Choose your booze

A study on alcohol sales following the introduction of self-service in Systembolaget stores

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Abstract

Research has shown that many factors influence the degree of alcohol sales, for instance the level of taxes or the extent of alcohol availability. In this context, it is examined whether the gradual replacement of counter-service with self-service stores in the Swedish alcohol retail monopoly Systembolaget leads to an increase of alcohol sales. The findings show that into self-service converted outlets experience an overall sales boost of around 36% with beer sales reacting most strongly. This effect is, however, diminished by business stealing, i.e. the reduction of sales in stores in proximity to the self-service shop.

Keywords: self-service; sales; alcohol consumption; retailing; Systembolaget

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1. Introduction

The consumption of alcohol is a prevalent phenomenon in many societies. In this context, the Nordic countries and Sweden in particular have historically stressed their strategies for minimizing excessive alcohol consumption. Principal reasons for this are that although extreme drinking is often viewed as individual behavior the consequences from it put a heavy (financial) burden on society. This includes implications for publicly funded health insurances – for instance, costs for alcohol-related treatment and support, lower work productivity or poorly performed work, a higher level of absenteeism due to sickness (which also implies a loss of labor), increased car crashes, engaging in high risk sex, death[1] or rising violence and crime.[2] Ultimately, this can lead to a deterioration or misallocation of resources.

Because of the negative impacts from alcohol abuse, scientists have conducted extensive research to analyze numerous alcohol policies in their effectiveness to limit alcohol sales and, consequently, consumption as will be illustrated below. Nevertheless, a neglected issue has been the potential response of alcohol sales to the establishment of a self-service format in alcohol retail stores which entails an upwards shift in availability. Since the Swedish public alcohol retail monopoly, Systembolaget, is currently in a transition phase to convert all its shops from clerk-service to self-service,[3] the purpose of this thesis is therefore to examine how the transformation of these outlets affects alcohol sales.

[1] For instance, one study in Finland suggests as much as one fourth in the difference of the life expectancy between upper class and lower class workers to the high alcohol consumption of the latter group (Mäkelä 1999, as cited in Tigerstedt, Karlsson, Mäkelä et al. 2006).

[2] See Chaloupka, Grossman and Saffer (2002) or Cook and Moore (2002) for a review of studies on these topics.

[3] In the clerk-service/counter-service format, customers make their requests to a shop assistant who then gets the alcohol from the back of the shop. In the self-service format, in contrast, clients buy all goods without assistance which equals present-day's supermarket format.

Problem definition

As only very limited studies on the effect of self-service have previously been conducted (and none on a large scale), the aim of this research is to fill the gap by applying a more holistic approach to examine Sweden-wide effects through the introduction of self-service, taking into account additional factors that influence the development of alcohol sales and analyzing regional differences in purchasing patterns. In conclusion, the following hypothesis will be tested:

"The introduction of self-service in Swedish alcohol monopoly retail stores will lead to an increase of alcohol sales in these outlets. "

The remainder of the thesis is structured as follows. The next segment provides background information on mechanisms which influence the degree of alcohol sales. Section 3 then summarizes previous research on the causes and consequences associated with the introduction of self-service while section 4, in turn, discusses the underlying dataset and makes first observations before the subsequent econometric analysis. In section 5, the econometric model and results for the effect of self-service are analyzed before drawing a conclusion and addressing further research possibilities in the final section.

2. Alcohol sales – a background

To determine efficient methods to reduce societal implications from extreme alcohol consumption, the usefulness of various measures has been scrutinized by researchers. Much emphasis is placed on regulation through high taxation – with varying tax differentials between alcohol categories (Smith and Mitry 2006; Heeb, Gmel, Zurbrugg et al. 2003).[4] Other actions include education about the consequences of excessive consumption, warning labels, age limits

[4] Due to their higher alcohol content spirits are most heavily taxed to reduce intoxications. See Saffer (1989b) for an evaluation of optimal tax differentials between beer, wine and spirits.

for purchase, appropriate penal law (Chaloupka, Grossman and Saffer 2002) as well as the banning of alcoholic drink advertising.[5]

More importantly, the restriction of availability is found to be a highly decisive factor in limiting alcohol consumption.[6] This comprises several measures, for instance, the level of outlet density in a defined area (Mann, Rehm, Giesbrecht et al. 2005) or the degree of differentiation in the alcohol content, e.g. via the introduction of medium-strength beer in private retail stores (Noval and Nilsson 1994, as cited in Mäkelä, Rossow and Tryggvesson 2002). Both are positively correlated with sales and alcohol-related fatalities. In contrast, somewhat ambiguous effects (though generally resulting in decreased consumption) are associated with a change in sales hours, depending on the analyzed country. The closing of monopoly alcohol stores on Saturdays led to a lower total alcohol consumption in Norway and Finland but surprisingly did not affect Swedish figures (Mäkelä, Rossow and Tryggvesson 2002).[7] Furthermore, research highlights that alcohol regulation through sales monopolization by a public entity would stimulate a significant reduction in alcohol purchases[8] as well as alcohol-related harm and diseases. In sum, a policy focus on availability restriction can effectively diminish social costs arising from alcohol consumption.

[5] For instance, Saffer (1989a) evaluates the impact of advertising bans on alcohol in 14 OECD countries and finds a 10% drop in alcohol consumption and motor vehicle fatalities for countries with an adverting ban for spirits and an even larger decrease in beer and wine consumption if advertising for these beverages is banned in the respective country.

[6] As an example, see Mäkelä, Rossow and Tryggvesson (2002) who report that the restriction of availability via a rationing system was more efficient in limiting heavy drinkers' consumptions than a 40% tax increase on liquor.

[7] While a Saturday closing of Systembolaget stores in the 1980s left Swedish total consumption unaltered (Mäkelä, Rossow and Tryggvesson 2002), the re-opening on this day interestingly increased it by some percentage points (Norström and Skog 2005).

[8] For a review of studies related to the effects of privatizing public alcohol outlets see Her, Giesbrecht, Room et al. (1999) or Mann, Rehm, Giesbrecht et al. (2005).

In line with the above, the Swedish state undertook large efforts to reduce its citizens' alcohol consumption.[9] After the abolition of the Bratt-system in the 1950s, which was based on a rationing book that recorded and controlled individual alcohol purchases, the current system with an alcohol retail monopoly, Systembolaget, was established. In this context, all of the mechanisms outlined above were applied to regulate alcohol consumption. The restriction of availability through monopolization since then seems to have curbed alcohol sales and various studies (for example Holder, Agardh, Högberg et al. 2007) emphasize that a deregulation of the current structure would stimulate sales and produce socially undesirable effects. While only few experiments to liberalize the rigid system were undertaken over several years,[10] a policy change constituted the decision to convert stores from counter-service to the self-service format. Although this implied a potentially large increase in availability, the verdict was made "in light of the [Swedish] parliament's decision (…) intending to increase the opportunities to boost Systembolaget's legitimacy" (Systembolaget 2005, p. 20) and "to insure its survival" (Systembolaget 2005, p. 20). Furthermore, it was viewed as a means to maintain "a balance between public health objectives and the requirement for reasonable availability as part of providing a high standard of service" (Systembolaget 2005, p. 19).[11] From figure 1 below, which displays the evolution of self-service stores over time, the rising share of this outlet format can be deducted. The visible increase of the share of self-service shops from the end of 2000

[9] For a history of the Swedish approach to limiting alcohol consumption refer to Holder, Agardh, Högberg et al. (2007).

[10] In 1967, strong beer (with max. alcohol content 5.6%) was made available in private grocery stores during a trail. After a large sales increase of this type of beer (ca. 1000% in comparison to a country-wide increase of 26%) the experiment was aborted (Mäkelä, Rossow and Tryggvesson 2002). Also, in 2001 it was decided to re-open Systembolaget stores on Saturdays in spite of an increase in alcohol sales of 3 % found by researchers evaluating trial stores because no harm indicators had increased and customer surveys displayed support for the re-opening (Systembolaget 2005; Norström and Skog 2005).

[11] This is also in line with similar developments towards self-service in other Nordic countries in order to uphold the legitimacy for the alcohol monopoly retail stores in the respective states, as a study by Tigerstedt & Sutton (2000) shows.

onwards is probably due to the decision of Systembolaget's board in this year to convert all outlets to the self-service design by 2010 (Systembolaget 2005).

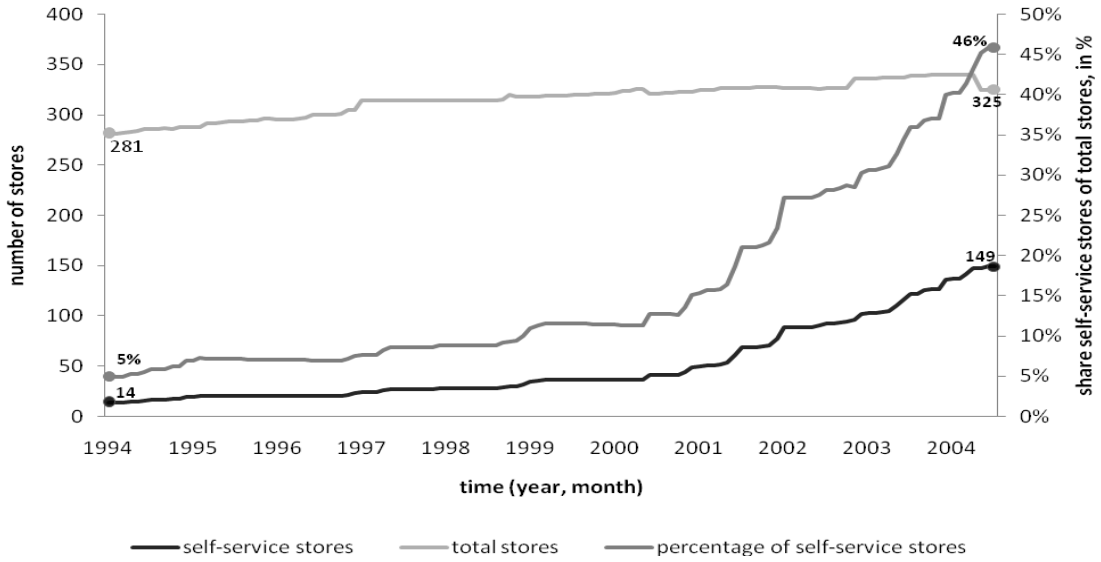


Figure 1: Development of the number of Systembolaget's full self-service stores over time
Source: author's calculation based on available dataset; Note: calculations exclude shops in municipalities directly bordering Norway and Finland.

