

Effects of increasing availability of wine and spirits in Norway

Introduction

The Norwegian State Alcohol Monopoly (Vinmonopolet)¹ has been a cornerstone of Norwegian alcohol policy since it was established in 1922. After a period of prohibition of spirits, which ended in 1927, the temperance movement struggled hard to limit the number of alcohol shops. Local referendums, which were binding for the local authorities, were organised almost every time a shop was to be opened in a new municipality². The majority of voters were quite often against alcohol shops, and this trend continued also after World War II (Nordlund 1998). From the 1950s there was a significant shift in public sentiment and the referendums could no longer be seen as a measure of restrictive alcohol policy. An increasing number of referendums – and since 1973 all referendums – resulted in a majority vote in favour of opening a monopoly store in the municipality (ibid.). Therefore, when the right to demand a referendum was eliminated from the Alcohol Act in 1989, the temperance movement did not regard this as a great loss (Horverak 2001).

By ironic coincidence, negotiations concerning the EEA agreement were initiated the same year as the Alcohol Act was amended, and this added a new dimension to the alcohol monopoly debate in Norway: the choice

ABSTRACT

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During the 1990s the monopoly on wine and spirits sales in Norway lost popular support. In 1998 the management of the monopoly therefore launched a plan for regaining popularity by increasing the number of retail outlets and introduce self service in the shops. Surveys since 1990 show that the negative trend really changed around the turn of the millennium, and the monopoly system has regained most of its popular support since then. A crucial question is then: Has the increased availability of wine and spirits resulted in increasing alcohol consumption? Data from two surveys, one in 1999 and one in 2004, are used to answer this question. According to these data the total alcohol consumption increased during this period, but only in the municipalities that had a monopoly shop before 1999, i.e. in municipalities that were not expected to be influenced by the increasing availability. This increase was mainly due to increased consumption of beer and spirits. In the municipalities that were influenced by the new monopoly shops during this period, there was a decrease in consumption of spirits. This was due to a sharp decrease in the consumption of "moonshine", while the consumption of spirits from the monopoly shops increased. These results are in accordance with previous studies of short term (one year) effects

in particular municipalities
where a new monopoly
shop was opened.

■ KEYWORDS

Alcohol, increased
availability, effects, attitudes,
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was no longer only between 'a shop' and 'no shop' at the local level, but between 'a monopoly' or 'no monopoly' at the national level. The question of maintaining the alcohol monopoly became even more controversial during the negotiations for EU membership. Norway did not become a member of EU, but the EEA agreement, which harmonised many Norwegian laws with those of the EU, came into force in January 1994. This adaptation to EU rules resulted in a dissolution of the monopoly system on import, export, production and wholesale of alcoholic beverages in all the Nordic countries. The main question about the monopoly system did, however, concern the retail sales monopoly. This question was not resolved until 1997, through a decision of the EU Court in the so-called Franzén case (Case C-189/95). The decision implied that the Nordic retail monopolies could persist, under the condition that no discrimination between domestic and imported products occurred.

Following some adjustments to its policy (Nordlund 2007) the Norwegian retail monopoly continued to operate as it did before the Franzén verdict. However, a new situation had emerged: From having been an undisputed cornerstone of Norwegian alcohol policy for about 70 years, the monopoly system (or the remains of it: the retail monopoly) was now seriously questioned. Especially the possibility of purchasing wines in ordinary grocery stores seemed very appealing to many.

Given that the very existence of the monopoly was being heavily discussed, and some political parties included dissolution of the monopoly in their programs, this development in public attitudes naturally worried the management of Vinmonopolet, as well as those politicians who sought to protect and maintain the monopoly system. Therefore, in 1998 a four-year plan for developing Vinmonopolet was laid out. It included the opening of 50 new monopoly shops, as well as the introduction of self-service in the shops, first as an experiment in a limited number of cities (14 in all). An evaluation of this experiment (Horverak 2002) showed that self-service caused an increased sale of about 12 per cent, more for wine than for spirits, which is consistent with previous results from Sweden (Skog 2000). In spite of this conclusion, the government approved self-service in 2001. The declining popularity of the monopoly system was obviously

an important argument for this decision (Vinmonopolet 2001).

