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The effect of the United Kingdom smoking ban on alcohol spending: Evidence from the Living Costs and Food Survey

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ABSTRACT

The effect of smoking bans on alcohol consumption is unclear, and this is especially true of the differing effect on smokers and non-smokers. This paper uses spending survey data to examine the effect of the United Kingdom smoking bans on alcohol spending. It finds the introduction of a smoking ban decreased alcohol expenditure, specifically in the on-trade (pubs and restaurants) and amongst smoking households. Smoking households are estimated to have reduced their weekly on-premise alcohol expenditure by £1.70 (approximately 15–20%), whilst non-smoking households do not significantly change their expenditure. The smoking ban may therefore have affected on-premise outlets through a reduction in revenue. This study provides further evidence that tobacco policies affect drinking behaviour.

1. Introduction

Over 20% of deaths in the United Kingdom are attributed to alcohol and tobacco [1], and have been linked to various cancers and other conditions [2–7]. Tobacco and alcohol also have an interactive effect in terms of health, meaning that those who smoke and drink are at even greater risk of mortality and morbidity [8]. This is compounded by the fact that smoking and heavy drinking are clustered behaviours, in that drinkers are more likely to smoke than non-drinkers [9]. There is debate about whether tobacco and alcohol are complements or substitutes [10,11]. If they are complements, then a price rise of one will lead to a decrease in consumption of the other. Conversely if they are substitutes, then a price rise of one will lead to an increase in consumption of the other. The majority of policy has targeted tobacco and alcohol separately, for example taxation. A ban on indoor smoking may reduce the enjoyment of on-premise alcohol to smokers as they can no longer smoke and drink indoors at the same time, and thus lead to lower levels of on-premise alcohol consumption.

The Smoking, Health and Social Care (Scotland) Act 2005 led the way to a ban on smoking in enclosed public places in Scotland, including pubs and restaurants. The smoking ban was introduced in Scotland on March 26th 2006. This was followed by similar bans in Wales (April 2nd 2007), Northern Ireland (April 30th 2007), and England (July 1st 2007). There is existing research on the effect of smoking bans on smoking both generally [12,13] and in the United Kingdom specifically [14]. There is also evidence that smoking bans had an effect on hospital admissions [15,16], asthma rates [17], and life satisfaction [18,19].

There has been work examining the effect of smoking bans on alcohol consumption and expenditure, with mixed results. Some literature finds a negative effect. For example, Dunham and Marlow find that bar owners are more than twice as likely to predict losses following a smoking ba than restaurant owners [20]. Similarly, Hammar finds that restaurant owners in Sweden are more likely to expect a decrease in revenues the larger their share of smoking customers [21]. Picone et al review the effect of the tobacco settlement and smoking bans on alcohol consumption in the USA. They find that smoking bans reduce alcohol consumption, as well as finding cigarettes and alcohol are substitutes [22]. Pakko finds that casino revenue in Delaware reduced following the introduction of smoke-free laws [23]. Krauss et al find that a 1-point increase in smoke free air policy (on a 6-point scale) was associated with a 1.1% decrease in per-capita alcohol consumption [24]. Kvasnicka and Tauchmann find a moderate negative effect on on-premise alcohol sales following a smoking ban in Germany [25].

Other literature points to either a positive or mixed effect. Cowling and Bond examine the effect of smoke free laws in California and find that smoking bans increased revenues in bars and restaurants [26]. Pieroni et al find significant indirect effects of anti-smoking legislation on alcohol consumption, with particularly high increases in wine consumption, which they ascribe to increased consumption at home [27]. Cornelsen and Normand examine the effect of the Irish smoking ban on sales in bars and find that some bars experienced increased revenues whilst others saw decreases [28]. Cornelsen et al conduct a meta-analysis of the economic impact of smoking bans in restaurants and bars in several coun-

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Table 1
Summary Statistics.