3. Previous research

This part provides an overview of previous findings on the self-service effect on sales. After briefly mentioning results from grocery retailing management research in general, emphasis is placed on studies that specifically evaluate this effect in alcohol retail stores.

3.1.Findings in retail management

In grocery retail management, the changes in the food retailing industry from clerk-service to self-service are viewed as the "most significant innovation leading to the modern food market" (Mueller and Garoian 1961, p. 11) or the "[conditio] sine qua non" (Zimmerman 1941, p. 405) which established the supermarket. The main motivations for its introduction from the 1930s onwards were the attraction of more customers and the generation of larger sales per customer (Goldman 1976) through increased availability of items that were more easily accessible to shoppers. At the same time, this was also meant to provide greater convenience

and improved service due to shortened queuing or shopping times as well as the ability for customers to inspect goods (Shaw, Curth and Alexander 2004). Retail store owners, in contrast, benefited from the new format as it allowed them to significantly reduce spending on, e.g. wages and rent, as well as increase sales per employee (Zimmerman 1941; Shaw and Alexander 2008). While one author identifies large sales increases of 20-25% per store associated with the new service system (Hough and Lambert 1951, as cited in Shaw and Alexander 2008) most other authors only provide qualitative assessments.[12] These, however, all point towards a substantial enhancement of sales and increase of customers as a consequence of the establishment of self-service.

3.2.Findings in health research

In contrast, several public health researchers apply a quantitative approach to specifically analyze the effect of self-service in alcohol retail stores. Smart (1974) compares the purchasing patterns in a self- and clerk-service liquor store in Toronto, Canada, and evaluates different effects related to these patterns as well as customer reactions. Through the comparison of both store types he studies customer characteristics, alcohol purchasing patterns as well as proportions of people making impulsive purchases of different beverage types. The main findings correspond to the advantages of self-service pointed out by retail management research: establishing self-service increases both the number of customers and the purchases per customer. In addition, more frequently drinking impulse buyers purchased alcohol in these stores. However, the study's shortcomings make it impossible to generalize Smart's results. With only two stores in scope, the sample size is extremely small and the monitoring of purchase amounts as well as patterns was only performed during a few selected days in a small time window (between 7 and 9 p.m.). Moreover, the data for evaluating impulsive buying behavior is based on surveying several customers after their purchases, which can result in

[12] For instance, see Appel 1972.

downwards-biased responses as alcohol is a socially unaccepted good, and should therefore not be considered representative.[13]

Fiilin and Virtanen (1984, as cited in Skog 2000)[14] focus on the sales volume increase following the introduction of self-service in the monopoly alcohol stores in two Finnish towns and compare them to several control regions with only clerk-service shops. While no significant effect on sales is detected their study is only comprised of five time-series observations, making the sample small, which decreases statistical reliability. An additional study conducted by Skog (1991, as cited in Skog 2000) concentrates its analysis on the increase in beer sales associated with a change from clerk-service to self-service in Systembolaget stores in eight Swedish cities. Drawing on monthly sales data from each shop he compares the sales in the new self-service stores with similar clerk-service stores in adjacent towns. While the findings of this study again draw on a small sample, the results suggest a sales increase due to the self-service format – with the limitation that the effect is only significant for three out of the eight towns.

The most extensive study so far is performed by Skog (2000) who uses a time-series approach to study the effect of the introduction of self-service on sales in seven Swedish towns[15] with one alcohol retail store in each town, respectively. He assigns one control store with only clerk-service in another town[16] to each store with full self-service (experimental store). Based on

[13] Del Boca and Darkes (2003) provide a research review on the causes of the under-estimation of self-reported alcohol consumption. They find that, among other factors, excessive drinking is considered as socially irresponsible and thus induces people to systematically understate their true alcohol consumption in surveys.

[14] The studies of Fiilin and Virtanen (1984) as well as Skog (1991) are published in Finnish and Norwegian, respectively, and are therefore not readable for the author. Instead, references to this research are based upon their discussion in Smart (2000).

[15] These stores were Systembolaget's test stores to validate the usefulness of a general conversion of all stores into the self-service format (Systembolaget 2005).

[16] The matching control store for each self-service store is selected on the base of similar sales patterns, correlation analysis and spatial distance to avoid spill-over effects.

monthly alcohol sales data for several years, the effect is examined by comparing the variations of sales of the experimental to the control stores of each of the seven store pairs via regression analysis. While the size of the overall gross impact on alcohol sales varies from 12-21%, depending on the store pair, Skog finds a positive persisting gross sales increase in all examined stores with an average of 17%. This effect remains large (13%) even after controlling for the reduced sales in neighboring towns[17] and indicates increased purchases by local residents due to the change in shopping format. Within the different alcohol categories, Skog detects the strongest gross results for wine with an average sales increase of 21%, followed by beer with an increase of 19%. Spirits sales show a gross rise of 13% with large variations between the store pair with the smallest (5%) and largest (20%) increase. He therefore concludes that higher physical accessibility substantially raises alcohol consumption.

Although Skog's study provides a more reliable quantitative depiction for the effect of self-service, his approach assumes relatively homogenous driving forces behind the sales patterns and does not control for additional determining parameters that might vary between regions. This, however, is necessary to identify other variables that influence sales patterns in other counties.

In summary, previous research provides qualitative reasons and indicates quantifications for the positive effect on sales through the establishment of self-service in supermarkets in general and alcohol retail stores in particular. Nonetheless, current studies either lack sufficiently rigorous data analysis or are not based on an appropriately large dataset to generate representative results. This thesis aspires to overcome these challenges.

[17] This might be due to consumer switching from a clerk-service store to a self-service store in their proximity. Customer surveys at two of the experimental stores confirm this and attribute approximately 50 % of the sales volume increase to people coming from different towns (i.e. non-locals).

4. A first analysis of the data

The following section provides an introduction to the underlying data sample for subsequent econometric analysis as well as a first analysis of statistics and sales patterns.

4.1. Data source

The main dataset consists of monthly sales volumes from January 1994 to July 2004 for approximately 400 stores[18] of the Swedish public retail alcohol monopoly Systembolaget.[19] Individual sales data are available for the categories of beer, wine, and spirits. As the underlying dataset for this thesis not only draws upon data from all 21 Swedish counties with approximately 120,000 observations but also over a long time period, it represents the most extensive source for analyzing determining factors of alcohol sales hitherto. Descriptive statistics of raw key variables (further explanation of these follows in section 5) can be found in table 1 below. As is evident in the table, an unbalanced panel is used. Furthermore, the centile statistics suggest that wine sales exceed beer sales in terms of liters of alcohol sold.

Table 1: Descriptive statistics for untransformed data

Variable	obs	Mean	S.D.	Min	10%	25%	50%	75%	90%	Max
Sales spirits	39270	5202.19	3544.47	0.00	1772.89	2720.67	4383.80	6671.00	9728.00	37745.00
Sales beer	39327	24684.30	22196.02	0.00	5001.19	8948.86	19223.00	32085.35	50368.00	234996.00
Sales wine	39279	30700.92	24459.82	-3.45	9288.00	14732.00	23653.61	38418.13	60332.00	239284.20
Income/capita	33613	162.13	26.02	109.90	133.5	143.50	158.10	174.60	194.00	342.50
Store density	40004	0.0000664	0.0000512	0.0000132	.0000258	0.0000333	0.0000496	0.0000833	.0001309	0.0003883
Ownprice_spirits	36570	106.07	4.77	96.10	99.3	102.50	107.00	110.50	111.00	111.10
Ownprice_beer	36586	104.43	4.36	93.50	98.5	101.50	105.70	107.20	109.5	110.60
Ownprice_wine	36584	100.53	2.52	91.70	97.6	99.00	100.30	102.50	104.00	104.50
Fridays	39998	4.35	0.48	4.00	4.00	4.00	4.00	5.00	5.00	5.00
Holidays	39998	0.66	0.92	0.00	0.00	0.00	0.00	2.00	2.00	3.00
D_Self-service	40034	0.16	0.37	0.00	0.00	0.00	0.00	0.00	1.00	1.00

Note: "Min" and "Max" indicate minimum and maximum value of each variable, respectively; "10%", "25%", "75%" and "90%" specify the respective centiles; statistics exclude shops in municipalities directly bordering Norway and Finland.

[18] In addition, customers in whose town no outlet is present can order alcohol from 552 local agents who supply them with the entire product range for no extra cost (http://www.systembolaget.se/Applikationer/Knappar/InEnglish/History.htm, 11/11/08).