In 2001 the plan for the alcohol monopoly was revised, to allow for an additional 20 new shops (on top of the initial 50). After the expiry of the plan period in 2002, Vinmonopolet had 176 shops spread across the country. This was an increase of 62 shops since 1997, the year before the plan period. The next year the number of new shops passed the 70 shop limit, and the political signals were obviously to continue this expansion, although this was not explicitly stated in any plan or official document. The number of shops has continued to increase further (see Figure 1), and at the end of 2008 there were 239 monopoly shops, of which 236 (99 per cent) offered self service.

The increase in the number of shops since 1997 is the greatest since Vinmonopolet was established as a complete state monopoly in the late 1930s³. The purpose of the monopoly has from the start been to curb the consumption of wine and spirits, and it is obviously of vital interest to see

how the increase in the availability has influenced the consumption. This situation therefore represents a good opportunity for evaluating the effect of an increase in the availability of wine and spirits on consumption.

Some studies from abroad have shown increased consumption after large increases in the number of alcohol outlets (Babor et al. 2003). More local studies from Norway have, however, shown little effect on total consumption in municipalities where monopoly shops have been opened. The only statistically significant change after one year is a substitution from beer and different kinds of unrecorded products to the products sold by the monopoly shops (Nordlund 1974; Hauge & Amundsen 1994; Horverak 2004). Will this also be the case when we study a longer period, with shops opening continuously in a large number of municipalities across the country?

The increase in the number of monopoly shops came as a clearly expressed result of the development in public attitudes,

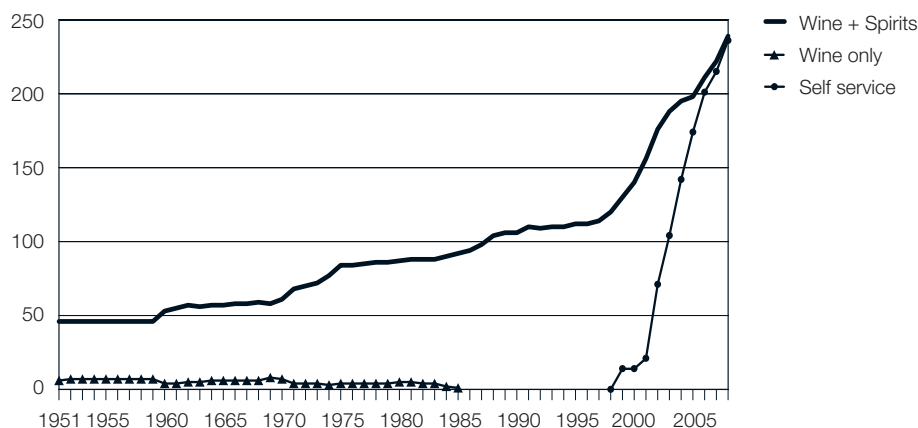


Figure 1. Number of monopoly shops, their assortment type, and how many of the shops which have self service, by the end of each year 1951–2008

while the increasing number of shops is supposed to be the cause of an increase in consumption. Therefore the change in public attitudes will be studied for the whole adult population, while the change in consumption will be studied also in relation to the change in availability in different municipalities. The aim is to answer two main questions: 1) Has the increase in the number of shops led to an increased popularity for the monopoly system? And 2) Has the increase in the number of shops led to an increase in alcohol consumption in Norway, particularly in the municipalities which have got an increased availability of wine and spirits due to the opening of the new monopoly shops?

Data and methods

■ Data on attitudes

In 1990, when the discussion about the monopoly system was in its initial stages, monitoring of developments in public attitudes to the retail monopoly system was started. This was carried out by collecting two different series of data, both based on nationwide interview surveys of presumed representative samples of the population aged 15 years and older. In one of these series the respondents were asked where they would like to buy wine and spirits; in ordinary grocery shops or in monopoly shops. The data comes partly (in 1991, 1994, 1999 and 2004) from broad special surveys on many aspects of the Norwegian alcohol culture (consumption, private production, private import, attitudes, good and bad experiences, etc.). Each year the samples include about 2000 people, except in 2004 when the survey covered nearly 3200 individuals. In all the

other years since 1990, except 1992, 2000 and 2005, the same question was posed within general market surveys (omnibus) by the same professional agency (MMI/Synovate) that conducted the special alcohol surveys. In these cases the number of respondents was 1000-1200. All these survey data were obtained by face-to-face interviews in the respondents homes, during October/November each year.

