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## **DEVELOPMENTAL ALCOHOL TRAJECTORIES WHEN PRICE AND AVAILABILITY CHANGED**

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## **Developmental alcohol trajectories when price and availability changed**

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### **ABSTRACT**

*Purpose.* To identify developmental trajectories for alcohol consumption in southern Sweden in relation to increased availability of cheaper alcohol, and to study the likelihood of belonging to one of the identified trajectory groups. An increase of total consumption was expected to be related to an increase in consumption of spirits due to the nature of the changes. Developmental patterns were assumed to be different in northern Sweden given the distance to the changes.

*Design.* 16-80 year olds from general population samples from southern (n=610) and northern (n=575) Sweden were interviewed by telephone before and after changes. Alcohol use trajectories for the years 2003-2006 were identified through longitudinal cluster analysis. Characteristics of clusters – sex, age, income, price expectations, alcohol attitude, alcohol consumption, binge drinking and beverage preferences – were compared.

*Findings.* Three developmental trajectories for consumption were identified for each region. Alcohol habits influenced the likelihood of trajectory membership as decreaseers on average had a higher initial consumption. An increase in spirits consumption was also observed among overall increaseers. Other potential explanations were not linked to trajectories.

*Research implications.* Earlier research of the changes was unable to find an overall increase in consumption but these results suggests that some groups changed as expected.

*Originality.* Few studies have identified trajectories of alcohol use in relation to policy changes. Studying patterns of change puts the focus on consumption rather than population groups.

*Keywords.* alcohol consumption, policy, price, availability, development, longitudinal data, cluster analysis, trajectory groups

## INTRODUCTION

The traditionally restrictive alcohol policy in Sweden was to some extent weakened when the less restrictive allowances for private imports of alcohol was fully carried out in 2004 as a result of the Swedish membership in the European Union (EU) in 1995 (Gustafsson, 2010<sup>a</sup>). Around the same time a Danish tax decrease in spirits (-45 %) was implemented. These two changes were hypothesized to affect volumes of alcohol consumed in southern Sweden since private persons could now import unlimited amounts of alcohol for own use at the same time as there was a change in the price of privately imported alcohol and particularly of spirits (Room, 2004; Mäkelä et al., 2007). Northern Sweden was not assumed to be affected by these changes since there were large regional differences in private imports. In southern Sweden almost half of the amount of alcohol consumed was acquired from abroad and from Denmark and Germany in particular: 43 per cent compared to 11 per cent in northern Sweden (Ramstedt et al., 2009; Gustafsson, 2010<sup>b</sup>).

The basic economic principle linking price to demand generates the expectation that as alcohol prices decrease, demand will increase (Chaloupka et al., 2002). The physical availability of alcohol has also been shown to affect demand (Mäkelä et al., 2002). In fact, alcohol research has identified pricing and physical availability as the most effective policy control instruments (Babor et al., 2010; Wagenaar et al., 2009). Thus, when physical availability changes (greater allowances for private imports) and prices are lowered (tax decreases) the likelihood of purchasing more alcohol increases. For people living in southern Sweden, where a large share of the total volume of alcohol consumed comes from private imports, the effect was expected to be larger than in northern Sweden, where a smaller share comes from these sources (Gustafsson, 2010<sup>b</sup>). It was surprising when earlier analyses of these changes were unable to find an increase in either self-reported cross-sectional data on consumption or alcohol-related problems (Gustafsson, 2010<sup>b</sup>, Gustafsson, 2010<sup>c</sup>). Analyses of hospital data (Gustafsson and Ramstedt, 2011) suggested, however, a possible increase in some groups, i.e. chronic heavy drinkers. This finding was also in line with a note made by Mäkelä and colleagues (2002) stating that policy changes most often have their greatest effect among people with high initial alcohol consumption. This is furthermore what can be expected from Skog's theory of the "collectivity of drinking cultures" (1985), which claims that when there is a change in total consumption, the largest changes (in absolute terms) are to be expected among high consumers of alcohol.