[19] The dataset was previously used for studying cross-border price elasticities of alcohol in Asplund, Friberg and Wilander (2007).

In addition to sales data, Systembolaget provides a list with an indication of the service design type for each store together with the exact date of change of the store design. Three different kinds of shop designs can be distinguished in the monopoly's stores – clerk- or counter-service, only beer self-service and full self-service shops. While clerk- or counter-service stores require customers to deliver purchasing requests to a shop assistant, beer[20] or full self-service stores allow customers to buy beer or all available beverages, respectively, without assistance. However, since all stores are gradually being converted into full self-service stores the focus of this thesis lies on examining the effect of the introduction of full self-service, thereby not taking into account the effect of beer self-service stores.

4.2. First graphical observations

A graphical examination of individual store sales developments with example outlets, depicted in figures 2a-c below, reveals large increases immediately following the introduction of self-service and suggests that an effect of the new shop design exists and takes place instantly. Although an accurate judgment on the extent of this outcome is hard to make, an approximate estimation places the effect on total sales somewhere between 25-45%.

In addition, the figures also display seasonal and regional variations in alcohol purchases. While figures 2b-c show peak sales in December, figure 2a additionally provides evidence for peak sales in the summer months. On a county-level,[21] in particular the northern counties like Västernorrland, Västerbotten and Norrbotten, these extreme points typically arise during June and July, whereas the more southern counties such as Stockholm and Uppsala rather reach peak sales during December. This is a somewhat counter-intuitive finding for the latter group,

[20] In this context, beer is referred to as strong beer exceeding the typical 3.5% threshold of alcohol content below which it may otherwise be sold in private retail stores. Sales of beer below that threshold are thus not in the scope of this thesis.

[21] The sales developments in selected counties are presented in the appendix.

which could be attributed to the de-facto reduced population during the holiday season that diminishes sales.

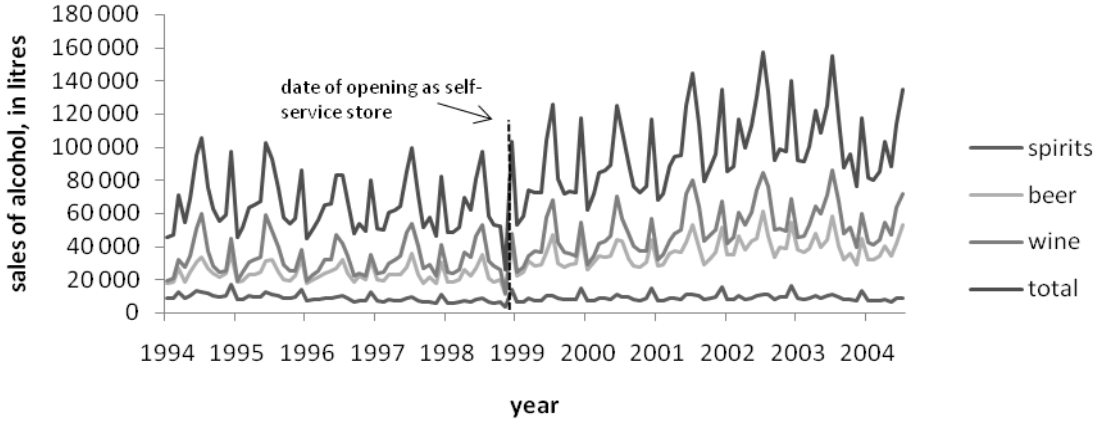


Figure 2a: sales development of a store (no. 1002[22]) in municipality Karlskrona, Blekinge County

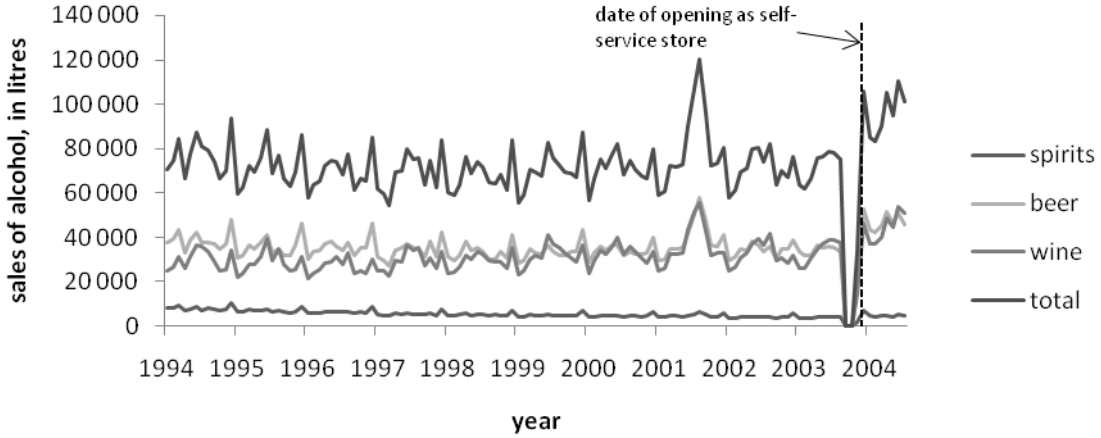


Figure 2b[a]: sales development of a store (no. 147) in municipality Stockholm, Stockholm County

[22] The store number indicates the internally assigned store number by Systembolaget and is here used to enable easy differentiation between the outlets.

a: Note that the strong reduction in sales prior the opening as self-service stores is due to renovation.

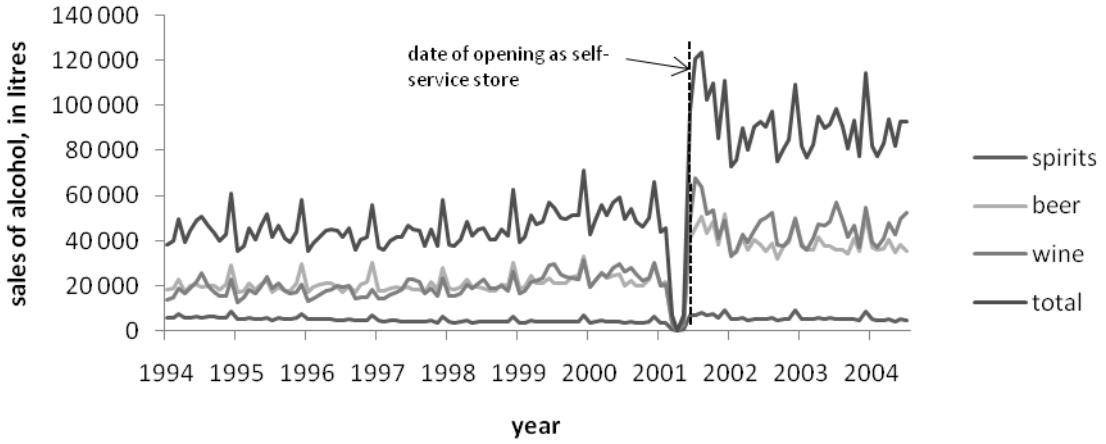


Figure 2c[a]: sales development of a store (no. 1901) in municipality Vasteras, Vastmanland County

Furthermore, the sales patterns indicate a shift in preferences for beer and wine, respectively, as from the end of the 1990s onwards, wine sales increased notably. Bentzen and Smith (2004) attribute this to rising living standards but it should be noted that the growth could also be due to the increasing role of wine sold in multi-liter boxes, so-called bag-in-box wine. As of 2005, these make up more than 50% of total wine sales and are becoming even more popular among consumers (Systembolaget 2005; Norström and Ramstedt 2006).

In general, the figures point towards a trend in rising total alcohol consumption in recent years. This is confirmed by figure 3 below which displays the development of national per capita alcohol sales in Systembolaget stores as well as by a study by Holder, Andreasson, Norström et al. (2005). Moreover, the sales increase is not only considerable on a national level but persists when investigating the individual sales per capita chart of each Swedish county. However, it does not become apparent from the graphs whether the rising consumption is due to the introduction of self-service and the gradual replacement of counter-service stores (as indicated by figure 1 above) or other factors.

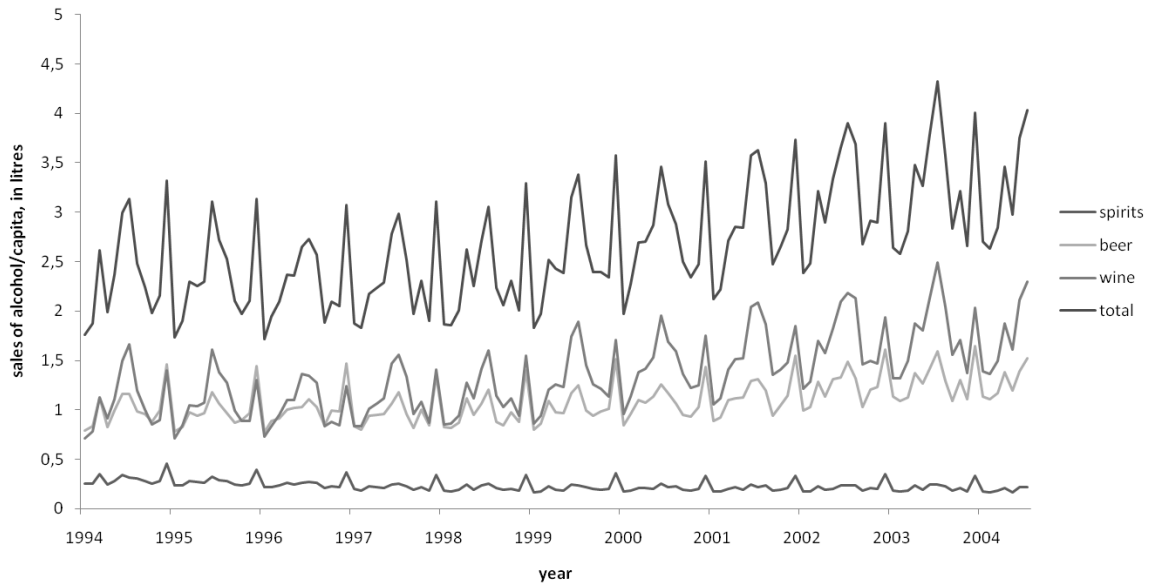


Figure 3: Development of per capita alcohol sales in Systembolaget stores based on available dataset

5. Econometric estimation

5.1. Design for modeling the effect of self-service

To limit the focus of the thesis to the effect of self-service on alcohol sales and to reduce the influence of external factors such as trans-border shopping from other Nordic countries with higher price levels, several stores in proximity to the Finnish and Norwegian border are excluded from the dataset. Use is made of the fact that alcohol prices and products offered in Systembolaget shops are the same nation-wide so that trans-border shoppers will only stop at the first store after the border. In line with the findings of Asplund, Friberg and Wilander (2007), the effect of the high price levels for alcohol, which induces people in these countries to buy alcohol in Swedish stores, is thereby strongly decreased.[23] In sum, this leads to the elimination of 21 municipalities bordering Norway and 4 municipalities bordering Finland.

