Market Regulation and Firm Performance: The Case of Smoking Bans in the UK

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May 2009

Abstract

This paper analyzes the effects of a ban on smoking in public places upon firms and consumers. It presents a theoretical model and tests its predictions using unique data from before and after the introduction of smoking bans in the UK. Cigarette smoke is a public bad, and smokers and non-smokers differ in their valuation of smoke-free amenities. Consumer heterogeneity implies that the market equilibrium may result in too much uniformity, whereas social optimality requires a mix of smoking and non-smoking pubs (which can be operationalized via licensing). If the market equilibrium has almost all pubs permitting smoking (as is the case in the data) then a blanket ban reduces pub sales, profits, and consumer welfare. We collect survey data from public houses and find that the Scottish smoking ban (introduced in March 2006) reduced pub sales and harmed medium run profitability. An event study analysis of the stock market performance of pub-holding companies corroborates the negative effects of the smoking ban on firm performance.

JEL Codes: I18, H23, L51, L81
Keywords: regulation; smoking ban; market provision of quality; sales; prices; profitability; stock market performance.

Acknowledgements
Thanks to Mark Armstrong for helpful comments and to Audrey Stern, Michele Savini and Warn Nurpear for excellent research assistance. We also gratefully acknowledge financial help from the Nuffield Foundation and the ESRC (grant M544285003).

1. Introduction

This paper considers theoretical and empirical evidence on a form of market regulation that has come to widespread prominence in recent years, namely smoking bans. There is much public policy and media interest in these policies which have, in different forms and guises, been introduced in many countries. Indeed, the imposition of a ban on smoking in public places has often generated controversy and there are many advocates and opponents of such policies. The very fact that this subject is emotionally charged emphasizes the value of thinking carefully about what economic theory has to say about such bans and bringing together empirical evidence on the plausibility or otherwise of the predictions of this theory.

This paper develops an equilibrium model of public good provision by firms, allowing for heterogeneous valuation of smoke-free amenities between smokers and non smokers. While there is an extensive literature on the market provision of quality when consumers differ in their valuations of quality[1], there is little work examining this in a context where quality is a public good, and in a situation where all customers of the firm are constrained to consume the same quality level. An exception is the literature on the market provision of broadcasting where Anderson and Coate (2005) consider the question of whether there is excessive or too little advertising, while Armstrong (2005) also allows programme quality to be a choice variable. However, these papers assume that all consumers have identical evaluations of advertisements and quality.

In the context of smoking, the public good aspect and consumer heterogeneity in preferences regarding smoking appear to be central to the problem. Our model allows us to examine the appropriate form of optimal regulation and to study the welfare effect of a

[1] Recent contributions include Armstrong and Vickers (2001) and Rochet and Stole (2002).

smoking ban. We show that market equilibrium results in uniformity of amenity choice, and that this may not be optimal from a welfare standpoint. The optimal policy response is to ensure that some pubs are permitted to allow smoking while others are not. In the real world, this could be operationalized, for example, via a licensing policy. We derive from the model a set of empirical predictions regarding sales, prices and profitability, which we test using data on public houses that we collected before and after the introduction of a smoking ban in Scotland in March 2006.

Previous empirical research on smoking bans has examined the effects on firm performance.[2] Some of this exploits only cross-sectional variation or time-series variation in policy (see, for instance, Alamar and Glantz, 2004, or Cowling and Bond, 2005). Our study improves upon this by carrying out a before-after analysis methodology using English pubs located just south of the Scottish border as a control group, thereby facilitating a proper difference-in-difference approach, which is able to eliminate both time and regional confounders. Another strand of this literature has mostly exploited local changes in smoking regulation at county or city level in the United States (see Sciacca and Ratliff, 1998, Bartosch and Pope, 1999, 2002 and Hyland et al, 2000).[3] In contrast, the empirical part of our study exploits the advent of a total ban across an entire region. One can argue that the implementation of smoking bans at city level is not an exogenous event, as the hospitality industry is likely to have local political power to influence such a policy. Finally, and in an exercise not considered in the existing literature, we corroborate and extend our micro-data results by using data on share values of pub holding companies. We investigate how the

[2] See for instance the references in the survey by Scollo et al (2006).
[3] One notable exception is Adams and Cotti (2007) who investigate the effect of smoking bans across American states and time on employment in bars and restaurants.

announcement of smoking bans affected the stock market performance of firms by looking at market returns in an event study analysis of announcements of the introduction and implementation of smoking bans.

