

The Relationship between Alcohol Availability and Alcohol Consumption

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Abstract

This paper examines the relationship between retail alcohol supply and total alcohol consumption. In Finland, the state alcohol company (Alko) has a retail monopoly on the sale of stronger alcoholic beverages. Only drinks with a maximum of 4.7% alcohol by volume can be sold in licensed grocery stores. The influence of the state alcohol monopoly was examined using data from Alko outlets and controlled sales from restaurants and grocery stores, prices, regional differences in consumption levels, and the trend over time. Data were collected from Alko registers and the National Institute of Health and Welfare. Panel data from regions of Finland over the period 1995-2009 were analysed using regression models.

This study provides evidence that alcohol supply has an impact on alcohol consumption. The consumption of strong alcohol and wine increases as the number of Alko outlets grows. Taxation through pricing also affects the purchase of strong alcohol. The disposable income of the consumer does not influence consumption, and there is no relationship between the number of Alko outlets and alcohol consumption in restaurants and alcohol purchases from grocery stores.

Keywords: Alcohol availability; Monopoly; Alcohol consumption; Retail alcohol outlets

Introduction

In this study, we contribute to the discussion on the role of state control of alcohol consumption. Is there still a place for the monopoly, how well does taxation through alcohol prices work, and is there a relationship between drinking products from Alko stores (which holds the monopoly on strong alcohol sales) and grocery stores and drinking in restaurants? The tight control of alcohol availability through the state monopoly and the control over prices gives us a unique opportunity to study the effects of changes in alcohol availability on alcohol consumption. We assume that Finland has its own cultural climate regarding alcohol, which is largely based on a long tradition of alcohol use and a strict alcohol monopoly.

The availability of alcohol has been restricted in Finland since 1932, when the first outlets of Alko, the state alcohol company, were opened after a period of prohibition (1919-1932). Prior to 1995, only Alko had the licence to produce, import, and export alcohol. Wholesale and retail sales of alcoholic beverages were also strictly controlled by Alko. Today, Alko has a retail monopoly on selling alcoholic beverages that contain more than 4.7% alcohol by volume. Beer, cider, and other drinks with a maximum of 4.7% alcohol by volume can be sold in licensed grocery stores [1,2].

In Finland, the total consumption of alcohol consists of legal domestic sales, tourist imports, and moonshine (in Finnish 'kotipolitto', 'home brew' production). Undocumented consumption is defined as alcoholic imports by passengers, home preparation and illegal distillation at home, smuggling, surrogates, and alcohol consumed by Finns abroad. There are some estimates available for the magnitude of this consumption. In the late 1980s and early 1990s, Finland experienced a boom in wine-making at home, with many small speciality stores selling wine-making equipment. The main reason for this boom was the economic recession in Finland at the beginning of the 1990s, giving people a stronger motivation to produce cheap alcohol. Undocumented consumption for 1995-2010 was estimated to be quite stable at between 2.0 and 2.7 per cent of the total consumption of alcohol in Finland. Most of this consumption was tourist alcohol imported from abroad (about 75% of the undocumented consumption) [3,4].

A large body of literature shows drinking to be a risk factor for many injuries, diseases, and social problems. Alcohol causes severe health and non-health-related problems, such as additional deaths, assaults, drink-driving offences, and losses in productivity due to an increased amount of sick leave. Alcohol-related causes are the third most common cause of death in the US and the most common cause in Finland [5-8]. Alcohol consumption is high in Finland and Denmark based on alcohol consumption statistics from countries that do not include free private import of alcohol from other countries in their calculations. Between 1990 and 2013, Finland and Denmark had a higher alcohol-related disease burden than the other Nordic countries [9,10].