In the other series of surveys, people were asked to state if they agreed or not with the statement: "Wine should be sold in ordinary grocery stores". These surveys were done by telephone interviewing (CATI) made monthly during one-year periods from August to July (by TNS Gallup). The total samples of these surveys amounted to around 3700 respondents in each one-year period.

■ Data on consumption

As mentioned above, in October/November of 1999 and 2004 relatively large, nationwide interview surveys were carried out with presumed representative samples of the population aged 15 years and above. The samples are drawn by a standard three-step method, based on a stratification of all municipalities in 84 strata according to geographic location, number of inhabitants and principal trade. The municipalities are drawn with a probability proportional to the number of inhabitants aged 15 and above. As a second step random addresses are drawn within the municipalities, and the third step is to interview the person with the latest birthday on the random address. No response rates are given, which is normal in this type of sampling. Although the samples are presumed

to be representative for the total population, they are not drawn from the same municipalities each year, even if there is quite a large overlap. This complicates the use of these data for the purpose of studying the effect of the new monopoly shops on alcohol consumption, but it is the only data available.

These surveys included questions about alcohol consumption, suitable for calculating quantity-frequency estimates for annual consumption of different kinds of alcoholic beverages. The estimates were based on how often the respondents reported drinking each type of alcoholic beverage normally during a longer period, and reported amount normally consumed of that beverage type on one drinking occasion.

The initial idea for the study design was to look at the consumption data for people living in municipalities where a monopoly shop was opened during the period 1999 to 2004, and to compare them with the consumption data for people in the municipalities with a stable availability situation. However, when a monopoly shop opens in a municipality in Norway, it is usually not only the residents in that particular municipality that are affected. Many municipalities with relatively small populations can be really large in geographic area, and very often the municipal centre, where the monopoly shop is established, can be better reached from some neighbouring municipality than from the more remote places within the municipality itself. A careful study of the Norwegian map, with all the municipal borders marked, was therefore necessary in order to ascertain which municipalities were

actually affected by the different openings of monopoly shops⁴. Hence, we have partitioned the Norwegian municipalities into three groups: Those who had a monopoly shop already in 1999 and were very little affected by the new shops⁵ (“Had”), those who were influenced by the opening of a new monopoly shop (because it was opened in the municipality or in an easily reachable neighbouring municipality) during the period 1999 to 2004 (“Influenced”), and those who did not have a monopoly shop (or were not influenced by a new one in a neighbouring municipality) during the study period (“Not influenced”). We will compare the development of alcohol consumption in these three groups by using the available survey data. The number of respondents in each of the categories of municipalities is shown in Table 1.

Even if there is not a complete overlap in municipalities that are represented in both surveys, there are good reasons for considering the total sample in the analysis. First, the respondents are not the same in the two surveys (even when the municipalities are the same), so the two samples are mutually independent. Second, the municipalities that are represented both years are dominated by large and central municipalities (including the largest cities). These municipalities have a larger probability to be represented in a random sample of respondents than a less populated municipality, of which there are many more. Therefore (as is evident from table 1) the relative loss of respondents would be much less from the “Had”-group than from the other two groups if only the municipalities that are represented both years are included. By including the total sam-

Table 1. Number of respondents in the samples from 1999 and 2004 according to whether the municipality was represented in the sample only in 1999, only in 2004, or both years, and according to what type of municipality the respondents lived in (“Had”, “Influenced” or “Not influenced”) during the study period

Monopoly influence on municipality	Municipality represented in sample...				Total sample	
	... only in 1999	... only in 2004	... both years		1999	2004
Had shop 1999	184	350	1067	1474	1251	1824
Influenced by shop 1999–04	204	179	297	376	501	555
Not influenced by shop	220	473	195	315	415	788
Total	608	1002	1559	2165	2167	3167

27 persons (3 from the 1999 survey and 24 from the 2004 survey) are omitted because they lived in communities that got a monopoly shop just after the survey in 2004 was ended, and we are not sure if this influenced them in some way or not.

ple in the analysis we therefore get a more balanced partition of the sample.