£ (2001 prices)	Non-Smoking Households		Smoking Households	
	Before Ban	After Ban	Before Ban	After Ban
Full Sample				
Expenditure: All Alcohol	10.60	9.35	14.80	10.40
Expenditure: On-Premise	5.70	4.42	10.06	5.68
Expenditure: Off-Premise	4.90	4.92	4.74	4.73
June 2005 – June 2007				
Expenditure: All Alcohol	10.53	10.77	13.81	9.88
Expenditure: On-Premise	5.53	5.35	9.12	5.67
Expenditure: Off-Premise	5.00	5.42	4.69	4.22

tries and find no substantial gains and losses, although there are differential impacts according to business type [29]. Koksal and Wohlgenant find that smoking bans increase alcohol consumption in restaurants but decrease at-home drinking in the United States [30]. Finally, Pieroni and Salmasi find no significant effect on economic outcomes or employment following smoking bans in European countries [31].

This paper uses nationally-representative household-level expenditure survey data to examine the effect of the United Kingdom smoking bans on alcohol consumption. It exploits the difference in timing of the introduction of the smoking ban across the nations of the United Kingdom. The main contribution of this paper is that the dataset has the benefit of being able to distinguish between on-premise and off-premise expenditure to test for switching towards at-home drinking, and can distinguish between smoking and non-smoking households.

2. Methods and data

This paper uses data from the Living Costs and Food Survey 2001–2014, which is a nationally-representative repeat cross-sectional survey of household expenditure on all items including food and drink. This is captured via a two-week expenditure diary recorded by all adult members of the household. However, given that a household member may be purchasing food and drink for other members, this paper aggregates expenditure to the household level. The sample is roughly 6000 households per year. All expenditure variables are converted into January 2001 prices using the all-items inflation index provided by the Office for National Statistics. The expenditure diary records whether alcohol was purchased for consumption at home (off-premise) or away from home (on-premise). It also records the type of alcohol (beer, cider, wine, spirits, ready-to-drink). A list of codes of the products can be found in the appendix. This paper identifies smoking households as those who spend any money on tobacco products (cigarettes, cigars, pipe tobacco). The Living Costs and Food Survey also records information about the household including the make-up of the household (number of adults, number of children), the age of the oldest household member, total household expenditure, the region of residence (of which there are 12 in the United Kingdom), and the month the diary was completed. The latter two allow identification of whether a smoking ban was in operation during the diary period. Summary statistics for the sample are shown in Table 1.

The underlying model for this paper is shown in Equation 1.

Equation 1

$$Exp_{irt} = \alpha + \beta_1 SMOKER_{irt} + \beta_2 BAN_{rt} + \beta_3 (SMOKER_{irt} * BAN_{rt}) + \gamma_1 ADULTS_{irt} + \gamma_2 CHILDREN_{irt} + \gamma_3 AGE_{irt} + \gamma_4 TOTEXP_{irt} + \delta_r + \delta_t + \varepsilon_{irt}$$

Where subscripts i r and t denote household, region and time period respectively. X_{irt} is expenditure on alcohol in pounds sterling, $SMOKER_{irt}$ is a binary variable indicating that the household purchased tobacco, BAN_{rt} indicates that a smoking ban is in operation in the region and time period, and $SMOKER_{irt} * BAN_{rt}$ is the interaction of the two. $ADULTS_{irt}$ and $CHILDREN_{irt}$ are the number of adults and children in the household respectively, AGE_{irt} is the age of the oldest household member and $TOTEXP_{irt}$ is logged total household expenditure on all goods. δ_r is region fixed effect and δ_t is a year-month fixed effect to pick up any time effects. Finally ε_{irt} is an error term assumed to be normally distributed with a mean of zero. The main coefficients of interest are β_1 which indicates the differential alcohol expenditure between smoking and non-smoking households, β_2 which indicates the effect of the smoking ban on alcohol expenditure by all households, and β_3 which indicates the differential alcohol expenditure between smoking and non-smoking households following the introduction of a smoking ban. Robust standard errors are calculated, clustered at country level.

Two separate models are run; the first is for on-premise alcohol expenditure, and the second for off-premise alcohol expenditure. Given the findings in the literature, it is more likely that on-premise alcohol expenditure is more affected than off-premise alcohol expenditure because the smoking ban only applies to the on-premise setting. The modelling is done for both the whole sample period 2001–2014, and a reduced sample from June 2005 until June 2007 which is the month prior to the smoking ban introduction in England. The former allows for long-run effects of the smoking ban but is less precise as the results may be driven by other factors and there is no control group once England introduces the smoking ban. The latter model uses a difference-in-difference approach to get a causal result, albeit only able to capture the short-run effect.