Economically, it is assumed that consumers behave rationally and they acquire commodities to maximize their utility based on their own preferences. Alcohol is a totally different commodity, and often alcohol consumption is related to addiction, which has an impact on consumers' behaviour. A strong commitment to alcohol is the basis for a diagnosis of alcohol dependence, at worst the form of mental illness known as alcoholism. However, the economics literature states that people tend to drink less alcohol and have fewer alcohol-related problems when alcohol prices are increased or alcohol availability is restricted. Secondly, policy changes have often had their greatest effect on heavier drinkers [11,12]. Unfortunately some studies have also indicated that very heavy drinkers consume alcohol regardless of its price level [13]. Because alcohol is its own kind of commodity, alcohol policy can be seen as a necessity. The aim of alcohol policies is to mitigate the negative health and social consequences of alcohol use. There are common strategies used in alcohol policies: the price policy, taxation, and restrictions on the availability of alcohol. The

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main objective of alcohol supply studies is to provide policy-relevant information [14].

In Finland, the alcohol policy was deregulated to some extent by the Alcohol Act of 1994, which increased travellers' duty-free allowances. Alcohol restrictions on imports from other EU countries to Finland were removed in early 2004. Alcohol imports were presumed to increase when the neighbouring state of Estonia joined the EU in early May 2004. In response, the Finnish government lowered the level of taxation on alcohol. In 2004, both retail sales of alcohol and tourist imports of alcohol from Estonia increased. The negative effects on health became evident: for example, there was an increase in alcohol-related deaths. The tax cut had a greater negative public health effect than increasing travellers' allowances [15,16]. To reduce the social and health harm, alcohol taxes were raised again in 2008.

Policies

Alcohol availability: Alcohol policies can regulate the physical availability of alcohol through the number of outlets and the outlet's business hours. In this paper, we study the impact of alcohol supply on consumption in the Finnish context, where the supply and price of alcohol are under monopoly control. The supply effect on alcohol consumption is precisely defined using the same regional classification for the whole 14-year period studied. Alcohol availability was measured as the number of Alko outlets in the country's regions.

Based on Popova, et al. [17] systematic review, alcohol outlet density and hours and days of sale had an impact on overall alcohol consumption, drinking patterns, and harm. Restricting the availability of alcohol is an effective measure to prevent alcohol-related harm. In Campbell, et al. [18] review, the basic result was that the density of alcohol outlets in communities could be regulated to reduce alcohol consumption and the harm it causes. Studies have been undertaken in Finland, Iceland, New Zealand, and North Carolina, USA. Each study showed that the increase in the number of outlets significantly increases alcohol consumption. Alcohol policies involving a licensing system for alcohol retail sales and regulating the physical availability of alcohol and business hours were the most consistent predictors of alcohol consumptions also in low- and middle-income countries when country-level living standards and drinking patterns were controlled for [19].

The availability of alcohol, defined as the number and types of alcohol outlets, has been examined in traffic injury studies. In California, changes in outlet densities were positively related to traffic injury rates. In the United States, from 1975 to 1986, night-time traffic fatality rates were strongly related to beer sales, moderately influenced by spirits sales, and almost unaffected by wine sales. A reduction in availability may reduce alcohol sales and alcohol-related harm [20,21].

Previous research has demonstrated that in many cases, increased alcohol availability also increases consumption, but uncertainty remains concerning the magnitude of the effect on alcohol consumption. As Gruenewald et al. summarize, there is a difficulty in obtaining sufficient data to examine comprehensive models of access to alcohol. Nowadays, theoretical approaches focus more on the social mechanism behind the distribution of problems related to alcohol and regulations on availability [22,23]. However, precise knowledge of how much alcohol availability affects alcohol consumption is still missing. It is important to learn this information, especially now that the world is changing and old structures are being evaluated. The grounds for limiting the availability of alcohol and the alcohol monopoly should therefore be justified.

Price policy: In Finland, alcohol prices are under monopoly control. Several studies have shown that alcohol consumption is responsive with respect to its price. Wagenaar's meta-analysis established the highly significant relationship between alcohol price or tax measures and indices of sales or consumption of alcohol [24-26]. According to Swedish price and sales data gathered by Systembolaget from 1984 to 1994, consumers respond to price increases by altering the total consumption through varying brand choices. The results revealed that consumer behaviour is related to changes in beverage prices. Instead of simply lowering the quantity when alcohol price increases, alcohol drinkers drink cheaper alcohol to maintain their overall level of consumption. Wagenaar et al.'s systematic review suggests that doubling the alcohol tax would reduce alcohol-related mortality by an average 35%, traffic accidents deaths by 11%, and violence by 2% [27].