The two samples are weighted by gender, age and type of municipality (number of inhabitants, location and principal trade). However, in spite of the weighting of the total sample, we also have to ascertain that the samples from each group of municipalities (“Had”, “Influenced”, “Not influenced”) are comparable in the two surveys. In this case it is especially important that the samples from each of the groups have about the same gender and age distributions in both surveys. Chi-square-tests of the gender and age distributions for each of the groups show no significant differences between the two surveys, with one exception: The oldest age groups (above 55 years) are slightly over-represented in the 2004-survey compared to the 1999-survey among those who did not have a monopoly shop (and were not influenced by one) at the end of 2004. This might induce an artificial difference in the mean consumption for this group, and will be kept in mind as results are interpreted.

Results

■ Effects on public opinion

From the figures 2 and 3 we can see that the popular attitudes to the monopoly system, especially the retail monopoly on wine, became increasingly unpopular during the 1990s. Around the turn of the millennium, more than two-thirds said they wanted wine to be sold in grocery stores, and an even greater share said they agreed fully or partly with the statement about buying wine in grocery stores. In fact, in 1999-2000 a majority agreed fully with this statement.

The figures also show that the public opinion really did change during this period of increasing availability. In 1998, when the monopoly plan was launched, less than one-third of the population wanted the monopoly system to prevail (Figure 2). According to the surveys, more than two-thirds wanted wine in the grocery stores, and nearly one-fourth would even like to have spirits at their local grocers. Since then a clear increase in support for the monopoly has occurred; in 2009 only around

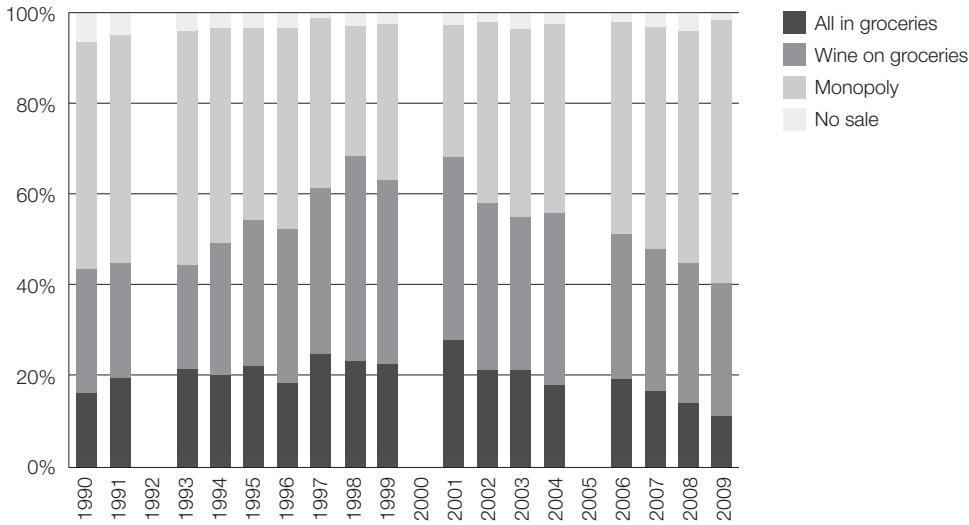


Figure 2. Share of population that want wine and/or spirits to be sold in grocery shops, in the monopoly shops or not at all