Our empirical results can be briefly summarized as follows. The comprehensive ban on smoking in Scottish public houses resulted in sales falling by about 10% relative to English pubs across the border. On the other hand, prices were largely unresponsive. There was also a fall in profitability ranging from 2 to 4% in the medium run. The fall in profitability is also corroborated using stock market performance data where we find significant announcement effects of the ban upon the share price of pub holding companies. Thus overall the results are in line with the predictions of the model and show that the smoking bans led to a significant worsening of the economic performance of public houses.

The rest of the paper is structured as follows. Section 2 briefly describes the institutional setting, including the widespread introduction of smoking bans in public places, and then focuses on the particular ban on which our empirical analysis is based. Section 3 sets out a theoretical model where a smoking ban is introduced in the context of competition between pubs. Section 4 presents empirical evidence on the impact of smoking bans on firm performance, first looking at the effects on sales, prices and profitability, then reporting the outcome from the stock market valuation event study. Section 5 concludes.

2. Institutional Setting

International Picture

Smoking bans have been introduced in a number of countries across the globe. The nature and extent of these bans, as of 2008, are shown in Figure 1. The Figure makes it clear

that the vast majority of bans were introduced in the five years up to 2008. The heterogeneous nature of bans is also evident from the Figure. For example several countries, and some American states (or counties), have introduced total bans in bars and restaurants, while other countries have opted for partial bans or smoking designated areas. About a quarter of the world population now live under bans that prevent smoking in bars and restaurants, although there is heterogeneity in how these bans are enforced.

The Scottish Smoking Ban

Most of the empirical analysis reported in this paper focuses upon the introduction of the Scottish smoking ban of 2006 and evaluates its impact upon pub economic performance. Identification of an effect of bans comes from an empirical analysis of performance of Scottish pubs before and after ban introduction relative to what happened in English pubs at the same time (where no ban was in place).[4]

The historical context of the Scottish ban, and the fact that Scotland could introduce a ban when other parts of the UK did not, came about because of devolution of decision making across the nations of the UK. The formation of the Scottish Parliament and Executive to administer Scottish affairs in 1999 allowed Scotland to create anti-tobacco legislation independently of the rest of the UK.

Before 2004 the Scottish Executive view was that legislation to ban smoking in bars and restaurants was a last resort. In 2000, the hospitality industry had signed up a Scottish Executive charter designed to encourage smoke-free policies, including better ventilation and prominently displayed official stickers outlining the establishment's smoking policy. The

[4] For a more detailed history of the Scottish and English smoking bans we refer the reader to the Appendix 1 of the paper.

idea was to rely on the voluntary approach as much as possible. However, on March 26 2006 Scotland became the first region of the United Kingdom to ban smoking in public places, following a vote that took place a year earlier. England also introduced a smoking ban in all restaurants and pubs on July 1 2007, again following much debate and controversy.

3. Theory

"… it would be commercial suicide for a pub company to prohibit smoking in the absence of a nationwide ban by the government. Going it alone, in my opinion, is not a viable option in the pub world."

Tim Martin –Founder JD Wetherspoon UK pub chain, 7 April 2004

The Model

We now set out a simple model where pubs compete by choosing amenity provision and prices. Our purpose in setting out this model is two-fold. First, we would like to examine how the unregulated market behaves, and whether it ensures the appropriate provision of smoking versus non-smoking pubs, as compared to the social optimum. This also enables us to examine what forms of regulation or intervention may be appropriate, and specifically, whether a ban on smoking in pubs can be welfare improving. Our second purpose is to derive empirical predictions from the model, in terms of the effects of the smoking ban upon various aspects of pub economic performance, in particular sales, prices and profitability.