The unexpected results also raised questions as to whether there were population groups who changed their consumption differently from others. There is evidence in the literature

showing that consumption levels do not always change evenly across population groups over time in relation to policy changes (Mäkelä et al., 2002; Gustafsson, 2010<sup>c</sup>). Longitudinal data were also collected in relation to the cross-sectional samples mentioned above. These data offer the unique opportunity to study various patterns of change in alcohol consumption levels on the individual level in relation to the changes, as well as to study what characteristics describe these different trajectories. Some groups in the southern region were expected to change their consumption more than others. People with a preference for consuming large amounts of alcohol were more likely to make the trip since the economic incitements are larger for them, and with more alcohol at home larger consumption and possibly more binge drinking could follow. Earlier results from register data (Gustafsson and Ramstedt, 2011) indicated that high consumers were a group which had increased their alcohol consumption more than others in relation to these changes. Based on rational choice theories (Becker and Murphy, 1988) it has also been suggested that people expecting prices to decrease (further) increase their consumption accordingly prior to changes being implemented. Danish prices were lower on all alcoholic beverages already before the changes, but since the tax decrease in Denmark was on spirits and this beverage is easy to transport, increasers were suggested to possibly change their beverage preference towards spirits. As men, and especially young men, are known to drink more (Mäkelä et al., 2006; Ramstedt et al., 2009; Wilsnack et al., 2000), they were consequently expected to increase their consumption more after the changes. Thus, sex and age were expected to vary by clusters as young men were assumed to be more present in trajectories increasing their consumption after the policy changes. The expectations linked to income level are ambiguous; although lower prices could be argued to be more important for those with low incomes, the nature of the changes implied travelling, which in itself involves an expense. Additionally, one would need capital to privately import larger amounts of alcohol.

### *Objectives*

Analyses aimed at identifying different alcohol use trajectories in two Swedish regions in relation to two alcohol policy changes carried out in 2003 and 2004, which were assumed to increase alcohol consumption in southern Sweden in particular. It was hypothesized that population groups would be affected differently by the changes and that potential increases in consumption would be related to spirits. Thus, the likelihood of belonging to one of these trajectory groups was studied in relation to sex, age, income categories, volume of alcohol consumed, non-drinking, weekly binge drinking and beverage preference.

## METHODS

In order to identify developmental pathways for alcohol consumption in relation to the two changes which resulted in an increased availability of cheaper alcohol especially for those living in southern Sweden, longitudinal data was analysed.

### *Data and participants*

Longitudinal survey data were collected through telephone interviews during the third quarter (July-September) of the calendar years 2003-2006 from southern and northern Sweden separately. Southern Sweden<sup>i</sup> was defined as the areas geographically closest to Denmark with the lower prices and northern Sweden<sup>ii</sup> as the region furthestmost from this area. Assuming that southern Sweden particularly would be affected by the changes, northern Sweden was mainly included as a control site, aiming for a natural experimental study design.

The data collected in 2003 was considered to be the 'before period', before the Danish tax decrease in spirits on 1 October 2003 and the Swedish abolition of restrictions on travellers' allowances on alcohol on 1 January 2004. Initial samples were collected from the general population aged 16-80 years and living in southern (n=1425) and northern (n=1336) Sweden in 2003. Response rates were 50.5 per cent and 48.4 per cent respectively. At baseline (2003), the samples included slightly less men and older people, aged 60+ years in northern Sweden and in southern Sweden 45+ years, compared to the composition in the general population during this year<sup>iii</sup>. The self-reported mean alcohol consumption level was noted to be higher in the initial sample of the southern region compared to the northern region (4.54 and 2.99 litres of pure alcohol per year respectively, Gustafsson, 2010<sup>b</sup>), to be compared with the annual national self-reported consumption in 2003 of 4.5 litres of pure alcohol (Ramstedt et al., 2009). People were re-interviewed the following three years. Only those who had participated in all four waves were included in the analyses presented here, resulting in sample sizes of n=610 in the south and n=575 in the north after excluding total abstainers (abstained from alcohol all four years). The longitudinal samples had a completion rate (responding all four years) of 79.1 per cent in southern Sweden and 77.7 per cent in northern Sweden. People participating in all waves was found to have a slightly lower consumption (4.01 and 2.55 litres of pure alcohol per year compared to the initial year) than the base-line samples mentioned above but the general patterns have been shown to be the same, i.e. a decrease in south and an increase in north (Gustafsson, 2010<sup>b</sup>). For more details on the original study see Mäkelä et al., 2007.