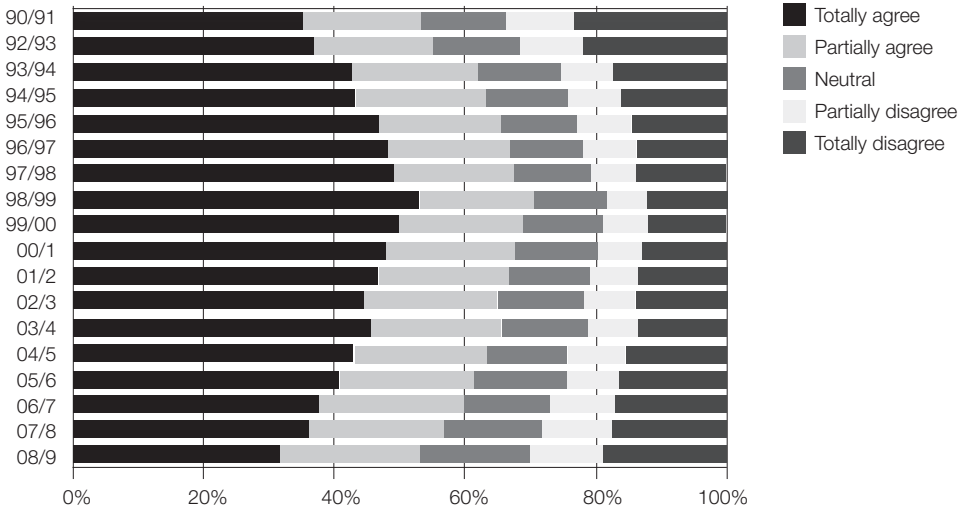


Figure 3. Distribution of attitudes to the statement: "It should be possible to buy table wine in grocery stores"

40 per cent still wanted wine in the grocery stores, and the share that also wanted spirits in grocery stores was down to 11 per cent, which is clearly less than in 1990.

Popular attitudes to the statement "It should be allowed to buy ordinary wine in grocery stores" have developed accordingly (Figure 3). The clear majority (53 per

cent) that fully agreed with the statement in 1998/99 was reduced to 32 per cent in 2008/09, and the more than 70 per cent that agreed fully or partly in 1998/99 was reduced to 53 per cent. Even if this is still a majority, it is no longer overwhelming and the direction of the development has definitely been reversed. The attitudes to this statement are now more or less back to the situation in 1990 when privatisation of the sale of wine and spirits was hardly an issue in the minds of ordinary people.

■ Effects on consumption

The recorded consumption (see Figure 4) shows a clear increase since 1997, but this trend began long before the sharp increase in the number of monopoly shops, and there is no sign of an accelerated development in consumption since then. The small increase in the sale of spirits since 2002 is more likely related to a contemporary decrease in smuggling and home distilling after the death of nearly 20 persons after they drank smuggled spirits polluted with methanol. These data are therefore of little value for an evaluation of the rapid

increase in the number of monopoly shops.

The mean annual consumption of each beverage type, based on quantity-frequency estimates for the respondents in 1999 and 2004, for the three groups of municipalities is shown in Table 2. Also the per cent change in each group is shown, as is the result of t-tests of transformed variables⁶.

There are many sources of errors in this type of data, both systematic and unsystematic. The first type concerns the obvious underreporting that all surveys of this kind are encumbered with (Midanik 1982; Nordlund 2000). The other type is the rather great random fluctuations in the data, revealed here by the large variability of the estimates. Therefore, one should not take the figures in the table too seriously, but mainly focus on the changes that are shown to be significantly different from zero.

If we first look at the change in total alcohol consumption we find a significant change only for the samples from municipalities that already had a monopoly shop before the first survey. These municipali-

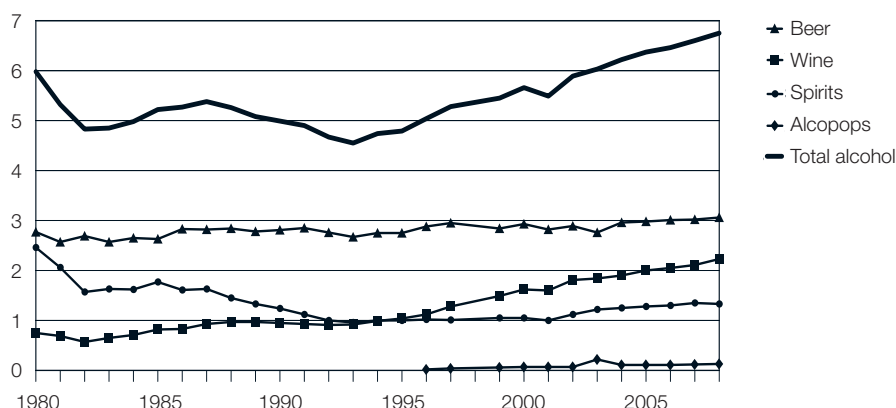


Figure 4. Recorded consumption of alcohol in Norway 1980–2008. Litres of pure alcohol per inhabitant 15 years and older

