

Short-run economic effects of the Scottish smoking ban

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Background We estimated the short-run economic impacts of the Scottish smoking ban on public houses. Previous findings on the effect of smoking bans on the hospitality sector have mainly focused on the United States. These studies have mostly found no negative economic effects of such legislation on the hospitality sector in the long run. However, differences in the social use of public houses in Great Britain in comparison with the United States may lead to different findings.

Methods We used a quasi-experimental research design that compared the sales and number of customers in public houses located in Scotland before and after the Scottish smoking ban was introduced, relative to a control group of establishments across the English border where no ban was imposed. To perform this analysis, we collected data on 2724 pubs, 1590 in Scotland and 1134 in Northern England by phone interviews using quota sampling.

Results We found that the Scottish ban led to a 10% decrease in sales [$P=0.02$, 95% confidence interval (CI) -19% to -2%] and a 14% decrease in customers ($P=0.02$, 95% CI -26% to -2%).

Conclusion Our study suggests that the Scottish smoking ban had a negative economic impact on public houses, at least in the short run, due in part to a drop in the number of customers.

Keywords Smoking, legislation, second-hand smoke, hospitality sector

Introduction

A number of countries have implemented or plan to implement smoking bans in public places to reduce smoking prevalence and second-hand smoke. Although the available evidence suggests that the public health gains of such measures are likely to be sizeable, these types of policies are partly opposed by pub and restaurants owners who argue that a smoking ban will reduce sales (and therefore profits and employment) because smokers will not go to pubs or will spend less time in them. However, this conclusion is far from obvious as alternative consumption patterns may emerge. For example, it may be the case that a smoking ban attracts new customers

or existing customers decide to consume more (e.g. because they have more money to spend if they smoke less).

There have been numerous attempts to quantify the economic effects of banning smoking at the aggregate level.¹⁻³ This work aims to estimate the net impact of banning smoking on the overall economy and reports that the net employment impact of banning smoking is relatively small. A related literature at the more micro level—using data at city, county or state level—finds that bans have little or no effect on the hospitality sector.⁴

In this article, we assessed the economic effect of the smoking ban that was introduced on March 26, 2006 in Scotland. We studied its effect on public house sales and on the number of customers before and after the ban was introduced relative to establishments across the English border where no ban was imposed.

Methods

Study design

A sample of public houses in Scotland (the intervention group) and Northern England (the control group) was surveyed by

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telephone by Ipsos MORI, a company that specializes in opinion polls and market survey data. The sampling frame was obtained from Experian, a company which compiles a comprehensive and up-to-date database of establishments from the following sources: Post Office Address File, Companies House, Payment Performance Data, Thomson Directory, Yellow Pages, Direct Marketing Association, Registry Trust, London and Edinburgh Gazettes, National Canvas and Modelled Data. The interviews were obtained from a list of 6773 public houses with a telephone number. Establishments were contacted before the ban in the weeks from February 24 to March 10, 2006 and data was collected again for a second wave, after the ban was imposed in Scotland, from May 3 to May 31, 2006. In the second wave, an effort was made to re-contact the establishments who responded in the first wave.

The sampling relied on quotas based on location (rural vs urban) and on size (number of employees previous to the imposition of the ban) in order to be representative of the universe of pubs in Scotland and Northern England. Within these quotas, the pubs were selected at random until the desired sample sizes were achieved. The data on rural/urban location was obtained from the Office of National Statistics and the number of employees from Experian, together with the list of establishments. The pubs in the control group were located in the following counties: Cleveland, County Durham, Cumbria, North Yorkshire, Northumberland and Tyne and Wear. For the intervention group, the pubs were located all over Scotland.

We also collected data on Northern Ireland. However, the sample sizes were significantly smaller for this region than for Scotland and Northern England. Given that none of the results of the study were affected by including this region within the control group we did not include these observations in the analysis.

Questionnaire

The questionnaire was designed to obtain general information about the establishment (for example: ownership status, number of seats, offer of food service) and business outcomes such as total sales in the preceding week, the number of customers at the busiest time on a randomly chosen day and the price of the best selling beer. It took about 10 min to complete and was carried out by experienced interviewers.

Sample size and outcome measurements

We collected a sample of 2724 observations. In Scotland, 781 pubs were surveyed for the first wave and 809 pubs for the second. The respective numbers for England were 565 and 569. Of the 2724 pubs, 941 establishments were surveyed in both waves.