3. Results

The results for the full sample are presented in Tables 2 and 3. The results show that smoking households spend on average £3.92 more in the on-premise compared to non-smoking households. The smoking ban increased on-premise expenditure in all households by £0.92, although this was not significant at the 5% level. However, following the smoking ban smoking households reduced their spending by £2.70 meaning a net reduction of £1.78. This means that smoking households significantly reduced their on-premise expenditure following the smoking ban, and non-smoking households did not significantly change their expenditure. No significant change is seen in off-premise alcohol expenditure following the smoking ban for either smoking or non-smoking households. Furthermore, these results are quite precise, and in particular rule out effects of the size of the on-premise effects.

The results for the reduced sample difference-in-difference approach are presented in Tables 4 and 5. They show similar results to the full sample model, with smoking households still spending more on average in the on-trade than non-smoking households. The net reduction in on-premise expenditure for smoking households is negative and significant, at £1.62. Non-smoking households are

Table 2
Full Sample On-Premise Expenditure.

	(1)	(2)	(3)
Smoking Household	4.36***	4.32***	3.92***
	(0.26)	(0.22)	(0.19)
Smoking Ban	−1.28**	1.09*	0.92
	(0.11)	(0.30)	(0.33)
Smoking Ban x Smoker	−3.10**	−3.09**	−2.70**
	(0.29)	(0.25)	(0.21)
Log Adults			2.83***
			(0.15)
Number of Children			−2.17***
			(0.06)
Age of Oldest Hhold Member			−0.07***
			(0.00)
Log Total Expenditure			4.40***
			(0.13)
Observations	85935	85935	85919
Region-Time Controls	No	Yes	Yes

Dependent variable £, deflated to 2001 prices. Robust standard errors in parentheses.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 3
Full Sample Off-Premise Expenditure.

	(1)	(2)	(3)
Smoking Household	−0.16	−0.12	0.20
	(0.10)	(0.14)	(0.11)
Smoking Ban	0.02	−0.25	−0.42
	(0.08)	(0.20)	(0.19)
Smoking Ban x Smoker	−0.04	−0.01	0.32
	(0.14)	(0.15)	(0.18)
Log Adults			−0.18**
			(0.03)
Number of Children			−0.36***
			(0.02)
Age of Oldest Hhold Member			0.06***
			(0.00)
Log Total Expenditure			4.17***
			(0.08)
Observations	85935	85935	85919
Region-Time Controls	No	Yes	Yes

Dependent variable £, deflated to 2001 prices. Robust standard errors in parentheses.
*$p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 4
Reduced Sample On-Premise Expenditure.

	(1)	(2)	(3)
Smoking Household	3.57***	3.60***	3.13***
	(0.20)	(0.19)	(0.19)
Smoking Ban	−0.14	1.24*	1.09
	(0.22)	(0.33)	(0.38)
Smoking Ban x Smoker	−2.86**	−2.97**	−2.71**
	(0.47)	(0.45)	(0.26)
Log Adults			3.33***
			(0.17)
Number of Children			−2.33***
			(0.06)
Age of Oldest Hhold Member			−0.08***
			(0.00)
Log Total Expenditure			4.34***
			(0.09)
Observations	20414	20414	20412
Region-Time Controls	No	Yes	Yes

Dependent variable £, deflated to 2001 prices. Robust standard errors in parentheses.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 5
Reduced Sample Off-Premise.

	(1)	(2)	(3)
Smoking Household	−0.29*	−0.26	0.09
	(0.08)	(0.12)	(0.05)
Smoking Ban	0.07	−0.14	−0.13
	(0.46)	(0.34)	(0.28)
Smoking Ban x Smoker	−0.47	−0.55	−0.57
	(0.52)	(0.62)	(0.46)
Log Adults			0.00
			(0.11)
Number of Children			−0.24**
			(0.02)
Age of Oldest Hhold Member			0.06**
			(0.01)
Log Total Expenditure			3.95***
			(0.14)
Observations	20414	20414	20412
Region-Time Controls	No	Yes	Yes

Dependent variable £, deflated to 2001 prices. Robust standard errors in parentheses.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

not seen to significantly increase their on-premise expenditure following a smoking ban. Again, there is no change to off-premise expenditure in the reduced sample model.