[23] Based on the calculation of an EU average alcoholic PPP price index for each year between 1995 and 2003 of 100, the authors calculate a price index of 162 for Sweden, 235 for Norway and 188 for Finland. In relation, the indices for Germany and Denmark are 89 and 129, respectively. Furthermore, they report that almost all municipalities with the largest sales per capita volumes for spirits are municipalities close to Norway.

Furthermore, following these authors, all stores closer than 200 km to the southern Swedish border[24] are excluded. This is due to the fact that, firstly, from the border several countries with significantly lower price levels on alcohol such as Denmark and Germany can quickly be reached, which could induce Swedes to engage in trans-border shopping. Secondly, Asplund, Friberg and Wilander (2007) estimate that the cross-price elasticity with respect to foreign alcohol prices is high but declines to a sufficiently low level at a distance larger than 200 km (especially for wine) which makes the cutting point reasonable. Excluding these municipalities lowers the total number of stores in scope to 340.

To facilitate the interpretation of the coefficients the variables of the initial model are estimated in a logarithmic form. The function for alcohol sales per category j= {spirits, wine, beer} at time *t* in store *i* therefore looks as follows

$$lnsales_{j,i,t} = \beta_{j,1} + \beta_{j,2}(D_Self_service_{j,i,t}) + \beta X_{j,i,t} + \beta^{y} D_{Year_{j,i}} + \beta^{m} D_{Month_{j,i}} + \beta^{s} D_Store_{j,t} + u_{j,i} + e_{j,i,t}$$

where *sales* refers to the number of liters of alcohol sold and *D_Self_service* is a dummy variable equal to 1 from the date onwards[25] when a Systembolaget store is a full self-service store. *D_Year* indicates a separate dummy variable with the value 1 for each year *y* (i.e. 10 in total), *D_Month* is a different dummy variable set to 1 for each month *m* (i.e. 11 in total) and *D_Store* symbolizes a new dummy variable equal to 1 for each store *s* (i.e. 339 in total). In turn, *u* is designed to capture unobserved heterogeneity that might be constant over time but varying between stores as suggested by Wooldridge (2000). Besides, *X* represents a number of control variables that are considered to influence the level of sales in addition to the outlet design and could drive regional and time variation as pointed out by Asplund, Friberg and Wilander (2007). These are the following:

[24] The distance to Malmö thereby serves as a proxy for the distance to the border.

[25] Since the exact opening date within a month varies greatly between stores (i.e. some stores open at the beginning, others at the end of it), the first full month in the new format is assigned the value 1.

Fridays – the number of fridays per month. It is believed that most beverages for the weekend are bought on that day and, moreover, it is known that the alcohol stores were closed during the entire weekend before 2003. The number of weekends in one particular month can vary from one year to another and thus drive seasonal sales. Hence, this variable controls for these potential changes. It is predicted that larger alcohol sales are reflected in a higher number of fridays so that the coefficient should take a positive sign.

Holidays – the number of days of public holidays per month. Similar to the *Fridays* variable, holidays such as Easter, can fall into different months depending on the year. They can therefore raise sales in a different month, e.g. April in one year and March in another. Since celebrations on these days are common, alcohol sales should be positively correlated with the Holidays variable, resulting in a positive sign of the coefficient.

Ownprice – a price index for alcoholic beverages made up of the price indices for the respective categories of spirits, beer and wine (named *ownprice_spirits, ownprice_beer* and *ownprice_wine*). Higher prices raise the cost for alcohol purchases so that the variable's coefficient should take a negative sign.

Income/capita – the average income per municipality for the population aged 16 years and above. As a rising income should increase consumption the coefficient of the variable is expected to yield a positive sign.

Store density – the number of stores per municipality divided by the population above 16 in the municipality. Since a higher amount of stores will supply the same number of inhabitants, a higher geographic store density will drive down sales. Therefore, the sign of the variable's coefficient should be negative.

However, the analyses in the sections above indicate variations between stores as well as seasonal effects. To eliminate these differences, the model is transformed by using 12-month differences, Δ_{12}, and OLS so that it takes the subsequent form

$$\Delta_{12} lnsales_{j,i,t} = \beta_{j,1}\Delta_{12}(D_Self_service_{j,i,t}) + \beta\Delta_{12}X_{j,i,t} + e_{j,i,t}$$

The variables included in X are Holidays, the log of Income/capita, the log of Store density, the log of Ownprice and the log of Fridays.

5.2. Results for the effect of self-service

The results from estimating the above model are displayed in table 2. However, the inclusion of income/capita and store density makes the latter variable insignificant. Below, the outcomes for the model using income/capita are reported.

Table 2: Regression results for measuring the effect of self-service

Independent variable	(1) All categories	(2) Spirits	(3) Beer	(4) Wine
Δ12ln Income/capita	1.121	1.448	0.833	0.722
	(16.39)***	(12.88)***	(8.63)***	(5.09)***
Δ12ln Ownprice	-1.125	-2.749	-0.514	-1.006
	(56.59)***	(21.97)***	(12.97)***	(23.27)***
Δ12ln Fridays	0.159	0.075	0.160	0.236
	(28.85)***	(8.33)***	(20.79)***	(20.86)***
Δ12 Holidays	0.019	0.027	0.019	0.013
	(19.16)***	(16.50)***	(13.46)***	(6.29)***
Δ12 D_Self-service	0.312	0.308	0.368	0.265
	(75.16)***	(44.93)***	(63.19)***	(31.09)***
Constant	-0.040	-0.052	-0.009	-0.016
	(14.06)***	(9.32)***	(2.14)**	(2.66)***
Observations	76921	25626	25660	25635
R-squared	0.13	0.12	0.17	0.08

Note: Dependent variable is always Δ_{12}ln Sales; *, ** and *** indicate significance at 10, 5 and 1% level, respectively; absolute value of t statistics is presented in parenthesis.

Regression (1) returns the results for a regression on all alcohol categories and does not take into account any differences between them. As a robustness test and to obtain beverage-type specific estimates, regressions (2) – (4) separately report the coefficients for spirits, beer and wine. Overall, all the coefficients are significant at a 1% level with one exception, take the expected sign, and seem reasonable in size. Furthermore, despite some variations the size of the coefficients remains fairly stable when testing for robustness with the sub-sample

regressions (2)-(4), in particular for the D_Self_service dummy. The large absolute values of the t statistics also imply solid results.

An interpretation of the coefficient of average income per capita suggests that an increase of it leads to a disproportionately large increase in sales in the pooled regression. Nonetheless, the main driver behind this are spirits sales that react far more strongly to a change of income than beer and wine, which only rise by 0.833% and 0.722%, respectively, if income/capita grows by 1%. The results from regression (4) also dismiss the argument brought forward by Bentzen and Smith (2004) that the recent growth in wine sales can be attributed to a rising living standard. A comparison of the coefficients of all alcohol categories reveals that the response of wine sales as share of total sales to higher income is the lowest among the three. Consequently, it seems more reasonable to hold increasing consumer interest in buying bag-in-box wine or a change in cultural attitudes towards wine accountable for this development.

The large response of spirits to an increase in the corresponding price index provides a reasonable explanation why the highest alcohol tax is placed upon spirits to limit alcohol consumption. In contrast, beer consumption is especially insensitive to changes in its respective price index. Nonetheless, as will be shown below it is plausible to argue that sales for this beverage category in particular are more strongly affected by other means, e.g. the degree of availability. The Fridays coefficient points towards different purchasing patterns between beverage types as its size for wine is approximately three times as large as for spirits. A possible explanation for this is that spirit purchases are spread out more evenly over the week whereas wine is a good more consumed during the weekend when more time can be devoted to extended dinners and parties.

The variable of interest, Δ_{12} D_Self_service, presents strong evidence in favor of a positive effect of self-service on sales with a coefficient of 0.312 in the overall regression (1). Ceteris paribus, this signifies a 36.6%[26] increase of sales in case an alcohol store has been converted

[26] Since the underlying model is exponential, the percentage change is obtained by taking the antilog, i.e. estimating ($e^{0.312}$–1)*100=36.6% (Halvorsen and Palmquist 1980, as cited by Gujarati 2004).

into the self-service format. Although this surge is substantial, it is roughly within the range found by researchers in retail management mentioned earlier. The predictions after the graphical examination of example stores above estimated an overall increase between 25-40% and thus also re-enforce the statistical findings. To validate these discoveries, additional regressions are run. A regression with dummy variables for each store, year, month and alcohol category arrives at the same conclusion.[27] This proposes that the computations presented above are conservative.