### *Measurements*

The self-reported alcohol consumption volumes were measured with a beverage-specific measurement (quantity-frequency scale) and recoded into litres pure (100%) alcohol per year. The volumes were presented as total amount of alcohol consumed as well as composition by beverage type (in litres and % of total consumption). The beer category included beer class II and III, and the wine category included table wine and fortified wine. There was also a spirits category. “Other” beverages included cider, alcopops, long drinks and strong cider. The proportion of abstainers referred to those had not consumed any alcohol during the past 12 months. Binge drinking was defined as at least weekly binge drinking (consuming ‘alcohol equivalent to at least one bottle of wine, 25 cl of spirits, 4 cans of strong beer or strong cider or 6 cans of medium strength beer’) or not<sup>iv</sup> during last year. Monthly income was re-coded into low, middle and high income categories, equivalent to below 1,600 €, 1,600-3,200 €, 3,200 € and above, respectively. Price expectancy was based on an item asking whether persons thought the price of spirits would have increased or decreased in one year and response alternatives were re-coded into ‘increased’, ‘stayed unchanged’ or ‘decreased’. Alcohol attitude was measured by an item asking whether persons thought that taxes on spirits should be ‘raised’, ‘lowered’ or generally ‘kept the same’. The respondent age was measured at baseline in 2003 as a continuous variable. Additionally, persons were asked about their sex.

### *Statistical analysis*

The volume of alcohol consumption from the four waves was included in longitudinal cluster analyses (average linkage). Consumption data were log-normally transformed prior to the analysis due to skewness. In the presentation of the cluster centroids, the untransformed data are presented for clarity. Rather than start with initial alcohol consumption levels and study overall change, analyses focus on similarities in changes of consumption levels among respondents, i.e. on patterns rather than change between time points. The purpose was to extract different developmental pathways over time, independent of the actual levels of consumption. For this reason, differences in alcohol consumption between different years were not tested with regards to statistically different change. Given that the variation of the levels of consumption can be very large within the same cluster such a test would be misleading. The number of clusters was selected based on a scree plot of the agglomeration coefficients. Cluster analyses were carried out separately for subjects in the southern- and northern parts why the patterns for the trajectories differ. Given that one region was assumed

to be affected by changes and one not, clusters were expected to differ. Cluster solutions were validated with the statistical Software package SLEIPNER version 2.1 using Bootstrap (Bergman and El Khouri, 1998). A version of LICUR<sup>v</sup> (Bergman et al., 2003) was used where clusters were identified for each year. Bonferroni correction was further used to correct for multiple testing problem. Abstainers according to definition above consisted mainly of older women and were excluded from the cluster analysis since they were not likely to be affected by the changes. Individuals within each consumption trajectory were compared with respect to socio-demographic variables, price expectations, alcohol attitude, binge drinking and beverage preference with the intention of explaining the differences in development. Trajectories of patterns of change in alcohol consumption levels were analysed in relation to these predictors using chi-square tests and one-way ANOVA. The longitudinal data were not weighted based on the argument that analyses were aimed at studying how persons included in the sample changed on an individual level rather than being able to generalise to alcohol consumption levels in the general population (earlier analyses on cross-sectional data have applied weights).

## RESULTS

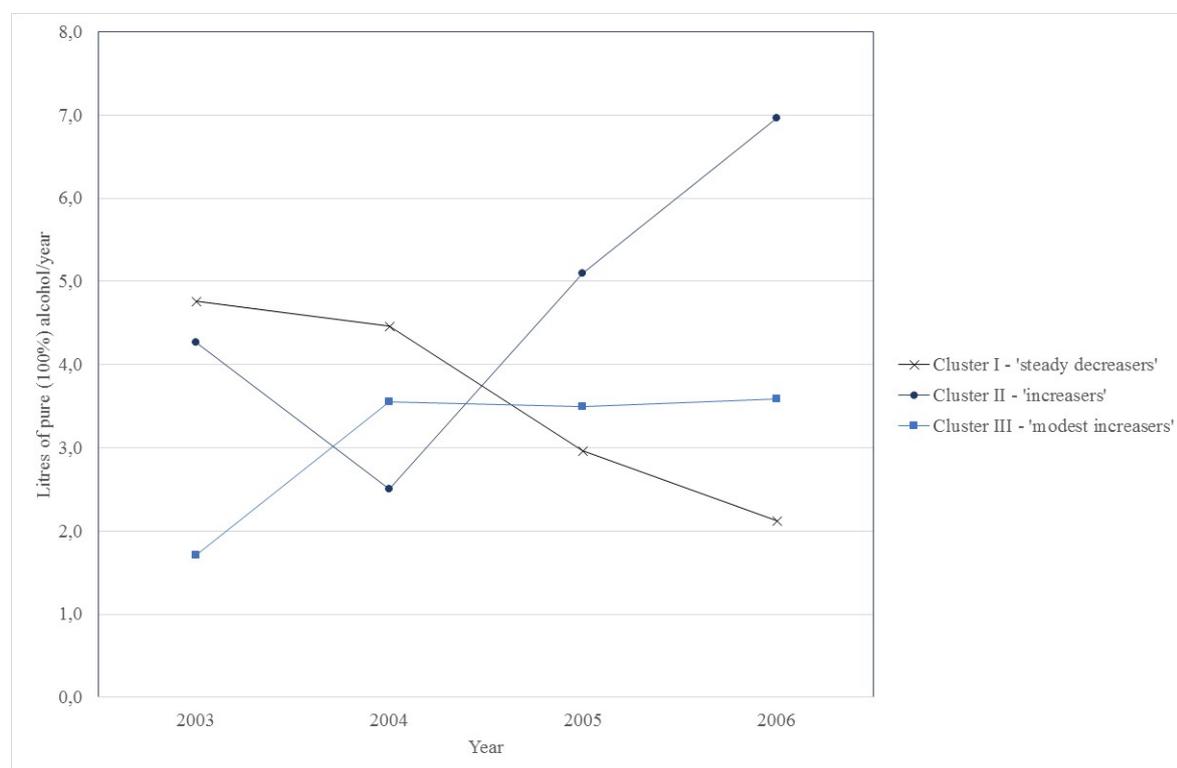
Three alcohol consumption trajectories were identified for each region based on how people changed their alcohol consumption. Since cluster centroids were created based on similar developmental patterns in alcohol consumption levels, the reader should be careful not to draw the conclusion that people in the same cluster have similar consumption levels. The consumption levels reported for each cluster are the means of all individual's alcohol consumption in that cluster, but clusters are based on developmental patterns only.

