 0.448 | 0.410 | 0.371 | 0.334 |
| cider/alcop. | 0.249 | 0.278 | 0.309 | 0.340 | 0.372 | 0.403 |

|        | 1999  | 2003  | 2007  | 2011  | 2015  | 2019  |
|--------|-------|-------|-------|-------|-------|-------|
| spirits| 0.195 | 0.143 | 0.102 | 0.072 | 0.050 | 0.035 |
| wine   | 0.181 | 0.203 | 0.222 | 0.239 | 0.254 | 0.268 |
| beer   | 0.425 | 0.432 | 0.430 | 0.421 | 0.408 | 0.391 |
| cider/alcop. | 0.198 | 0.223 | 0.246 | 0.268 | 0.288 | 0.306 |

|        | 1999  | 2003  | 2007  | 2011  | 2015  | 2019  |
|--------|-------|-------|-------|-------|-------|-------|
| spirits| 0.398 | 0.251 | 0.145 | 0.0788| 0.0411| 0.0209|
| wine   | 0.146 | 0.186 | 0.216 | 0.237 | 0.249 | 0.256 |
| beer   | 0.440 | 0.537 | 0.599 | 0.628 | 0.633 | 0.622 |
| cider/alcop. | 0.017 | 0.011 | 0.008 | 0.007 | 0.008 | 0.010 |

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