Moreover, regressions (2)-(4) indicate that with a coefficient of 0.265 wine sales increase to a comparatively lower extent through the introduction of self-service than spirits (coefficient of 0.308) or in particular beer sales with a value of 0.368. With beer sales possessing the largest coefficient one can make the proposition that the restriction of availability plays a more decisive role for it. This is diametrical to the reaction of beer sales in response to an increase of its price index. It also highlights that beverage types respond distinctly to the various alcohol control measures.

Whereas spirits sales are more driven by price index changes, beer sales are rather dependent on the extent of alcohol availability. In that sense, self-service of beer seems to offer more selection and variety of brands at lower opportunity costs (e.g. reduced queuing time) for potential customers which entails an increase in availability. This might be even more important as at Systembolaget stores beers are sold as single cans (instead of packs) so that an undecided client could quickly pick additional can. This line of argument corresponds to the implications of self-service proposed in retail management and health research according to which increased accessibility induces people to make more impulsive purchases (e.g. Smart 1974). The supply of single goods instead of bundled packages should facilitate the generation of such impulsive buying behavior. Furthermore, beer is typically purchased in a higher unit quantity than wine or spirits so that impulsive buying behavior of new unknown beer brands could be encouraged. As

[27] The corresponding coefficients for Δ_{12} D_self-service are 0.347 for the overall model as well as 0.352, 0.389 and 0.303 for the spirits, beer and wine sales model, respectively.

a consequence, beer sales experience a far higher increase. However, it should be noted that the reported coefficients reflect national averages and do not take into account individual store specifics, which can deviate from it.

5.3. The moderating effect of business stealing

5.3.1 Model design

Since the store conversion is a gradual process, the high sales increases detected in the above section can be ascribed to two sources – either greater purchases per current customer or the attraction of new clients who have switched from buying at a clerk-service store due to higher convenience. As the latter would clearly diminish the outcome of establishing self-service, the subsequent segment seeks to identify such a business stealing effect and to quantify it.

Consequently, several municipalities are examined individually by developing a model that takes into account that some stores are transformed into the self-service format whereas others remain with the clerk-service format. Given that a self-service store opens in a municipality that also has a clerk-service store, a statistically significant reduction in sales in this counter-service outlet would imply the existence of a business stealing effect. In this case, the above findings for self-service should rather be interpreted as a gross figure which is diminished by the lowered sales in other Systembolaget shops. Consequently, six different municipalities with a varying number of stores ranging from 2 – 4 are analyzed by applying the following model:

$$\Delta_{12} lnsales_{j,i,t} = \beta_{j,1}\Delta_{12} D_Self_service_{j,i,t} + \beta_{j,2}\Delta_{12} Comprebuilt_{j,i,t,k} + \beta\Delta_{12} X_{j,i,t} + e_{j,i,t}$$

In this context, C*omprebuilt* represents a dummy variable that takes the value 1 from the date onwards when competitor store *k* within the same municipality is open as a self-service outlet and might thus detract clients from the store in consideration. It should therefore exhibit a negative sign. All additional variables follow the same argumentation as outlined in the previous segment. The tables for the regression results in each municipality are presented in the appendix.

5.3.2. Results

a. The effect of self-service in individual stores

The results confirm previous findings but display large fluctuations in the self-service effect between the different municipalities. The overall impact varies substantially with the smallest coefficient being 0.032 in store 809 in Västervik and the largest one being 0.581 in store 517 in Norrköping. Thus, emphasis should be placed upon a cautious interpretation of the coefficient of self-service on a national level when looking at an individual store. However, beer sales exhibit the highest upwards leap in most stores with the most extreme increase being approximately 100% in store 517 in Norrköping. This is therefore further evidence that beer sales react most strongly to widened availability. Against this trend, only few shops experience the largest category-specific increase in either wine or spirits sales.[28]

b. The effect of business stealing

More importantly, based on the municipalities under review the question whether a business stealing effect is present can be answered affirmatively. The decisive coefficient of the *Comprebuilt* variable is significant in almost all store-specific regressions and takes the right sign. When examining individual outlets the degree of business stealing varies between approximately -10 to -40% in the regression including all alcohol categories. The mean decrease associated with it amounts to roughly 19%. This would entail a significant reduction of the overall sales increase of 36.6 % due to self-service estimated above if the effect on average remains equally large for the remaining stores in Sweden. Thus, the calculations suggest the net effect of self-service estimated here is still positive but somewhat smaller than in section 4.2..

Nonetheless, business stealing does not apply to each individual store. For instance, while in municipality Eskilstuna the business stealing effect of store 403 for store 404 is substantial with

[28] For instance, refer to regression (12) of store 404 in the municipality Eskilstuna which gives an increase of 130% for wine. Furthermore, store 407 in the municipality Strängnäs displays the largest category-specific sales increase in spirits with a coefficient of 0.131.

a coefficient of -0.154 in the pooled regression (9), the effect on store 405 is statistically insignificant. At the same time, the results for store 403 in Eskilstuna also show that business stealing affects not only clerk-service stores but also already existing self-service stores. As can be deducted from regressions (7) and (8), the effect from Δ_{12} *Comprebuilt404* amounts to a sales reduction of approximately 33% for beer and 43% for wine. It therefore appears that customer switching can arise in response to the opening of re-designed stores in general or outlets in spatial proximity and can be considerable in size. Contrary to expectations that it might most strongly prevail for beer sales, however, the sub-sample regression results provide a blurred picture. Overall, some shops experience the largest category-specific reduction in beer sales, others in spirits or wine.

6. Conclusion

This thesis shows that the conversion of Swedish public alcohol retail stores into self-service will on average have a positive impact on sales across all beverage categories with beer sales as the main driver. This effect is, however, softened through business stealing, i.e. consumer switching within the same municipality. The positive net effect of self-service points towards larger sales per customer which affirms previous findings by Smart (1974) and Skog (2000). Following Skog's (2000) argument, self-service in Swedish alcohol outlets might remove alcohol's special commodity status which differs from other goods such as bread. Alcoholic beverages might thus be perceived like normal products in a grocery store and induce people to increase their purchases. Hence, the outlined results have implications for a governmental health policy aimed at minimizing alcohol consumption. Countervailing measures might have to be devised in response to this expansion in sales.

Nevertheless, this analysis has several limitations. The time frame to write it is limited. Regarding the business stealing effect, the scope is restricted to only examining a few municipalities with a maximum of four shops. This excludes cities with a larger amount of outlets like Malmö or Stockholm where the effect might differ. Moreover, the analysis does not take into account inter-municipality business stealing which can yield additional results. The extent of the business stealing effect of one shop should depend on the distance to others but

this is outside the scope of the thesis. Further research should incorporate these points to even more accurately model business stealing and with even larger samples. This could also involve the joint estimation with the self-service effect in one model.

Moreover, apart from that the effect of self-service sales growth might not be entirely attributable to rising alcohol consumption since the sources for alcohol consumption are plentiful[29] and in this thesis only sales in public retail stores are evaluated. Subsequently, rising sales in Systembolaget outlets could also indicate a shift from one alcohol source to another one. The evaluation of such potential alteration is, however, left to future researchers. Since it is found that beer sales respond especially strong to an increase of availability it should also be investigated to what extent beer self-service stores' sales rises. Impulsive buyer behavior and other underlying causes for the increase (e.g. because of greater convenience, less queuing time) should in this context best be modeled with surveys. Besides, since the total share of self-service rises as all counter-stores are being replaced, it would be interesting to see if the effect of business stealing fades out with that.

[29] They include smuggling, private imports, sales of beer with lower alcohol content in private retail stores or private production (Holder, Andreasson, Norström et al. 2005).

7. References

Appel, D. (1972): The supermarket – Early development of an institutional innovation. In: Journal of Retailing, 48, 39-53.

Asplund, M., Friberg, R. and Wilander, F. (2007): Demand and distance: evidence on cross-border shopping. In: Journal of Public Economics, 91, 141-157.

Bentzen, J. and Smith, V. (2004): Short-run and long-run relationships in the consumption of alcohol in the Scandinavian countries. Aarhus Department of Economics working paper 04-14. Online: http://ideas.repec.org/p/hhs/aareco/2004_014.html, 15/11/08.

Chaloupka, F., Grossman, M. and Saffer, H. (2002): The effects of price on alcohol consumption and alcohol-related problems. In: Alcohol Research and Health, 22-34.

Cook, P. and Moore, M. (2002): The economics of alcohol abuse and alcohol-control policies. In: Health Affairs, 21, 120-133.

Del Boca, F. and Darkes, J. (2003): The validity of self-reports of alcohol consumption: state of the science and challenges for research. In: Addiction, 98 (suppl. 2), 1-12.

Fiilin, P. and Virtanen, M. (1984): 'Är självbetjäningsbutiken lämplig för alkoholförsäljning?' [Is the self-service store suitable for sales of alcohol?]. In: Alkoholpolitik, 1, 43-47.

Goldman, A. (1976): Stages in the development of the supermarket. In: Journal of Retailing, 51, 49-64.

Gujarati, D. (2004): Basic Econometrics. 4th edition. Boston et al., McGraw Hill.