The main outcomes of interest for our study were sales and the number of customers. We collected data on weekly total sales (*'Can you please tell me your total turnover over the course of the last week, that is, over the course of the last seven days and nights?'*) and the number of customers at the busiest time on a randomly chosen day of the week [*'During your busiest time period last (RANDOMLY GENERATED DAY OF THE WEEK), approximately how many customers did you have in your pub?'*]. In addition, we

collected data on pub characteristics and prices of alcoholic drinks (*'What is the current price of your best selling beer or lager?'*).

Statistical analysis

We adopted a quasi-experimental approach to identify the impact of the smoking ban on pub sales and number of customers. We compared what happened to pub level outcomes in a treatment area (Scotland) with an otherwise comparable control area (North England) before and after the smoking ban was introduced. Thus, we measured the impact of the intervention as the net difference between the change in outcomes for the treatment and control areas. This methodology (commonly referred to by economists as 'difference-in-differences'⁵) has been widely used in evaluations of the economic and social impact of government policies (for example, the economic literature that looks at the employment effects of minimum wages^{6,7}). Some of the US work on smoking bans have used this empirical strategy as well⁸⁻¹¹.

We implemented our empirical approach using linear regression models. We used the log of the outcomes (sales and number of customers) as dependent variables for ease of interpretation of the results and to give less weight to outliers. The coefficients of the model can then be interpreted as the percentage change in the outcomes of interest due to changes in the explanatory variables.

The baseline regression contained three indicator variables: one for pubs located in Scotland, another for pubs surveyed during the second wave and the last one for Scottish pubs in the second wave of the survey. The coefficient on the Scotland dummy measures the percentage difference in the outcome of interest between Scotland and Northern England in the first wave. This captures permanent differences (or slowly evolving differences that for the span of the analysis can be considered as fixed¹²) between Scottish and English pubs. The coefficient on the second wave indicator measures the growth rate in the outcome of interest in Northern England. The causal impact of the smoking ban is identified in this model under the assumption that, in the absence of the intervention, Scotland and Northern England would have experienced similar trends. Thus, this variable captures aggregate changes in sales and number of customers between the two waves that are common to Scotland and England. It allows us to abstract from seasonal variations in demand and other changes that occur simultaneously in England and Scotland (e.g. tax changes). Finally, the coefficient on the indicator variable for Scottish pubs during the second wave captures the causal impact of the smoking ban. The 95% confidence interval (CI) for this coefficient can be used to test the null hypothesis that the net change in the outcome of interest between Scotland and Northern England is different from zero.

We augmented this baseline model to adjust for the location of the pub (rural vs urban) and the size of the pub (number of employee at baseline). Finally, we used only the pubs which were surveyed twice and we estimated a fixed effect model, which controls for any fixed time-invariant pub characteristics which may confound the relationship between the outcomes of interest and the smoking ban (this amounts to including a full set of pub indicator variables, thereby focussing on within-pub

Table 1 Definition of variables for the regression analysis

Variable	Definition
Log (sales)	Natural logarithm of the establishment total weekly sales.
Log (customers)	Natural logarithm of the number of customers at the busiest time in a randomly generated day of the week.
Log (price)	Natural logarithm of the price of best selling beer.
Scotland	Equal to 1 if establishment located in Scotland and 0 otherwise.
After smoking ban	Equal to 1 if observation collected after the ban and 0 otherwise.
Scotland × after smoking ban	Equal to 1 if observation collected after the ban in Scotland and 0 otherwise.
Employment	Number of employees in the establishment. (As reported in the sampling frame.)
Rural	Equal to 1 if the establishment is located in a rural area. (Office of National Statistics definition.)
Establishment fixed effect	Categorical variable for each establishment.

changes before and after the ban). Table 1 summarizes the definition of the variables used in the regression analysis.

In addition to studying the effect on sales and number of customers of the smoking ban, we also looked at the impact of the ban on the price of beer using a similar empirical strategy to the one for these other outcomes. In this way, we explored whether changes in business outcomes could have been caused by changes in pricing strategies as a response to the smoking ban.

For all models, standard errors were corrected for heteroskedasticity using the Huber–White-sandwich correction. For the first two models, the standard errors were also clustered at county levels to account for within county correlation.¹³ For the last model, the standard errors were not clustered given that the model already took into account county effects through the fixed effect. We used Stata statistical software (version 8.2) to analyse the data.