### *Trajectories for patterns of change*

Figure 1a shows the cluster solution for southern Sweden. The first cluster, 'steady decrease', was defined by a pattern of initially the highest average consumption of alcohol which steady decreased throughout the period (n=340). The second cluster, 'increasers', had an initial high average consumption and, after a temporary drop in 2004, increased their consumption further to a higher consumption compared to the other clusters in this site (n=168). The third cluster, 'modest increasers', showed a pattern of initially the lowest mean consumption, but increased in 2004 and stayed on a higher level (n=102).

In relation to the changes, only 'modest increasers' in southern Sweden increased their consumption the year after the two changes had taken place and had the largest percental

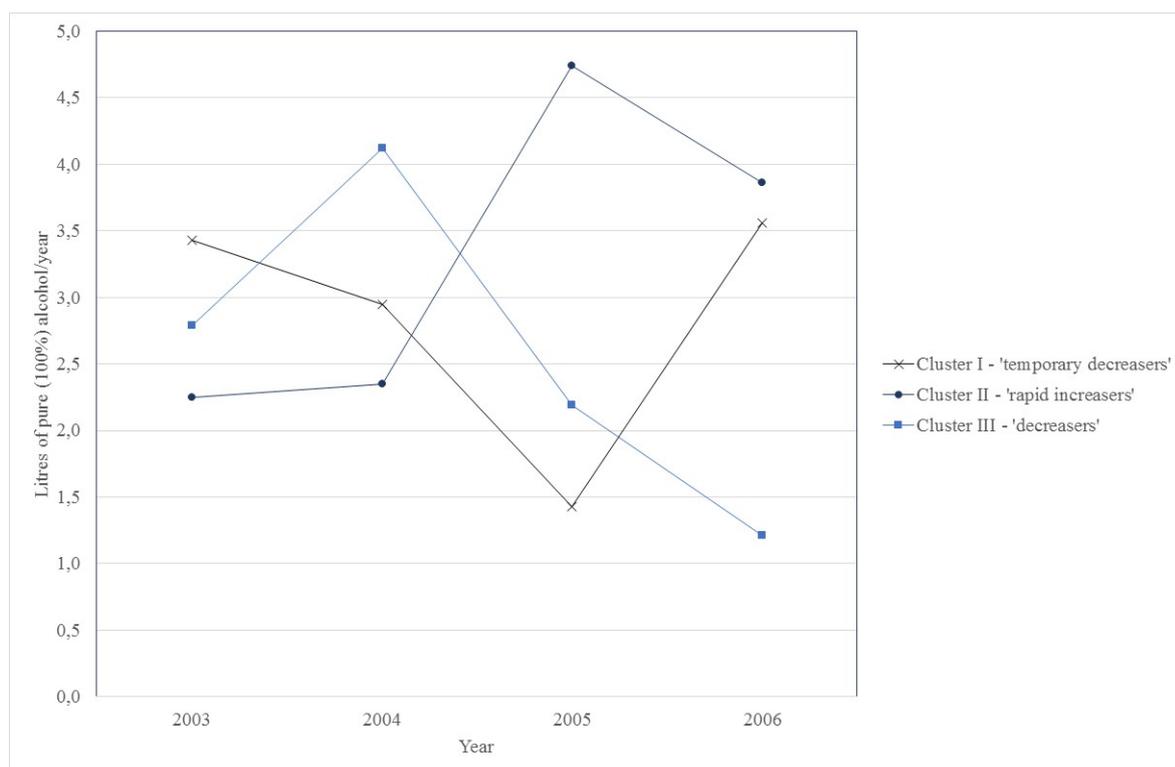
increase over the period. Although, despite the temporary drop in consumption in 2004, the highest consumption level in 2006 was observed among ‘increasers’.