Halvorsen, R. and Palmquist, R. (1980): The interpretation of dummy variables in semilogarithmic equations. In: American Economic Review, 70, 474–475.

Heeb, J.-L., Gmel, G., Zurbrugg, C. et al. (2003): Changes in alcohol consumption following a reduction in the price of spirits: A natural experiment in Switzerland. In: Addiction, 98, 1433-1446.

Her, M., Giesbrecht, N., Room, R. et al. (1999): Privatizing alcohol sales and alcohol consumption – Evidences and implications. In: Addition, 94, 1125-1139.

Holder, H. Agardh, E., Högberg, P. et al. (2007): If retail alcohol sales in Sweden were privatized, what would be the potential consequences?. Östersund, National Institute of Public Health.

Holder, H., Andreasson, S., Norström, T. et al. (2005): Estimates of harm associated with changes in Swedish Alcohol Policy. Stockholm, National Institute of Public Health.

Hough, J. and Lambert, F. (1951): Self-service shops. Manchester, Co-operative Union.

Mäkelä P. (1999): Alkoholiin liittyvät kuolemat. Yleisyys ja yhteys sukupuoleen ja sosioekonomiseen asemaan [Alcohol-related deaths. Incidence and connection to sex and socioeconomic status].Helsinki, STAKES Research Report 105.
Mäkelä, P., Rossow, I. and Tryggvesson, K. (2002): Who drinks more and less when policies change? – The evidence from 50 years of Nordic studies. In: Room, R. (ed.): The effects of Nordic alcohol policies – What happens to drinking and harm when alcohol controls change? Helsinki, NAD, 13-41.

Mann, R., Rehm, J., Giesbrecht, N. et al. (2005): Alcohol distribution, alcohol retailing and social responsibility. Toronto, Centre for Addiction and Mental Health. Online: http://www.fin.gov.on.ca/english/consultations/basr/basr_alcoholdistr_report.pdf, 15/11/08.

Mueller, W. and Garoian, L. (1961): Changes in the market structure of grocery retailing. Madison, University of Wisconsin press.

Norström, T. and Ramstedt, M. (2006): Sweden – is alcohol becoming an ordinary commodity?. In: Addiction, 101, 1543-1545.

Norström, T. and Skog, O.-J. (2005): Saturday opening of alcohol retail shops in Sweden: an experiment in two phases. In: Addiction, 100, 767-776.

Noval, S. and Nilsson, T. (1984): Mellanölets effekt på konsumtionsnivån och tillväxten hos den totala alkoholkonsumtionen [The effects of medium-strength beer on consumption levels and the rise in overall alcohol consumption]. In: Nilsson, T. (ed.): När mellanölet försvann [When the medium-strength beer disappeared]. Linköping, Samhällsvetenskapliga institutionen,Universitetet i Linköping, 77-93.

Saffer, H. (1989a): Alcohol advertising bans and alcohol abuse: an international perspective. NBER Working paper 3052.

Saffer, H. (1989b): Alcohol consumption and tax differentials between beer, wine and spirits. NBER Working paper 3200.

Shaw, G. and Alexander, A. (2008): British co-operative societies as retail innovators – Interpreting the early stages of self-service revolution. In: Business History, 50, 62-78.

Shaw, G., Curth, L. and Alexander, A. (2004): Selling self-service and the supermarket – The Americanization of food retailing in Britain, 1945-60. In: Business History, 46, 568-582.

Skog, O-J. (1991): Selvbetjeningssalg av sterkøl i svenske systembolagbutikker [Self-service ofstrong beer in swedish liquor stores]. Oslo, Norwegian Institute for Alcohol and Drug Research.

Skog, O.-J. (2000): An experimental study of a change from over-the-counter to self-service sales of alcoholic beverages in monopoly outlets. In: Journal of Studies on Alcohol, 61, 95-100.

Smart, R. (1974): Comparison of purchasing in self-service and clerk-service liquor stores. In: Quarterly Studies on Alcohol, 35, 1397-1401.

Smith, D. and Mitry, D. (2006): Consumer sensitivity to changes in tax policy on consumption of alcohol. In: International Journal of Consumer Studies, 30, 247-255.

Systembolaget (2005): Annual report 2005. Stockholm, Systembolaget.

Tigerstedt, C., Karlsson, T., Mäkelä, P. et al. (2006): Health in alcohol policies: the European Union and its Nordic Member states. In: Stahl,T., Wismar, M., Ollila, E. et al. (ed.): Health in all policies – prospects and potentials. Helsinki, Ministry of Social Affairs and Health, 111-127.

Tigerstedt, C. and Sutton, C. (2000): Exclusion and inclusion – Saturday closing and self-service stores. In: Sulkunen, P., Sutton, C., Tigerstedt, C. et al.: Broken spirits – power and ideas in Nordic alcohol control. Helsinki, NAD, 185-200.

Wooldridge, J. (2000): Introductory Econometrics: a modern approach. Mason (Ohio), South-Western.

Zimmerman, M. (1941): The supermarket and the changing retail structure. In: Journal of Marketing, 5, 402-409.