Results

Table 2 displays summary statistics for our sample. It gives the break down of pubs in Scotland and Northern England. While most of the pubs in our sample are in urban areas, rural pubs are more prevalent in England (13%) than in Scotland (4%). Small pubs, <3 employees, are more common in our English sample (31%) than in the Scottish one (22%). Weekly sales and prices are higher in Scotland than in England. However, Scottish pubs have fewer customers than English pubs. Finally, the differences in the number of observations between the number of interviews collected and the observations for sales, customers and prices reflect item non-response. The non-response is uncorrelated with country, wave or their interaction.

Table 3 displays the effect of the ban on sales. The first column presents the unadjusted results. The first row indicates that sales in Scotland were about 11% higher than in Northern England. The next row presents the change in sales in both regions between the two waves (February 2006 and May 2006). Sales went up by about 5.5% due to the seasonality in demand. Finally, the last row presents the differential effect of the ban on smoking in Scotland. Sales are seen to fall by about 9.7% (95% CI –18% to –1%). This gap arises as the result of a 5.5% growth in sales in Northern England compared with a 4.2% fall in Scotland.

Table 2 Descriptive statistics

	Northern England	Scotland
Number of interviews performed:	1134	1590
Urban (%)	86.57	96.33
Rural (%)	13.43	3.67
Employees 0–3 (%)	31.48	21.89
Employees 4–9 (%)	34.57	44.40
Employees 10+ (%)	33.95	33.71
Weekly sales (in pounds):		
Mean	7529	7892
Median	5000	5500
Standard deviation	7467	7397
Observations	589	816
Number of customers:		
Mean	80	66
Median	50	40
Standard deviation	88	77
Observations	1018	1463
Price of beer (in pounds):		
Mean	2.18	2.22
Median	2.20	2.20
Standard deviation	0.26	0.24
Observations	1115	1558

Column (2) of Table 3 presents adjusted coefficients. When we adjusted for the size of the pub as well as location (rural vs urban), there was no sizable difference in sales between Scottish and English pubs. Sales went up by about 4% during the period of observation. The effect of the ban is marked as sales decreased by about 10.5% (95% CI –20% to –1%), as a consequence of 4.0% growth in sales in Northern England and 6.5% fall in Scotland.

Column (3) of Table 3 presents the results obtained from the sample of establishments that appear in both waves and including a categorical variable for each pub (pub fixed effect). This is a smaller sample as we only have 381 pubs who reported sales in both waves. In those pubs, sales increased by 9.7% over the period of analysis in England and Scotland. The ban reduced sales in Scotland by about 10% ($P=0.02$) compared

Table 3 Effect of ban on sales

	Dependent variable: Log (sales)		
	(1)	(2)	(3)
Scotland	0.107 [−0.180/0.394]	0.033 [−0.115/0.180]	–
After smoking ban	0.055 [0.003/0.107]	0.042 [−0.038/0.123]	0.097 [0.035/0.159]
Scotland × after smoking ban	−0.097 [−0.185/−0.008]	−0.105 [−0.207/−0.003]	−0.104 [−0.191/−0.016]
Observations	1405	1405	762
Controls:			
Employment and rural	No	Yes	No
Establishment Fixed Effect	No	No	Yes

Notes: Results from ordinary least squares regressions. See Table 1 for the definition of variables. 95% CI in brackets computed with standard errors corrected for heteroskedasticity and clustered at county level in columns (1)–(2).

Table 4 Effect of ban on number of customers

	Dependent variable: Log (customers)		
	(1)	(2)	(3)
Scotland	−0.139 [−0.383/0.105]	−0.201 [−0.337/−0.065]	–
After smoking ban	0.037 [−0.062/0.136]	0.019 [−0.088/0.126]	0.040 [−0.051/0.131]
Scotland × after smoking ban	−0.106 [−0.235/0.022]	−0.102 [−0.233/0.029]	−0.138 [−0.255/−0.021]
Observations	2481	2481	1564
Controls:			
Employment and rural	No	Yes	No
Establishment Fixed Effect	No	No	Yes

Notes: Results from ordinary least squares regressions. See Table 1 for the definition of variables. 95% CI in brackets computed with standard errors corrected for heteroskedasticity and clustered at county level in columns (1)–(2).

with the English control group (−19%, −2%), due to 9.7% growth in sales in Northern England and a small 0.3% fall in Scotland.

Table 4 presents the effect of the ban on the number of customers. Column 1 presents the unadjusted coefficients. Scottish pubs had fewer customers compared with the pubs in the English control group. The number of customers increased by about 4% in both England and Scotland throughout the period of analysis. However, as a result of the ban, customers fell by about 10.6% in Scotland compared with England (95% CI −24% to 2%).