**Figure 1a. Cluster centroids for southern Sweden (n=610).**

The cluster solution for northern Sweden is presented in Figure 1b. The first cluster, ‘temporary decrease’, initially had the highest consumption which decreased slightly in 2004 but mainly in 2005 and then went up to similar levels as in 2003 during 2006 (n=174). The second cluster solution, ‘rapid increase’, started on a modest level of average consumption but increased rapidly in 2005 and, although decreasing, stayed on a fairly high level in 2006 as well (n=224). For the third cluster, ‘decrease’, a temporary peak in consumption levels was observed in 2004 but consumption mainly decreased (n=177).

‘Decrease’ was in fact the only cluster in which a larger increase in alcohol consumption levels was observed in northern Sweden the year after the two policy changes, but this change was not maintained. However, a year later (2005) ‘rapid increase’ changed their consumption considerably (largest percental increase in this region) and stayed on levels above those of the other clusters throughout the period.



**Figure 1b. Cluster centroids for northern Sweden (n=575).**

#### *Characteristics for trajectory groups*

The cluster centroids and their characteristics are presented in Table 1. Although ‘steady decrease’ began with the highest average consumption level, they ended up having the lowest consumption levels of the cluster groups in southern Sweden. The cluster centroids for ‘increasers’, although not a group with extremely high consumption in 2003, showed a steep rise in consumption after the changes. ‘Modest increase’ in the south were identified as having the initial lowest average alcohol consumption, but did not appear as a low consuming group in 2006. Among cluster centroids for northern Sweden, ‘temporary decrease’ had a fairly stable average consumption throughout the period, except for in 2005 when there was a larger temporary drop in consumption levels. Contrary to ‘steady decrease’ in the south, ‘rapid increase’ in the north started off with the lowest average consumption, but ended up having the highest. ‘Decrease’ peaked in consumption in 2004 but ended up having the lowest average consumption of all clusters.