In the United States, the demand for beer and spirits seems to be more sensitive to price changes in the licensed states than in the states where regulated markets do not exist [26]. In Finland, the effects of alcohol taxation and changes in alcohol consumption caused by changes in traveller's import allowances have been studied in subgroups of the population. Alcohol taxation and prices affect consumption and related harms, and heavy drinkers are responsive to price. The changes in Finnish alcohol policy in 2004 increased severe alcohol-related harm among the poorest sections of the population, such as the unemployed. In addition, those better off also increased consumption [28-30].

Income-related alcohol consumption

Previous studies on the relationship between alcohol consumption and income have shown contradictory results. Some studies have shown that lower incomes increase drinking while others have shown it has no effect or even the opposite. However, it can be assumed that alcohol consumption probably differs between population groups. Socioeconomic differences, such as income and the level of educational, can influence alcohol drinking. There is no clear evidence on how alcohol consumption affects people's income levels. Some studies suggest that people with high incomes drink more often but in smaller amounts. On the other hand, unhealthy habits-such as alcohol use-can also be typical of the lower social classes. Less well-educated adults have been found to drink more at all ages, and less well-educated adults drink more during a drinking session than their better-educated peers [31,32].

Data

We used panel data for the period 1995-2009. The years 1999 and 2000 are excluded from the data because Alko made a comprehensive data system change during that period and consequently there were no fully comparable sales data available for Alko outlets. The data came from Alko (Alko outlets, alcohol sales, and prices), the National Institute of Health and Welfare (grocery stores and restaurants), and the SOTKANet Statistics and Indicator Bank (various municipal-level statistics). Changes in the number of municipalities due to mergers have been taken into account. The 2010 regional classification, which is based on the classification of the Association of Finnish Local and Regional Authorities (NUTS4 level in the European Union), is the same as the 1995-2009 classification. The 2010 regional classification for mainland Finland comprised 67 regions and 331 municipalities. Loviisa and Pieksämäki municipalities have been excluded from the data because these municipalities have made consolidations and reliable data was not available; in addition, a few other municipalities (Himanka, Ylämaa, Ruotsinpyhtää, Noormarkku, Liljendahl, Pernaja) have been excluded because of defective data.

In this study, alcohol consumption has been sorted into three main groups: strong alcohol (spirits, other strong alcohol, and fortified wines), wine (light wines), and brewery products (cidars, beers, and similar beverages). This classification (strong alcohol, wine, and brewery products) is used by Alko. Brewery products also include grocery store sales. We studied alcohol consumption in restaurants separately by using restaurant sales data. We measure all alcohol consumption by sales. This is a common method in economics: commodities that are bought are also used. Alcohol consumption in all groups are defined in terms of absolute alcohol (100%) and are divided by drinking age population (15-89 years). The legal drinking age in Finland is 18 years. In this study, alcohol drinking is assumed to start at the age of 15. Based on our data for the period 1995-2009, the drinking age population increased from 4.1 to 4.4 million people. Descriptions of variables are shown in Table 1.

The explanatory variables in this study are: alcohol availability, disposable income, and alcohol price. Alcohol availability is measured as the number of Alko outlets in the region. From 1995 to 2009, the number of outlets increased from 233 to 302. The number of outlets per region varied: for example, in the Helsinki region in 2009 there were 54 Alko outlets, and in the Joensuu region there were 9 Alko outlets. There were no major differences in the hours of trading over the period 1995-2009, so we excluded this information from the data.

The disposable income of households consists of gross income, i.e. wages, income from self-employment, property income, and current transfers received, as well as current transfers paid, minus taxes (Statistics and Indicator Bank), and the figures are regional averages. We constructed one real alcohol price variable, which was the mean of the sales volume multiplied retail sale price indexes for each year, i.e. the alcohol sales price multiplied by retail sales in litres for each year. The retail sale price indexes, which were obtained from Alko, are uniform for the whole country. Descriptions of variables are shown in Table 1.