Further extensions of the work, including splitting the sample by total expenditure quartile, show similar results and are presented in the appendix.

4. Discussion

This paper shows that the UK smoking ban led to a decrease in alcohol expenditure, driven by a decrease in expenditure in the on-premise. This was wholly attributable to smoking households reducing their expenditure; no significant change was observed in alcohol expenditure for non-smoking households following a smoking ban.

However, the findings are not without their limitations. Firstly, there are issues with the survey itself in that there may be sampling and measurement error. The first should be satisfied through the large sample and the fact that the sample is nationally representative; the second is a larger concern given that households are known to under-record alcohol consumption and expenditure [32]. This is only a problem to the extent that the effect sizes will be larger if there is under-reporting, or if the degree of under-reporting is related to the introduction of a smoking ban. The former means that the results presented here are conservative estimates of the true effect of a smoking ban, whilst the latter means that the bias in direction of the results should be limited as there is no reason to believe that under-reporting is related to the smoking ban.

Another limitation is that the data is cross-sectional and cannot follow households. Those who stop purchasing tobacco after the introduction of a smoking ban, instead these (or similar households in later waves) as non-smoking households. There is no way of identifying households who previously purchased tobacco. Repeat cross-sectional survey data means that the issue of unobserved heterogeneity across households is not controlled for. Unfortunately, there is no panel data on UK alcohol expenditure.

Finally, the analysis is at household level. This is because individuals within households can purchase for one another, making individual-level data unreliable. However, this does mean that there may potentially be households containing a non-drinking smoker and a non-smoking drinker, and erroneously attribute changes in alcohol spending to the smoking ban. Keeping only single-adult households, who by definition cannot have intra-household transfers, is only possible with the full sample due to small sample size in the reduced period sample. The results,

presented in the appendix, show a similar pattern to the main results. None of these limitations are so severe that they cause the results to be unreliable, but are nevertheless worthy of consideration.

The findings sit alongside the other literature identified in the introduction section of this paper, which gave a mixed picture in terms of the effect of the introduction of a smoking ban on alcohol consumption and expenditure. The fact that some papers found no significant effect on bar revenues may be due to the fact that the size of the effect, a reduction in spending of around £1.70 per household per week, is small enough to be absorbed by bars. That said, there may be particular venues which saw larger reductions in revenue following the smoking ban which this paper cannot identify. For example, it is not possible to identify alcohol expenditure in bars compared to restaurants, where one might expect differential impacts.

The findings have implications for policy. The first implication is that on-premise venues observed a drop in revenues which can be attributed to the smoking ban. The second implication is that there may have been unintended consequences if this meant that smokers spent more time at home, such as an increase in passive smoking of children at home. The findings also have implications for future research, perhaps the most pressing of which is research on the impact of the smoking ban on expenditure in different venues or settings. There may also be underlying differences in the context of the drinking occasions arising from the introduction of a smoking ban which could be examined with richer data than that available in the Living Costs and Food Survey, for example if the number of drinking days changed.

5. Conclusion

The UK smoking ban led to a decrease in alcohol expenditure, specifically in the on-trade and amongst smoking households. Non-smoking households did not significantly change their expenditure following the introduction of a smoking ban. Although the smoking ban may have led to an increase in population health through a decrease in smoking and drinking, it led to a decrease in alcohol expenditure which will have particularly affected the on-premise sector in terms of revenue. Future research could examine the differential impact across venues, as well as the impact on other outcomes such as the number of drinking days. Tobacco and alcohol policies should not be evaluated in isolation, as these are joint behaviours and a change in policy affecting one behaviour will have effects on the other.

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Declaration of Competing Interest

Nothing to declare.

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.healthpol.2019.08.001.

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