**Table 1. Cluster centroids and characteristics by region.**

	Southern Sweden				Northern Sweden			
	I (n=340)	II (n=168)	III (n=102)	Sign.	I (n=174)	II (n=224)	III (n=177)	Sign.
Cluster centroids (litres of 100% alcohol per year) (SD)								
2003	4.76 (6.70)	4.27 (5.09)	1.70 (2.50)		3.43 (4.62)	2.25 (3.17)	2.79 (3.99)	
2004	4.46 (10.85)	2.50 (3.05)	3.55 (4.09)		2.95 (4.86)	2.35 (3.50)	4.12 (7.56)	
2005	2.97 (4.55)	5.10 (8.86)	3.50 (4.58)		1.43 (1.95)	4.74 (10.63)	2.19 (3.03)	
2006	2.12 (2.67)	6.96 (11.61)	3.59 (4.41)		3.56 (5.05)	3.86 (5.12)	1.21 (1.80)	
Cluster characteristics								
Men/women (%)	44/56	52/48	45/55	ns	46/54	47/53	45/55	ns
Age (2003)	44.5	44.5	44.8	ns	46.5	45.7	46.5	ns
Income (2003) (%)				ns				ns
High income	12.7	16.9	13.0		14.3	9.0	9.1	
Middle income	57.6	52.4	58.0		56.5	63.7	59.4	
Low income	29.7	30.7	29.0		29.2	27.4	31.4	
Price expectations (%)				ns				ns
Increased	16.5	14.6	18.8		27.1	20.7	23.8	
Unchanged	22.0	20.9	13.5		23.5	23.1	19.0	
Decreased	61.6	64.6	67.7		49.4	56.2	57.1	
Alcohol attitude (%)				ns				ns
Raised	5.7	5.5	3.0		10.8	9.6	8.8	
Kept	43.5	39.0	39.4		53.6	53.4	49.1	
Lowered	50.9	55.5	57.6		35.5	37.0	42.1	
Abstinence (%)								
2003	2.6	5.4	13.7	p<0.0001	3.4	9.8	7.3	p<0.05
2006	10.9	0.0	0.0	p<0.0001	5.2	2.2	20.9	p<0.0001
Weekly binge (%)								
2003	9.1	6.6	2.9	ns	5.2	5.4	5.7	ns
2006	3.8	5.4	3.9	ns	7.0	9.5	1.1	p<0.01
Beverage composition (litres 100% alcohol) (SD) 2003								
Beer	1.88 (4.06)	1.78 (3.55)	0.59 (1.15)	p<0.01	1.40 (2.44)	0.89 (1.81)	1.14 (1.98)	p<0.10
Wine	1.89 (2.94)	1.74 (2.66)	0.75 (1.35)	p<0.01	1.43 (3.53)	0.81 (1.62)	1.02 (2.04)	p<0.05
Spirits	0.87 (2.53)	0.71 (1.44)	0.36 (1.08)	p<0.10	0.48 (0.93)	0.48 (1.33)	0.52 (1.35)	ns
Other	0.18 (0.66)	0.10 (0.41)	0.04 (0.10)	p<0.05	0.14 (0.57)	0.10 (0.30)	0.13 (0.16)	ns
Beverage composition (litres 100% alcohol) (SD) 2006								
Beer	0.78 (1.58)	2.77 (5.16)	1.45 (2.29)	p<0.0001	1.73 (3.89)	1.79 (3.64)	0.49 (0.98)	p<0.0001
Wine	0.95 (1.53)	3.32 (14.21)	1.35 (2.14)	p<0.01	1.33 (2.58)	1.21 (2.07)	0.48 (1.06)	p<0.0001
Spirits	0.33 (0.76)	1.43 (3.73)	0.70 (1.15)	p<0.0001	0.43 (1.01)	0.69 (1.87)	0.21 (0.63)	p<0.01
Other	0.09 (0.62)	0.12 (0.43)	0.12 (0.49)	ns	0.10 (0.43)	0.17 (0.65)	0.04 (0.14)	p<0.05

Between clusters, the proportion of persons who had abstained from alcohol during the past year was significantly different. In southern Sweden, the highest proportion of abstainers in 2003 was observed among ‘modest increasers’. In 2006, however, the distribution had changed and whereas ‘steady decreasees’ now had the highest proportion of abstainers, the proportion in the two other clusters had decreased to zero. In northern Sweden, the difference between the trajectory group with the greatest and smallest share of abstainers was smaller in 2003 compared to that between clusters in southern Sweden, but the proportions changed here as well and ‘rapid increasers’ moved from having the highest share of abstainers to having the smallest. Thus the share of abstainers differed between clusters but the distribution changed between years and followed the changes in consumption, i.e. a decline in consumption was matched by an increase in the share of abstainers.

The share of weekly binge drinkers also varied during the period but only in the northern region in 2006 were clusters shown to be significantly different: ‘decreasees’ had a much lower share in 2006 and compared to other clusters. For this cluster was also a decrease in average consumption observed.

An attitude in favour of alcohol could not explain changes in consumption; increasers were not particularly in favour of decreasing taxes on spirits.

No large or statistically significant differences were observed between cluster solutions regarding sex distribution, ‘increasers’ in the south consisted of a few more men whereas ‘steady decreasees’ had a slightly larger share of women. In the north, the differences between clusters were even smaller. Mean age did not differ between clusters either.

Income seemed to be equally distributed between clusters, thus not explaining trajectory membership. ‘Increasers’ in the south included both a somewhat greater proportion of persons with higher income as well as a slightly greater proportion of persons with lower income.

Price expectations did not seem to matter for developmental patterns in alcohol use either as clusters observed to increase their consumption was not expecting prices to decrease more than clusters decreasing their consumption.

The amounts which was consumed of each beverage generally differed by cluster group. Given the way clusters were selected and the similarities between total consumption and by beverage, any conclusions based on analyses of litres of pure alcohol by beverage and year should be drawn with cautiousness. The preferred beverage was beer or wine in all clusters. Analyses suggest that there was a change in consumption also by beverage in clusters. In 2003 ‘steady decreasees’ consumed most of every beverage, whereas in 2006 ‘increasers’

consumed most of each beverage (except “other beverages”). ‘Rapid increasers’ similarly had the highest consumption of beer, spirits and “other beverages” in 2006.