Figure 1 shows the strong association between total alcohol consumption and the number of Alko outlets for all regions. The total consumption of alcohol (the average consumption per drinking-age person) increases with the number of Alko outlets (the figures are regional averages). This supports our hypothesis that there is a link between alcohol availability and consumption.

Statistical Methods

We studied the consumption of total alcohol, strong alcohol, wine, brewery products, and alcohol consumption in restaurants separately. The panel data were analysed using regression models. We estimated the following models for all alcohol consumption types:

$$\ln(C_r) = \alpha + \beta_1(A_r) + \beta_2 \ln(P) + \beta_3 \ln(I_r) + \beta_4 y + u_i + \epsilon_i$$

where C is Alcohol consumption in the region (r), A is the number of Alko outlets in the region, and P the real price of alcohol, I the average disposable income, y the years-a common time trend for all regions- u_i the error term, and ϵ_i the (fixed) regional level effect. In the specification of alcohol availability, on the advice obtained from discussions with Alko, the number of Alko outlets is assumed to be an exogenous variable. For example, the size of the population in the region was not a parameter upon which Alko based its administrative decisions to allocate retail outlets across the Finnish regions. We used Stata version 9.1 and 14.0 for the analyses.

In the modelling, we had some multicollinearity problems because the prices of different alcohol qualities correlate heavily, making the

estimation of cross-price elasticities impossible. In addition, the years and prices correlate heavily. In our models, we have taken these factors into account by using one real price variable, using robust option fixed effects (FE) models and making models with the price variable having time and time² in the model, and without the price variable using time as a class variable in the model. The disposable income of households also correlates with time. We constructed one real price variable, which is the mean of the volume-weighted retail sale price indexes for each year, i.e. the alcohol sale prices multiplied the retail sales in litres (100% alcohol) for each year.

Dependent variables (litres of 100% alcohol)	Description	Mean(SD)
Total alcohol consumption	Includes retail sales from Alko, brewery products from grocery stores, and sales from restaurants	8.9 (2.83)
Strong alcohol consumption	Includes spirits, other strong alcohol, and fortified wines retail sales from Alko	2.8 (1.15)
Wine consumption	Includes light wine retail sales from Alko	.87 (.51)
Brewery product consumption**	Includes brewery product retail sales from Alko and sales from grocery stores	3.7 (.84)
Alcohol consumption in restaurants	Includes all alcohol sales from restaurants	1.4 (.85)
Explanatory variables		
Number of Alko outlets	1000× number of retail Alko outlets per drinking age population	.09 (.06)
Disposable income (€)	Includes gross income, wages, income from self-employment, property income, and current transfers received and paid, minus taxes	12,927 (2,584)
Real price (€)	Alcohol sales prices multiplied by the sale in litres of absolute alcohol (100%)	15.46 (3.55)

Notes: The variables are calculated for people aged 15-89 years old and are regional averages.
**The data for brewery products from grocery stores were available from 1998 to 2009.
SD: Standard deviation.

Table 1: Variable descriptive statistics.

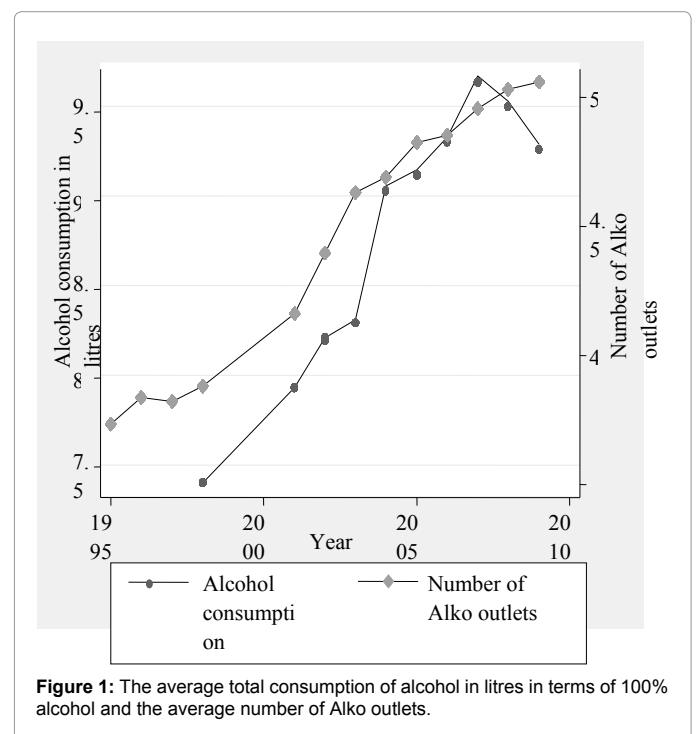


Figure 1: The average total consumption of alcohol in litres in terms of 100% alcohol and the average number of Alko outlets.