Column (2) presents the adjusted coefficients. Controlling for location and size of the establishment, Scottish pubs had on average 20% fewer customers before the ban. The effect of the ban was a 10.2% decrease in the number of customers in Scotland compared with England (95% CI −23% to 3%). Column 3 presents the results for the balanced sample, including establishment fixed effects. In these pubs, the effect of the ban was a 13.8% decrease ($P=0.02$) in the number of

customers, because of 10.2% growth in sales in Northern England compared with a 3.6% fall in Scotland. The 95% CI ranges from −26% to −2%.

Finally, we investigated whether the drop in sales and customers in Scotland could be explained by differences in pricing which may have been triggered by the ban. For that purpose, we first estimated models similar to those in Tables 3 and 4 but using the price of the best selling beer (in natural logarithms) as dependent variable. We reported these results in Table 5. In Columns (1), (2) and (3) we can see prices growing in England and Scotland by about 1.5% between the first and the second wave. However, we found that the coefficient for the interaction between Scotland and after the smoking ban is negligible (95% CI for these models lie between −0.05% and 1.5%). Second, we added the price of beer as a regressor to all the models estimated in Tables 3 and 4 and the impact of the ban on sales and customers were unchanged (results available upon request). We concluded that differences in pricing behaviour cannot explain our findings.

Table 5 Effect of ban on price of best selling beer

	Dependent variable: Log (price)		
	(1)	(2)	(3)
Scotland	0.015 [−0.014/0.044]	0.018 [−0.011/0.047]	–
After smoking ban	0.015 [0.009/0.022]	0.016 [0.009/0.022]	0.015 [0.008/0.022]
Scotland × after smoking ban	0.005 [−0.004/0.015]	0.004 [−0.005/0.014]	0.004 [−0.004/0.012]
Observations	2673	2673	1790
Controls:			
Employment and rural	No	Yes	No
Establishment fixed effect	No	No	Yes

Notes: Results from ordinary least squares regressions. See Table 1 for the definition of variables. 95% CI in brackets computed with standard errors corrected for heteroskedasticity and clustered at county level in columns (1)–(2).

Discussion

We used a quasi-experimental research design that compares the sales and number of customers in public houses located in Scotland before and after the Scottish smoking ban was introduced relative to a control group of establishments across the English border where no ban was imposed. To perform this analysis, we collected survey data by phone interviews using quota sampling. The use of survey data, in contrast to administrative data (e.g. tax receipts), to evaluate the economic impact of this policy has certain advantages. Firstly, it allowed us to assess the short term impact of this intervention which would have been more difficult to assess with tax receipts that are usually not reported monthly. Secondly, and most importantly, the use of survey data permitted us to understand some of the possible channels that may explain changes in turnover by giving us the opportunity to ask questions about customers, pub characteristics and prices of alcoholic drinks. Of course, there are also disadvantages. First, survey data is likely to be measured with more error than administrative data leading to more imprecise estimates. A second concern is that pub owners may be biased towards reporting negative results. Although, this notion can never be completely ruled out, our survey design attempted to minimize this possibility by: (i) collecting data before and after the survey (rather than relying in retrospective data post-introduction of the ban) and, (ii) by relegating

any direct question involving the publicans' view about the ban towards the end of the survey.

Previous findings on the economic effect of smoking bans on the hospitality business have mainly focussed on bans in the United States. These studies have mostly found no negative effects of such measures. In contrast, we find a negative and sizeable effect for Scottish pubs. This could be due to differences in the social use of pubs in Scotland compared with the United States. It also illustrates the limit of extrapolation of results from one country to another.

This study highlights the immediate or short-run impact of the smoking ban. This is in contrast to the studies cited above which investigate the effect over several years. Of course, it may be the case that in the longer run, pubs are able to attract different customers which might compensate for their initial loss of clients. This is an important topic for future research.

Conclusion

The smoking ban imposed on public houses in Scotland in March 2006 led to a short-run fall of similar magnitude in sales and customers after its imposition. The short-term impact of the ban therefore did not lead to more customers coming into pubs due to the smoke-free atmosphere and presumably did not lead smokers to spend more money on drink or food instead of smoking.

KEY MESSAGES

- The recent Scottish smoking ban had a negative impact on the pub industry, in the short run, as a consequence of a reduction in sales.
- The fall in sales partly occurred because of a drop in customers.
- Future research should address whether in the longer run pubs are able to attract different customers which might compensate their initial loss of clients.

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