8. Appendix

A. Regional development of per capita sales in Systembolaget stores (selected counties)

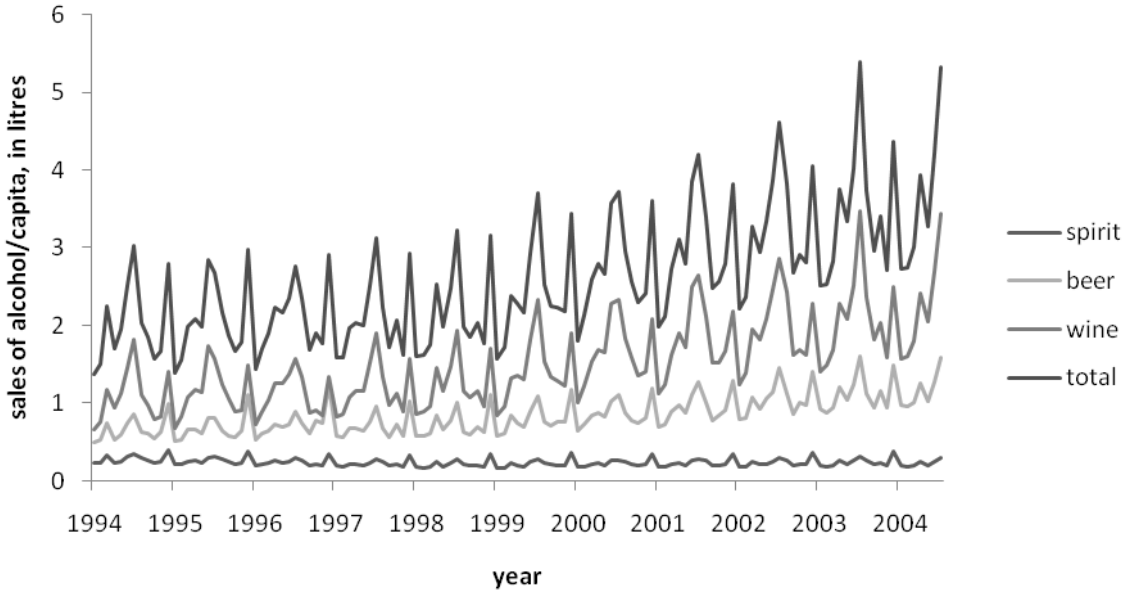


Figure 4a: Development of per capita alcohol sales in Västerbotten County

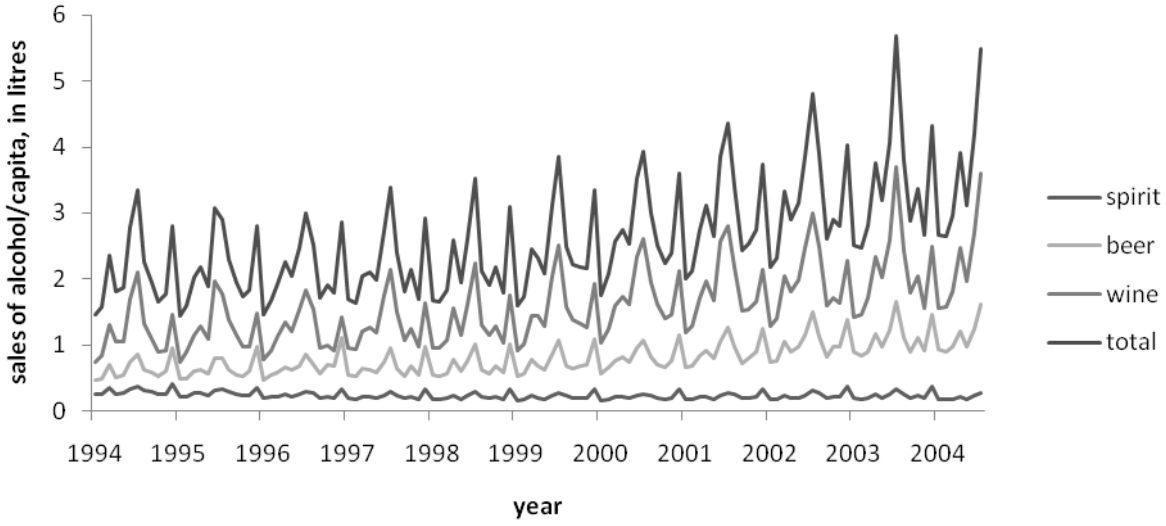


Figure 4b: Development of per capita alcohol sales in Norrbotten County

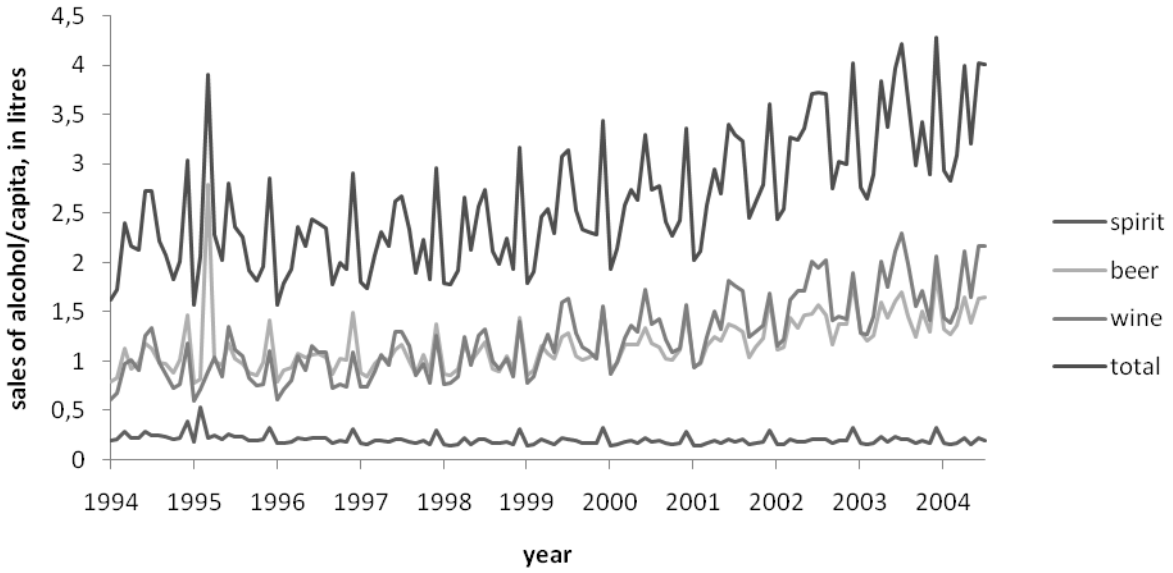


Figure 4c: Development of per capita alcohol sales in Uppsala County

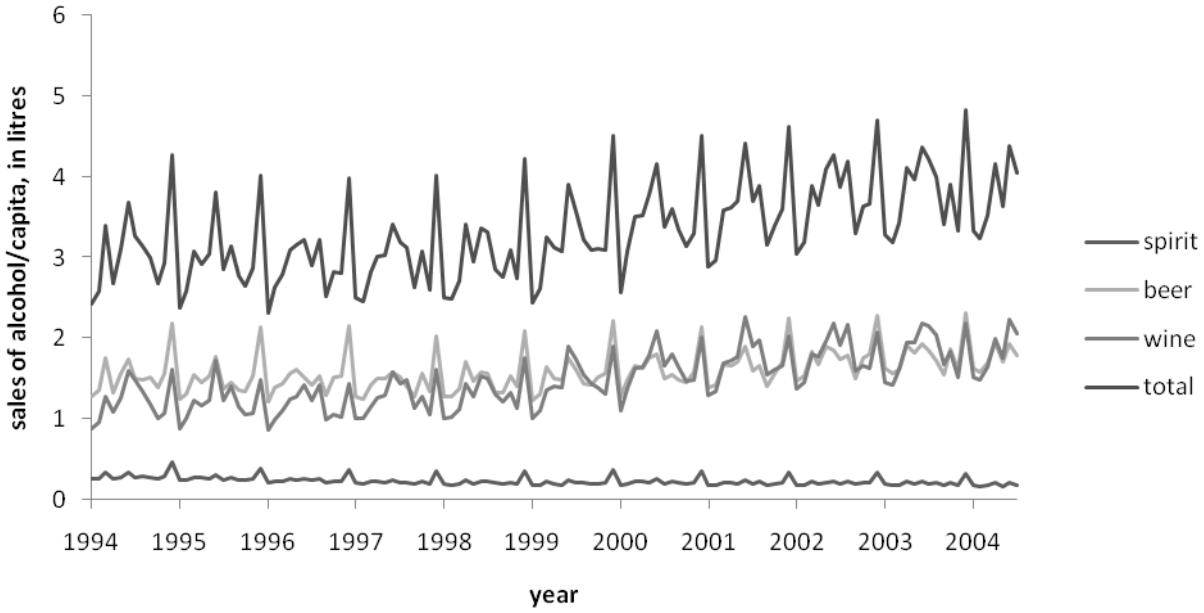


Figure 4d: Development of per capita alcohol sales in Stockholm County

B. Results for estimating the business stealing effect within municipalities

Note that *Pooled* implies a joint regression of all stores on the municipality level. The number in the heading of each regression specifies the internally assigned store number by Systembolaget. The number after the *Comprebuilt* variable indicates the shop which was converted into the self-service format. For example, Δ_{12} Comprebuilt1001 implies that outlet 1001 was re-designed into self-service.

The dependent variable is always Δ_{12}ln Sales; *, ** and *** indicate significance at 10, 5 and 1% level, respectively; the absolute value of t statistics is presented in parenthesis. Insignificant variables in sub-sample robustness tests, e.g. when only considering sales in one alcohol category, are not dropped from the regressions. The reasoning behind this is that, for instance, the effect of a *Comprebuilt* might prevail in a pooled regression but be principally due to changes in one, and not all three, sub-groups.

Table 3a: Municipality Karlskrona (2 stores)

Store number	Self-service from
1001	May 2003
1002	November 1998

Independent variable	(1)1002 - all cat.	(2)1002 - spirits	(3)1002 - beer	(4)1002 - wine	(5)1001 - all cat.	(6)1001 - spirits	(7)1001 - beer	(8)1001 - wine
Δ_{12} D_Self-service	0.288	0.286	0.336	0.209	0.211	0.191	0.283	0.184
	(11.19)***	(6.98)***	(8.36)***	(4.25)***	(9.68)***	(5.63)***	(7.34)***	(4.21)***
Δ_{12} Comprebuilt1001	-0.186	-0.215	-0.215	-0.202				
	(7.02)***	(4.61)***	(4.73)***	(4.02)***				
Δ_{12} Comprebuilt1002					-0.088	-0.101	-0.134	-0.034
					(4.17)***	(3.37)***	(3.94)***	(0.80)
Δ_{12}ln Ownprice	-1.296	-5.590	-1.008	-1.747	-1.628	-2.176	-1.173	-1.077
	(5.63)***	(4.13)***	(2.03)**	(3.68)***	(8.58)***	(2.20)**	(2.79)***	(2.61)**
Δ_{12} Holidays	0.046	0.047	0.046	0.045				
	(3.83)***	(2.53)**	(2.49)**	(1.95)*				
Constant	0.005	0.059	0.039	-0.021	-0.023	-0.042	0.000	0.001
	(0.48)	(1.97)*	(2.66)***	(0.82)	(3.03)***	(1.93)*	(0.01)	(0.05)
Observations	309	103	103	103	309	103	103	103
R-squared	0.42	0.51	0.51	0.34	0.46	0.46	0.58	0.25

Table 3b: Municipality Mjölby (2 stores)

Store number	Self-service from
507	June 2001
508	-

Independent variable	(1)508 - all cat.	(2)508 - spirits	(3)508 - beer	(4)508 - wine	(5)507 - all cat.	(6)507 - spirits	(7)507 - beer	(8)507 - wine
Δ_{12} D_Self-service					0.313	0.262	0.362	0.323
					(17.41)***	(9.08)***	(12.28)***	(10.16)***
Δ_{12} Comprebuilt507	-0.111	-0.110	-0.103	-0.060				
	(6.05)***	(4.11)***	(3.88)***	(1.70)*				
Δ_{12}ln Fridays	0.219	0.128	0.222	0.305	0.229	0.140	0.249	0.293
	(4.84)***	(1.95)*	(3.51)***	(3.57)***	(5.25)***	(2.01)**	(3.57)***	(3.84)***
Δ_{12} Holidays	0.044	0.052	0.052	0.030				
	(5.12)***	(4.13)***	(4.32)***	(1.86)*				
Δ_{12}ln Ownprice	-0.691	0.014	0.608	0.176	-1.232	-4.320	-0.601	-0.642
	(4.28)***	(0.02)	(2.10)**	(0.52)	(7.83)***	(5.14)***	(1.87)*	(2.12)**
Constant	-0.020	-0.072	-0.016	0.044	-0.008	0.021	0.007	0.023
	(3.23)***	(4.41)***	(1.84)*	(2.45)**	(1.28)	(1.18)	(0.76)	(1.41)
Observations	309	103	103	103	309	103	103	103
R-squared	0.26	0.29	0.38	0.18	0.60	0.58	0.66	0.58

Table 3c: Municipality Västervik (2 stores)