The analysis of alcohol consumption was divided into modelling phases. First, we explained the log of alcohol consumption using ordinary least squares (OLS) for testing purposes, and fixed effects (FE; preferred based on the Hausman test and the fact that our data covered almost all regions) with and without the real price variable. The impact of a new Alko outlet is related to the number of existing outlets in the area, and based on the reset test, no logarithmic specification is therefore appropriate. The models were tested for specification, multicollinearity, and heteroscedasticity. In OLS, the reset test for the models indicated that there are no problems in the specification, but the models suffer from heteroscedasticity. We report robust standard errors for the FE models. No autocorrelation was allowed in the models because the time series dimension was relatively short, while the number of regions is large.

Results

We arrived at three main results. First, the number of retail state alcohol outlets has a positive effect on total alcohol consumption. There is in particular a supply effect for the consumption of strong alcohol and wine that is sold in Alko outlets: prices affect strong alcohol consumption. Second, an increase in the number of Alko outlets does not increase sales in licenced restaurants and grocery stores. Third, disposable income does not have an effect on alcohol consumption.

We also tested whether the establishment of new Alko outlets depended on the characters of the municipalities by using an instrumental variable method-two-stage least squares (2SLS)-and we tested how those results differed from the results of this study. In 2SLS, we used the population densities of the regions as instruments for the Alko outlets. The instrumental variable method has been used to solve endogenous problems [33-35]. The instrumental variable estimation results do not differ from the models where the supply is exogenous (OLS and FE).

Total alcohol consumption

An increase in the number of Alko outlets increases the total consumption of alcohol ($b=0.82$, $p<0.001$). When alcohol prices increase, alcohol consumption decreases ($b=-0.26$, $p<0.001$). Disposable income does not affect alcohol consumption: this can be seen in the FE variable regressions (Table 2).

Strong alcohol, wine, brewery products, and consumption in restaurants

The consumption of strong alcohol responds positively to the increase in the number of Alko outlets ($b=2.34$ and $b=2.29$, $p<0.001$). When strong alcohol prices increase, alcohol consumption decreases ($b=-0.75$, $p<0.001$). Disposable income does not affect strong alcohol consumption. This can be seen in the FE variable regressions (Table 3).

The consumption of wines responds positively to the increase in the number of Alko outlets ($b=2.61$, $p<0.001$) ($b=2.48$, $p<0.001$). Disposable income and alcohol prices do not affect wine consumption. This can be seen in the FE variable regressions (Table 4).

A change in the retail state alcohol supply has no effect on brewery product consumption. People buy these products mainly from grocery stores and the sales are not dependent on the supply in Alko outlets. When alcohol prices increase, brewery product consumption decreases ($b=-0.07$, $p<0.05$). This can be seen in the results (Table 5).

An increase in the number of Alko outlets does not increase sales in licenced restaurants. Disposable income and alcohol prices do not affect alcohol consumption in restaurants. This can be seen in the FE variable regressions (Table 6).

	OLS (95% CI)	FE (95% CI)	FE (95% CI)
Number of outlets	3.17*** (2.89-3.44)	.82*** (.52-1.11)	.82*** (.51-1.14)
Ln(disposable income)	1.32*** (1.13-1.50)	.08 (-.06-.23)	-.00 (-.18-.17)
Ln(alcohol price)	-.03 (-.22-.16)	-.26*** (-.32 to -.20)	
Time	***	***	
Time ²	***	***	
Time as a class variable			***
Constant	-10.30	2.23	2.13
R-squared	0.52		
Number of obs	650	650	650

OLS: Ordinary Least Squares; FE: Fixed Effects; Ln: Natural Logarithm. *** $p<0.001$, ** $p<0.005$, $p<0.05$.