Of particular interest was also whether clusters changed the composition by beverage type (% of total consumption) as it was expected that the share of spirits would increase in southern Sweden, mainly among increasers. ‘Increasers’ was indeed found to have increased the share of spirits consumed, from 16.6 per cent of total to 20.5 per cent (analyses not presented elsewhere in paper). No other cluster group increased their consumption of spirits. ‘Increasers’ also increased their share of wine (from 40.7 % to 47.7 %), as did ‘steady decreaseers’ (39.7 % to 44.8 %) whereas ‘modest increasers’ mainly increased their share of beer (34.5 % to 40.4 %). Beer was also the beverage which seemed to have increased among steady ‘temporary decreaseers’ (40.8 % to 48.6 %) and ‘rapid increasers’ (39.6 % to 46.4 %) whereas ‘decreaseers’ increased their share of wine (36.6 % to 39.7 %).

## DISCUSSION

The study addressed the question of how different alcohol use trajectories evolved during a period including two major changes which were assumed to affect alcohol consumption levels: decreased taxation in Denmark and removed restrictions on travellers' allowance for private imports of alcohol. Within the main study (Mäkelä et al., 2007, Room et al. 2014), the aim had been to study whether alcohol consumption increased in southern Sweden when price and availability changed, assuming alcohol consumption in northern Sweden would not be affected to the same extent. Contrary to the expectations based on economic theory (Chaloupka et al., 2002) and on geographical arguments, earlier analyses of cross-sectional data had not shown a larger increase in alcohol consumption (Gustafsson, 2010<sup>b</sup>) or alcohol-related problems (Gustafsson, 2010<sup>c</sup>) in southern Sweden. The longitudinal data offered the unique opportunity to study what characterised those who did change by first identifying developmental trajectories.

This study found some differences between the south and north. In both regions, there seemed to be those who mainly decreased over the period: ‘steady decreaseers’ and ‘decreaseers’. However, in the south two other trajectories could best be described as increasers – ‘modest increasers’ were increasing somewhat and maintained the new, higher level and ‘increasers’ were increasing their consumption substantially. In the north, however, ‘temporary decreaseers’ basically did not change between 2003 and 2006, and although ‘rapid increasers’ increased their consumption considerably between 2004 and 2005, a decrease was observed in 2006. Related to the earlier results from cross-sectional samples it cannot be

argued that panel data showed an overall increase which the cross-sectional was unable to show. It becomes clear, however, that there are differences between the two sites in how people have developed their alcohol consumption over time and that this at least partly might be linked to consumption habits. 'Steady decreasees' had an initially higher consumption than any of the other trajectories, but were also found to decrease their consumption more than any of the other clusters. Thus, the hypothesis that high consumers would make use of these changes and consequently increase their consumption more than others was not supported, even though the other cluster with initial high consumption in the same site increased. This result also illustrates that studies of developmental patterns can contribute with additional information to that given by volumes of alcohol when studying the effects of changes in price and availability. Contrary to this pattern, 'modest increasers' were found to have the lowest initial consumption, but started drinking more after the changes. In line with this, the share of binge-drinking occasions also increased. The share decreased among 'steady decreasees'.

That people with alcohol consumption levels at the extremes are more likely to converge towards the average at follow-up is what can be expected by the regression towards the mean effect (Davis, 1976). Although analyses of abstinence call for some caution concerning this interpretation, as the share of abstainers among 'steady decreasees' increased. Some people in this trajectory might have been problematic consumers and raised the level of consumption for the whole trajectory at time-point one, but who quit drinking completely during this period. As mentioned earlier in this article, Gustafsson and Ramstedt (2011) found that hospitalizations due to alcohol poisoning increased in relation to the changes in private import allowances, also implying that high consumers quit drinking at least temporarily. In relation to the study aim, it is suggested that abstention among high consumers at least partly can explain why overall alcohol consumption levels did not increase in southern Sweden.