ties are mostly major cities and towns. Total consumption increased by an estimated 16 per cent, not far from the 14 per cent increase in the officially recorded alcohol consumption during the same period. This is, however, probably a coincidence, since the survey estimate also includes consumption of all kinds of unrecorded alcohol.

Beer consumption had a significant increase in the total population, according to the survey estimates. The recorded consumption in this period only showed a 4 per cent increase, but import by travellers had obviously increased during the same period (Nordlund 2007) and might explain some of the discrepancy. Only the increase

in the group that had a monopoly before 1999 is statistically significant.

The increase in wine consumption is not significant, neither totally nor for any of the different groups. This is quite surprising since the recorded consumption of wine increased by 28 per cent during this period. There was also an increase in the travellers' import (*ibid*), but the amount of homemade wine has decreased by more than one-half. How these changes in the different types of unrecorded consumption influenced total consumption is quite difficult to know, however, because each type is estimated by different methods: The estimates of homemade wine are for instance calculated on the basis of re-

Table 2. Changes in mean annual consumption of different types of alcohol from 1999 to 2004 by people living in municipalities with a monopoly shop established before 1999, in municipalities influenced by a newly opened monopoly shop in the period between the surveys (1999–2004), and in municipalities where people were not influenced by the opening of a monopoly shop in this period. Weighted.

Mean consumption of...		Monopoly shop before 1999	Influenced by monopoly shop 1999–2004	Not influenced by monopoly shop	Total
Total alcohol	1999	3.50	2.95	2.49	3.19
	2004	4.35	3.02	2.56	3.69
	% increase	24 **	2	3	16 **
Beer	1999	1.65	1.26	1.18	1.48
	2004	2.09	1.41	1.05	1.73
	% increase	27***	12	–11	17 **
Wine	1999	1.02	0.53	0.60	0.83
	2004	1.05	0.60	0.61	0.86
	% increase	3	13	2	4
Spirits (incl. moonshine)	1999	0.83	1.17	0.71	0.89
	2004	1.22	1.01	0.89	1.10
	% increase	47 **	–14*	25	24***
Spirits (excl. moonshine)	1999	0.62	0.50	0.49	0.57
	2004	1.01	0.73	0.52	0.84
	% increase	63 ***	46(*)	6	47 ***

*** = $p < 0.001$, ** = $p < 0.01$, * = $p < 0.05$ (*) = $p < 0.06$

ported production in households, while tourists' imports are estimated from reported personal import during the year, and smuggled alcohol is estimated on the basis of reported purchases on the illegal market. The rates of underreporting vary for each of these data types, which in turn are different from the level of underreporting for consumption data. Therefore, we have not tried to subtract the different types of unrecorded alcohol from the total consumption in an attempt to estimate the recorded consumption. Such an attempt would obviously give very unreliable results. Only the consumption of home distilled spirits ("moonshine") is estimated by the same method (quantity-frequency) as the consumption of spirits in general. In Table 2 we therefore have been able to present estimates for the consumption of spirits both including and excluding home distilled spirits.

When we look at the estimated consumption of spirits in all (including moonshine) we find some very surprising results: People in the municipalities who experienced the opening of a new monopoly shop during the period between the surveys seem to have reduced their consumption of spirits, even if it has been more available, while those who have experienced no change in availability seem to have increased their consumption of spirits. This result seems to be contrary to what one would expect.

If we now look at the estimated consumption of spirits excluding moonshine, we get figures which are a somewhat more relevant expression of the consumption of spirits from the monopoly shops. We then see that the people in the municipalities that introduced a new monopoly shop seem to have increased their consumption

of spirits from these shops (nearly significant), but the decrease in consumption of moonshine seems to more than counterbalance this increase.