Time and time² variables are included in the first two models, and yearly dummies for 1996-2009 in the third model. The data for brewery products from grocery stores were available from 1998 to 2009. The common significance of the time variables (time, time² and i.time) are reported.

Table 2: Total alcohol consumption.

	OLS (95% CI)	FE (95% CI)	FE (95% CI)
Number of outlets	4.15*** (3.78-4.52)	2.34*** (1.51-3.16)	2.29*** (1.50-3.07)
Ln(disposable income)	.29* (.05-.53)	.27 (-.07-.60)	.03 (-.41-.47)
Ln(alcohol price)	-.74*** (-.93 to -.54)	-.75*** (-.86 to -.61)	
Time	***	***	
Time ²	***	***	
Time as a class variable			***
Constant	1.11	1.45	.23
R-Squared	0.59		
Number of obs	845	845	845

OLS: Ordinary Least Squares; FE: Fixed Effects; Ln: Natural Logarithm. *** $p<0.001$, ** $p<0.005$, $p<0.05$.

Time and time² variables are included in the first two models, and yearly dummies for 1996-2009 in the third model. The common significance of the time variables (time, time² and i.time) are reported.

Table 3: Strong alcohol consumption.

	OLS (95% CI)	FE (95% CI)	FE (95% CI)
Number of outlets	4.01*** (3.54-4.47)	2.61*** (1.73-3.49)	2.48*** (1.72-3.23)
Ln(disposable income)	5.40*** (5.03-5.78)	.47 (-.03-.97)	-.15 (-.81-.51)
Ln(alcohol price)	1.06*** (.76-1.37)	.00 (-.17-.18)	
Time	***	***	
Time ²	***	***	
Time as a class variable			***
Constant	-56.04	-5.63	.40
R-Squared	0.70		
Number of obs	845	845	845

OLS: Ordinary Least Squares; FE: Fixed Effects; Ln: Natural Logarithm. *** $p<0.001$, ** $p<0.005$, $p<0.05$.

Time and time² variables are included in the first two models, and yearly dummies for 1996-2009 in the third model. The common significance of the time variables (time, time² and i.time) is reported.

Table 4: Wine consumption.

Discussion

The main result of the study is that the number of retail alcohol outlets is positively related to wine and strong alcohol consumption sales. We estimated the effect by region, so the effect cannot be explained by changes in outlet choice, i.e. sales moving from one outlet to another.

	OLS (95% CI)	FE (95% CI)	FE (95% CI)
Number of outlets	1.65*** (1.40-1.90)	.29 (-.07-.66)	.29 (-.08-.66)
Ln(disposable income)	.49*** (.26-.72)	-.00 (-.14-.13)	-.00 (-.18-.17)
Ln(alcohol price)	.02 (-.17-.21)	-.07* (-.13 to -.02)	
Time	***		
Time ²	***		
Time as class variable			***
Constant	-3.73	1.35	1.36
R-Squared	0.31		
Number of obs	660	660	660

OLS: Ordinary Least Squares; FE: Fixed Effects; Ln: Natural Logarithm
 ***p<0.001, **p<0.005, *p<0.05

Time and time² variables are included in the first two models, and yearly dummies for 1996-2009 in the third model. The data for brewery products from grocery stores were available from 1998 to 2009. The common significance of the time variables (time, time² and i.time) are reported.

Table 5: Brewery product consumption.

	OLS (95% CI)	FE (95% CI)	FE (95% CI)
Number of outlets	3.17*** (2.32-4.03)	1.26 (-.27-2.78)	1.30 (-.21-2.81)
Ln(disposable income)	3.29*** (2.93-3.66)	.29 (-.15-.73)	.29 (-.29-.87)
Ln(alcohol price)	.63** (.26-1.00)	-.02 (-.13-.09)	
Time	***	***	
Time ²	***	***	
Time as class variable			***
Constant	-32.91	-2.11	-2.33
R-Squared	0.37		
Number of obs	858	858	858

OLS: Ordinary Least Squares; FE: Fixed Effects; Ln: Natural Logarithm
 ***p<0.001, **p<0.005, *p<0.05.