As expected, 'increasers' in southern Sweden were shown to drink a larger proportion of spirits after the Danish decrease in spirits tax. This is interesting policy wise since the increase of alcohol consumption in this group, which stands out from that of others, seems to have been driven by an increase in preference for spirits for which availability changed in particular. This group additionally increased their proportion of wine, but an increase in the proportion of wine was also observed among cluster groups decreasing their consumption ('steady decreasees' in southern Sweden and 'decreasees' in northern Sweden). Thus this suggests that the Danish tax decrease can have influenced some people to drink more spirits and thereby increased their total consumption. Both 'rapid increasers' and 'temporary decreasees' in northern Sweden were found to increase the proportion of beer and decrease the

proportion of most other beverages. The observed preference in beer in the north was also observed in earlier analyses of cross-sectional samples and was then explained by the 10 per cent decrease in beer prices in Sweden during this period (Gustafsson, 2010<sup>b</sup>). Although this price change was similar for the whole country, it is likely that a change in prices for beverages sold at Systembolaget AB<sup>vi</sup> would affect those who retrieve a larger share of their alcohol consumption from registered sources more than others, which was the case in northern but not in southern Sweden. Although beyond the aim of this paper, changes in northern Sweden and what can explain it is something future research should look into. From a harm perspective it is a result one should be observant of as it has been shown that beer is the most problematic alcoholic beverage in Sweden, i.e. consumption of strong beer has been claimed to be a better predictor of heavy drinking and harm than consumption of spirits (Ramstedt and Boman, 2011).

Membership in the trajectories was not found to be linked to sex or age in either of the regions. Thus, the initial hypothesis that young men to a larger degree would be found in the clusters increasing their consumption was not supported. Although younger men often tend to have higher consumption levels than other groups, it seems like these characteristics were not relevant in relation to these particular changes. People with high incomes were not found to take advantage of the changes more than people in the lower income categories either. Although economic incitements existed people might have been uncertain of the size of profit a trip would result in, given that additional time and financial costs were attached to it. Price expectations did not differ between trajectories either and although rationality cannot be ruled out, it does not found support in this study in the sense implied by Becker and Murphy (1988). Here again, it is likely that uncertainties about the gain might have affected the results and a change closer to home would possibly have given different results. A larger share of people in favour of tax decreases on alcohol was not found among increasers either.

Regarding limitations, simple random samples were collected from each site in 2003 which should respond to the criticism directed against many natural experiments, i.e. that they have low internal validity as samples are not completely random and that they often lack a control group (Cook and Campbell, 1979). However, it could be questioned whether northern Sweden was optimal as a comparison given that consumption levels were lower in this site at baseline, thus giving larger room for further increases. Using longitudinal data might further involve the problem of attrition, which is problematic when drop-outs differ greatly from those remaining in the study. In this study, however, initial consumption level and development over time did not differ between panel and cross-sectional samples (method

section in this paper) and corresponded well also with national numbers (Ramstedt et al., 2009). The exact levels are however of less importance here since the focus was on developmental patterns. As development over time did not seem to differ between the longitudinal and cross-sectional samples, the conclusions drawn in this article are assumed to be reliable. An overall panel effect where people may have changed their consumption because of repeatedly having to answer questions about alcohol, is not thought to be very large. If there was such an effect, it is assumed that high consumers would decrease their consumption more as a result and thus the same conclusions would be drawn from the results. Owing to stronger causal inferences in longitudinal samples, it is believed that the effects found in this article are related to the changes studied.

As initial consumption, beverage preferences, temporal abstention and to some extent the habit of binge drinking differed between alcohol consumption trajectories, these factors seemed to have affected how individuals responded to the changes. The main interpretation of the present results in relation to the aim of the study is therefore that increased availability of cheaper alcohol in southern Sweden, due to decreased restrictions on private imports and a Danish tax decrease on spirits, resulted in increases in alcohol consumption levels between 2003 and 2006 among two of the identified clusters ('modest increasers' and 'increasers') in this region. Changes were further concluded to be related to earlier consumption levels and to beverage preferences. The Danish tax decrease in spirits had an impact on this development. As clusters in northern Sweden were not influenced in the same way, distance and (other) availability seemed to be of importance as well. In relation to theories on availability and price, the results of the study imply that different consumption groups are not affected in the same way. This is something which researchers and policy makers need to be aware of.

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<sup>i</sup> The counties of Skåne, Blekinge, Halland, and the city of Gothenburg.

<sup>ii</sup> The counties of Norrbotten, Västerbotten, Jämtland, Västernorrland, Gävleborg, Dalarna, Örebro and Värmland but excluding five districts closest to the Finnish border (Haparanda, Kalix, Pajala, Övertorneå and Överkalix) in order for this area not to be affected by tax-changes in Finland during the same period.

<sup>iii</sup> Comparisons made to statistics found at [www.scb.se](http://www.scb.se)

<sup>iv</sup> This division has been used in other Swedish studies of alcohol habits, e.g. the many studies on conscripts by CAN.

<sup>v</sup> LICUR – Linking of Clusters after removal of Residue procedure.

<sup>vi</sup> Systembolaget AB is the Swedish retail monopoly store.

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