As mentioned above, there was a small overrepresentation of people above 55 years in 2004 compared to 1999 in the "non-influenced" group. The difference in this group was expected to give too low estimates in 2004, especially for beverages preferred by the younger age groups. This might explain the apparent decrease in beer consumption for the "non-influenced" group. It also seems that the older generation prefers spirits, and especially moonshine, more than the younger drinkers, relatively speaking.

There might also be other sources of errors in these data: We have for instance the problem of outliers, i.e. responses so extreme and atypical that they alone can change the mean values so much that the results can be radically different if one removes them. We have tried different approaches to this problem; we have, for each beverage type, removed respectively the 10 most extreme observations, the upper 0.5 per cent of the observations, and the upper 1 per cent. These removals did of course reduce the estimates somewhat, but none of them changed the structure of increases and decreases from the first to the second interview, i.e. the outliers had no real influence on the results of this study.

We have also looked at the development in the tendency of drinking to intoxication in the different groups during the period between the surveys. Table 3 shows the mean number of self reported instances of intoxication, and the per cent change during this period. Self reports on per-

Table 3. Mean number of self reported instances of intoxication during last year in the 1999 and 2004 surveys by the respondents in the three groups of influence by the opening of monopoly shops. Weighted.

Mean number of intoxications	Monopoly before 1999	Monopoly 1999–2004	No mono- poly shop	Total
1999	4.5	3.4	3.2	4.0
2004	5.6	2.9	2.9	4.5
% increase	24*	–15	–9	13*

* = $p < 0.01$

sonal behaviour are not always very reliable, but still the results in the table are in accordance with the development in consumption shown in Table 2: A statistically significant increase in intoxication among those who had a monopoly shop already in 1999, i.e. among those who had a significant increase in total consumption of alcohol. The other groups had no significant increase in total consumption and also no significant change in self-reported intoxication. The increase in the number of self reported intoxications in the total samples is also in accordance with the significant increase in overall consumption. These results can therefore be taken as an indication of the reliability of the changes in the consumption data.

Discussion

After a period of declining popularity of the alcohol monopoly, the plan from 1998 for a rapid increase in the number of monopoly shops, and a change to self-service, seems to have succeeded in reversing general opinion in a more positive direction. This was especially evident with regard to views on where wine ought to be sold. In this sense the new policy of Vinmonopolet might be regarded as a success.

However, one must also ask just how far adjustments to market demands can

proceed. The state alcohol monopoly was established in order to curb demand and consumption of alcohol. This was a key element in the Norwegian alcohol policy which was based on limiting availability and maintaining high prices. For the most part, price policies are not the responsibility of the monopoly since prices are dependent on the different excise duties imposed on the products by the Norwegian Parliament. However, the monopoly policy does affect availability, and the rapid increase in the number of shops since 1997 might be interpreted as a clear departure from the original intentions behind the monopoly system. This, in turn, might become a new argument for opponents of the monopoly, given that the traditional justification for maintaining a monopoly system was used in the EU-negotiations, and in different processes in the EU- and EFTA Court (Ugland 2002). In this way the seeming success story of the monopoly's increasing popularity might in fact lead to its being questioned in the long run.

A central element in this discussion will probably be based on developments in consumption patterns in the municipalities where new monopoly shops have opened. If the increase in availability has led to increased alcohol consumption, especially of wine and spirits (since 99 per

cent of the beer is sold in ordinary grocery stores), the opponents of the system can claim that the monopoly is no longer acting according to its initial purpose.

The largest increase in alcohol consumption during the period 1999 to 2004 seems to have taken place in those municipalities who already had one or more monopoly shops in 1999, i.e. in the larger cities and towns. There is no sign of a significant increase in total consumption in the municipalities that experienced the introduction of a monopoly shop during this period, and neither in the municipalities that still had no monopoly shop by the end of 2004. There is, however, an indication (nearly significant) of increased consumption of spirits from the new monopoly shops in the municipalities where these were opened, or municipalities in the close vicinity, but this increase was counteracted by a decrease in the consumption of home-distilled spirits (moonshine).