Time and time² variables are included in the first two models, and yearly dummies for 1996-2009 in the third model. The common significance of the time variables (time, time² and i.time) are reported.

Table 6: Alcohol consumption in restaurants.

Strong alcohol consumption appears to be responsive to price level, but the disposable income of households does not affect consumption. In alcohol policy, the most common policy tool has been the price policy. In this paper, we have shown that the control of supply can still be a meaningful policy tool. The political problem in using this tool is that Finns seem to be more willing to accept a rise in prices than a limit to supply. Conclusions should be interpreted with caution, however, because Alko's strategy in opening new outlets was not known to us, and we had to treat outlet openings as an exogenous variable.

There are two main limitations to our study. First, we could not solve the potential endogeneity of Alko outlets, because no clues to the potential decision rule are available. Causality between regional characteristics and the decision to open a new outlet remain a mystery. Travellers' alcohol imports from abroad are difficult to assess, and our results on the effects of imported alcohol are vague. Some studies on travellers' imports and undocumented alcohol consumption have been conducted, but more reliable information is still needed [3,28].

As the number of Alko outlets in a region increases, it is evidently easier to obtain alcohol from the official outlets than to distil illegal alcohol at home. Consumption of moonshine has decreased in recent years. The estimated amount of undocumented alcohol consumption per year is about 2 litres of alcohol (in terms of 100% alcohol) per citizen [36].

An increase in registered alcohol consumption may imply that the

illegal demand has been partly transformed into legal sales at Alko outlets. As mentioned, travellers' alcohol imports from abroad are difficult to assess and predict reliably.

The increased number of Alko outlets has increased sales from Alko outlets and also slightly raised Alko's market share, and it has also contributed to the higher total consumption of alcohol. One factor increasing Alko's outlet market share may be the fact that drinking in restaurants is always more expensive than buying alcohol from Alko or other retail shops. Based on our regression models, there is no relationship between Alko outlet sales on restaurant or grocery store alcohol sales.

Based on our regression models, alcohol consumption is not associated with disposable income. The incomes were quite low, and that differs from some previous results. Our results depict average amounts, and the drinking age of the studied population was 15-89 years. Conclusions should be interpreted with caution, because there may have been differences if we had studied the population as groups of young, middle-aged, and older people.

This study contributes to the discussion of the purpose of state control of alcohol consumption: is there still a point to the monopoly, how well does taxation through alcohol prices work, and is there a relationship between drinking Alko and grocery stores products and drinking in restaurants? The results show that there may be link between alcohol consumption and the number of retail alcohol outlets. This could be a result of the long Finnish alcohol monopoly and restricted alcohol policy. We assume that Finland has its own alcohol culture that is based on the strict alcohol monopoly.

The main strength of the study was the measurement of alcohol availability: the supply effects were clearly estimated, while the consumption is measured from reliable sources. Many surveys where people report their drinking habits underestimate alcohol amounts; our study uses sales, which are objective.

Gruenewald et al. [22] argue that obtaining sufficient data to examine comprehensive models of access to alcohol is difficult. Previous research has demonstrated that in many cases, increased alcohol availability also increases consumption, but uncertainty remains concerning the magnitude of the effect on alcohol consumption. Our study shows that the magnitude of the effect on alcohol consumption is statistically high, and only one Alko outlet more per 1,000 drinking-age peoples would lead to an increase in consumption of 2.3 litres of strong alcohol and 2.5-2.6 litres of wine per year. Strong alcohol consumption seems to decrease lightly when prices increase.

Conclusions

This study provides evidence that alcohol availability has an impact on alcohol consumption, and basically, supply can be used as a policy tool. However, we need more detailed information on sales volumes of alcohol, as well as product-specific prices at the store and the local level, to reliably reflect the impact of availability. Unfortunately, this information is not currently available. Pressure for alcohol policy change and the deregulation of alcohol sales requires that the positive effects of the monopoly can be demonstrated. Further information is also needed on private imports from abroad to reliably estimate the total consumption of alcohol.

Declaration of interest

None.

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