Store number	Self-service from
809	May 2003
816	-

Independent variable	(1)816 - all cat.	(2)816 - spirits	(3)816 - beer	(4)816 - wine	(5)809 - all cat.	(6)809 - spirits	(7)809 - beer	(8)809 - wine
Δ_{12} D_Self-service					0.032	0.084	0.062	-0.050
					(1.67)*	(3.09)***	(2.09)**	(1.43)
Δ_{12} Comprebuilt809	-0.081	-0.065	-0.080	-0.085				
	(4.84)***	(2.30)**	(2.65)***	(2.70)***				
Δ_{12}ln Ownprice	-1.196	-2.325	-0.759	-0.657				
	(8.13)***	(2.82)***	(2.30)**	(2.19)**				
Δ_{12}ln Fridays	0.175	0.116	0.202	0.204	0.122	0.046	0.126	0.196
	(4.33)***	(1.89)*	(3.08)***	(2.68)***	(2.67)***	(0.71)	(1.76)*	(2.36)**
Δ_{12} Holidays	0.041	0.045	0.034	0.045	0.034	0.037	0.038	0.025
	(5.26)***	(3.83)***	(2.69)***	(3.09)***	(3.70)***	(2.92)***	(2.70)***	(1.56)
Constant	0.008	-0.005	0.027	0.040	0.007	-0.054	0.024	0.052
	(1.37)	(0.27)	(2.92)***	(2.52)**	(1.13)	(6.18)***	(2.44)**	(4.62)***
Observations	309	103	103	103	345	115	115	115
R-squared	0.30	0.23	0.22	0.23	0.08	0.15	0.13	0.09

Table 3d: Municipality Strängnäs (2 stores)

Store number	Self-service from
407	November 2002
408	-

Independent variable	(1)408 - all cat.	(2)408 - spirits	(3)408 - beer	(4)408 - wine	(5)407 - all cat.	(6)407 - spirits	(7)407 - beer	(8)407 - wine
Δ_{12} D_Self-service					0.131	0.131	0.121	0.121
					(6.78)***	(3.75)***	(3.40)***	(3.56)***
Δ_{12} Comprebuilt407	-0.083	-0.076	-0.076	-0.097				
	(4.30)***	(2.70)***	(2.70)***	(2.86)***				
Δ_{12}ln Ownprice					-1.372	-3.861	-0.892	-1.488
					(8.14)***	(3.80)***	(2.31)**	(4.59)***
Δ_{12}ln Fridays	0.116	0.124	0.124	0.236	0.155	0.067	0.147	0.244
	(2.53)**	(1.85)*	(1.85)*	(2.94)***	(3.33)***	(0.87)	(1.95)*	(2.92)***
Δ_{12} Holidays	0.034	0.035	0.035	0.022	0.022	0.036	0.027	0.005
	(3.72)***	(2.66)***	(2.66)***	(1.41)	(2.50)**	(2.42)**	(1.90)*	(0.31)
Constant	0.004	0.017	0.017	0.047	0.010	0.030	0.036	0.000
	(0.70)	(1.91)*	(1.91)*	(4.28)***	(1.48)	(1.40)	(3.37)***	(0.01)
Observations	345	115	115	115	309	103	103	103
R-squared	0.11	0.15	0.15	0.15	0.36	0.39	0.31	0.34

Table 3e: Municipality Eskilstuna (3 stores)

Store number	Self-service from
403	August 2003
404	November 1994
405	-

Independent variable	(1)pooled - all cat.	(2)pooled - spirits	(3)pooled - beer	(4)pooled - wine	(5)403 - all cat.	(6)403 - spirits	(7)403 - beer	(8)403 - wine
Δ_{12} D_Self-service	0.494	0.373	0.521	0.587	0.411	0.405	0.487	0.341
	(29.96)***	(16.68)***	(23.90)***	(18.02)***	(16.90)***	(11.76)***	(16.11)***	(6.97)***
Δ_{12} Comprebuilt403	-0.048	-0.031	-0.048	-0.065				
	(2.90)***	(1.37)	(2.19)**	(2.00)**				
Δ_{12} Comprebuilt404	-0.424	-0.326	-0.451	-0.494	-0.402	-0.228	-0.410	-0.567
	(25.70)***	(14.59)***	(20.68)***	(15.14)***	(16.52)***	(6.62)***	(13.58)***	(11.59)***
Δ_{12}ln Fridays	0.158	0.097	0.143	0.234	0.169	0.099	0.154	0.253
	(5.12)***	(2.31)**	(3.51)***	(3.83)***	(3.08)***	(1.27)	(2.27)**	(2.29)**
Constant	0.009	-0.048	0.017	0.059	-0.029	-0.090	-0.021	0.023
	(2.10)**	(7.92)***	(2.80)***	(6.75)***	(3.70)***	(8.07)***	(2.11)**	(1.47)
Observations	1035	345	345	345	345	115	115	115
R-squared	0.63	0.61	0.76	0.65	0.65	0.65	0.82	0.65

Independent variable	(9)404 - all cat.	(10)404 - spirits	(11)404 - beer	(12)404 - wine	(13)405 - all cat.	(14)405 - all cat.	(15)405 - spirits	(16)405 - beer	(17)405 - wine
Δ_{12} D_Self-service	0.568	0.329	0.543	0.831					
	(24.96)***	(12.37)***	(20.08)***	(24.71)***					
Δ_{12} Comprebuilt403	-0.154	-0.140	-0.152	-0.169	0.019				
	(6.76)***	(5.27)***	(5.61)***	(5.03)***	(1.01)				
Δ_{12} Comprebuilt404					-0.398	-0.400	-0.375	-0.444	-0.382
					(20.79)***	(21.01)***	(13.80)***	(15.13)***	(11.89)***
Δ_{12}ln Fridays	0.173	0.105	0.137	0.278	0.146	0.148	0.092	0.148	0.203
	(3.38)***	(1.75)*	(2.24)**	(3.67)***	(3.38)***	(3.43)***	(1.49)	(2.23)**	(2.79)***
Constant	0.056	0.006	0.065	0.098	0.001	0.003	-0.056	0.007	0.058
	(7.63)***	(0.72)	(7.43)***	(8.93)***	(0.14)	(0.49)	(6.64)***	(0.77)	(5.78)***
Observations	345	115	115	115	345	345	115	115	115
R-squared	0.68	0.64	0.81	0.86	0.57	0.57	0.63	0.68	0.57

Table 3f: Municipality Norrköping (4 stores)

Store number	Self-service from
513	October 2002
514	-
516	March 1994
517	May 2000

Independent variable	(1)pooled -all cat.	(2)513 - all cat.	(3)513 - all cat.	(4)513 - spirits	(5)513 - beer	(6)513 - wine	(7)514 - all cat.	(8)514 - spirits	(9)514 - beer	(10)514 - wine
Δ_{12} D_Self-service	0.459	0.402	0.398	0.410	0.464	0.322				
	(27.35)***	(15.47)***	(15.25)***	(9.52)***	(11.55)***	(7.02)***				
Δ_{12} Comprebuilt513	-0.102						-0.295	-0.326	-0.252	-0.307
	(6.92)***						(10.60)***	(5.95)***	(6.47)***	(6.43)***
Δ_{12} Comprebuilt516	-0.011	0.117								
	(0.33)	(2.36)**								
Δ_{12} Comprebuilt517	-0.231	-0.130	-0.134	-0.068	-0.195	-0.140				
	(13.13)***	(5.02)***	(5.14)***	(1.57)	(4.86)***	(3.06)***				
Δ_{12}ln Fridays	0.113						0.235	0.217	0.260	0.229
	(3.39)***						(2.36)**	(1.10)	(1.86)*	(1.34)
Δ_{12} Holidays	0.023									
	(3.47)***									
Constant	0.021	-0.015	-0.011	-0.072	-0.008	0.048	0.123	0.092	0.105	0.170
	(4.26)***	(1.61)	(1.20)	(4.90)***	(0.57)	(3.05)***	(7.97)***	(3.04)***	(4.89)***	(6.46)***
Observations	1152	345	345	115	115	115	117	39	39	39
R-squared	0.49	0.46	0.45	0.47	0.61	0.37	0.50	0.50	0.55	0.54
Independent variable	**(11)516 - all cat.**	**(12)516 - spirits**	**(13)516 - beer**	**(14)516 - wine**	**(15)517 - all cat.**	**(16)517 - all cat.**	**(17)517 - spirits**	**(18)517 - beer**	**(19)517 - wine**	
Δ_{12} D_Self-service	0.430	0.349	0.407	0.534	0.581	0.583	0.524	0.728	0.496	
	(11.62)***	(6.09)***	(7.31)***	(8.04)***	(23.94)***	(24.21)***	(14.07)***	(17.18)***	(13.40)***	
Δ_{12} Comprebuilt513	-0.102	-0.067	-0.101	-0.138	-0.016					
	(5.26)***	(2.24)**	(3.45)***	(3.96)***	(0.65)					
Δ_{12} Comprebuilt516					-0.089	-0.087	-0.043	-0.096	-0.122	
					(1.91)*	(1.88)*	(0.60)	(1.18)	(1.71)*	
Δ_{12} Comprebuilt517	-0.361	-0.279	-0.419	-0.384						
	(18.19)***	(9.08)***	(14.05)***	(10.79)***						
Δ_{12}ln Fridays					0.148	0.146	0.076	0.131	0.231	
					(2.60)***	(2.57)**	(0.86)	(1.31)	(2.64)***	
Δ_{12} Holidays	0.054	0.057	0.057	0.048						
	(5.89)***	(4.01)***	(4.12)***	(2.93)***						
Constant	0.036	-0.019	0.049	0.078	0.011	0.010	-0.042	0.018	0.053	
	(5.40)***	(1.80)*	(4.88)***	(6.49)***	(1.36)	(1.22)	(3.43)***	(1.28)	(4.36)***	
Observations	345	115	115	115	345	345	115	115	115	
R-squared	0.60	0.55	0.71	0.65	0.64	0.64	0.64	0.73	0.63	

Note: Δ_{12} Comprebuilt 516 not included in (3)-(6) as it shows a positive sign; in (7)-(19) Δ_{12} Comprebuilt 516 not included as shop 514 only opened 1997 (i.e. dummy is zero in all periods) and Δ_{12} Comprebuilt 517 not included because it takes a positive sign.