The conclusions about the change in consumption pattern are mainly in accordance with previous studies of particular municipalities where a new monopoly shop was opened. In these studies it was found that the consumption of beverages sold by the monopoly shops increased, but at the expense of moonshine and other unrecorded alcoholic beverages. The total consumption was not significantly changed. Pekka Kuusi's conclusions from his classical study of the increased availability of beer and wine in rural Finland in the 1950s (Kuusi 1957) are also in accordance with the conclusions of the present study. However, the study intervals in all these studies covered only one year, so the conclusions only apply to the short term effect of the opening of new monopoly

shops. The present study shows that the same conclusions seem to be valid even for longer periods.

In this study we should bear in mind that the design was not ideal. The sampling of respondents was not carried out for the purpose of this particular study, and this complicated the analysis and may have introduced errors which we have not discovered or corrected for. However, the adjustments and corrections we have made have not altered the estimates substantially, and definitely have not altered the main conclusions of the study: The monopoly has regained its popularity by increasing the number of shops and by introducing self service, and the data shows no indications of an increase in total alcohol consumption due to the increased number of shops.

These conclusions must obviously be in line with the aspirations of the management of the monopoly and the policy of the government. However, the increased alcohol consumption in the municipalities that already had a monopoly shop could indicate that the development in the longer term might be different also for those municipalities that relatively recently saw the opening of a monopoly shop. We should also keep in mind that the liberalisation of the Finnish alcohol policy in 1968, which was partly inspired by Kuusi's study, led to a major increase in alcohol consumption in Finland (Mäkelä 1971). It might therefore be wise not to draw too categorical conclusions.

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NOTES

- 1) The monopoly covers only spirits, wine and (from 1993) strong beer. Beer below 4.75 per cent (by volume) have never been under monopoly control. Strong beer represented about 5 per cent of the total beer volume the year before the monopolization, and about 1 per cent the year after, with further decrease since then. In the late 1950s strong beer amounted to around 30 per cent of all beer consumption.
- 2) "Municipality" is here used for "kommune", the smallest administrative unit in Norway. These units vary greatly in area and population. Oslo with more than half a million inhabitants is a kommune, but so is Utsira with its 209 inhabitants.
- 3) Until 1938 the "monopoly" existed alongside municipal wine and spirits shops, which gradually were bought out. In 1940 the number of shops was 41. In 1951 it was 46 with full assortment, and 6 with only wine.
- 4) The main rule for this partitioning was that neighbouring municipalities to a municipality that got a monopoly shop was regarded as influenced if they earlier had no neighbouring municipality with a shop, and no simple route to a municipality with a shop. In some cases a touch of personal judgement had to be used, for instance when the municipal borders were at sea, and the distance between the land parts of the communities was long.
- 5) During the period 31.12.99 to 31.12.04 (almost exactly the study period) the total number of monopoly shops increased by 65, of which only 7 were opened in municipalities that already had a shop. To increase availability throughout the country by opening shops in new municipalities was part of the official strategy of the monopoly.
- 6) Given two alcohol consumption variables X_1 and X_2 (which can be zero), with means ξ_1 and ξ_2 respectively. We want to test the null hypothesis $\xi_1 = \xi_2$. Then there are two problems: 1. The variables (alcohol consumption) are not normally distributed, 2. There is probably an accumulation of non-consumers (zeros). One way out is the following: The alcohol consumption in the two populations when the zeros (non-consumers) are excluded, X'_1 and X'_2 respectively, can be assumed to be log-normally distributed (Skog 1980). Let us call the shares of alcohol users (non-zeros) b_1 and b_2 , respectively. These shares of users are population variables, and can be assumed to be independent of the individual consumption among the consumers; i.e. it can be seen as known parameters of the populations. Then $\xi_1 = E X_1 = E b_1 X'_1$, and correspondingly $\xi_2 = E X_2 = E b_2 X'_2$. By making the transformations $Y_1 = \log b_1 X'_1$ and $Y_2 = \log b_2 X'_2$ we get variables with normal distributions, and an ordinary t-test is applicable.

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