Our model is intended to capture the following features. First, cigarette smoke has a large public good element, in the sense that if a pub permits customers to smoke, this can

have an adverse effect on non smokers (or on smokers who have quit, who may be tempted to smoke again). Conversely, if a pub prohibits smoking, this has an adverse effect upon die-hard smokers, who have no desire to quit. While pubs may be able to choose a mix of smoking and non-smoking rooms, the heart of the problem appears to be the fact that facilities cannot be tailored so as to perfectly satisfy both types of consumer, so that the public good element remains.[5] We shall therefore simplify and adopt a binary specification, where each pub must choose either to permit smoking or to prohibit it – the main qualitative conclusions of the model also obtain in a more general specification. Second, consumers are heterogeneous in the valuation of this amenity. Non-smokers dislike cigarette smoke, and may also differ in the intensity of their preferences in this dimension. Smokers prefer a smoking pub, and here again, one can allow the intensity of smoking preferences to vary. Finally, we shall also allow for an element of horizontal differentiation, so that consumers prefer to frequent a pub that is located "close" to them, where closeness may have a geographical element but may also refer to other characteristics of the pub. This enables a pub to have an element of market power over and above that arising from possible differences in amenity choice.

More specifically, the model we have in mind is a modification of the Salop model, allowing amenity choice. Consumers are uniformly distributed on the circle, and we have several pubs also located on the circle, each pub being equidistant from its two neighbors. Each pub has to choose whether to be smoking or non-smoking, and pubs then compete by choosing prices. Since our focus is on amenity choice, we keep the number of pubs fixed. In

[5] This could be due to the cost of sub-dividing rooms finely, and also due to random variations in the proportions of smokers/non-smokers over time.

consequence, the conclusions of our model will be formally identical to those derived from a simpler Hotelling model of competition between two pubs located at the end- points of the unit interval. Let pub *A* be located at *0*, and let pub *B* be located at *1*.

Consumers differ in three distinct dimensions. First, they differ in location, being uniformly distributed on the interval *[0, 1]*, so that some are close to pub *A* while others are close to pub *B.* Any consumer incurs a "transport cost" *t* per unit distance travelled. Second, they differ in smoking preferences: some are smokers and get a positive benefit from being able to smoke in the pub, while non-smokers incur a disutility from being exposed to tobacco smoke. To model this, let the set of types of smoking preferences be indexed by the elements of the set *{1, 2, ..., n}* and let u_i denote the additional benefit that a consumer of type *i* gets from the pub being a smoking one. For a smoker, $u_i>0$, while for a non-smoker, $u_i<0$. One may also allow for a third type, "reformed smokers", who have quit but have a self-control problem. These would prefer a non-smoking pub, so as to be able to commit not to smoke. The ex-ante self of such a type would also have $u_i<0$, although the ex-post self gets positive benefit from smoking. Our positive analysis applies to such types -- the interpretation being that the choice would be made on the value of u_i for the ex-ante self rather than the ex-post self.

Our analysis can also be applied where the decision to go to the pub is taken by a group of individuals. As long as group decision making is efficient, in the sense that the choice between pubs is made to maximize the sum of individual utilities over the group, our analysis continues to apply.[6] Finally, we will also want to enrich our model by having

[6] It is possible, of course, that group decision making is based on majority rule, in which case it would be inefficient, but this question is somewhat orthogonal to the concerns of this paper.

consumers with different intrinsic valuations for pub going - high valuation consumers will always patronize one pub or the other, low valuation consumers may choose not to go to any pub, in order to capture effects of the ban on sales. However, for the moment, let us restrict attention to high valuation consumers so as to simplify the exposition. Let λ_{iH} be the measure of consumers who have a high valuation and are of type i in terms of their valuation of smoking. Abstracting from transport costs, such a consumer enjoys a payoff v_H from patronizing a non smoking pub, and a payoff of $v_H + u_i$ from patronizing a smoking pub. Let us normalize to unity the total number of consumers, i.e. $\sum_{i=1}^{n} \lambda_{iH} = 1$.

Our model is related to models of quality choice with horizontal differentiation and heterogeneous quality preferences such as Armstrong and Vickers (2001) or Rochet and Stole (2002). These oligopolistic screening models allow qualities to be tailored to individual quality preferences. This is not possible in our context - the public good element implies that pubs must offer a single quality to all consumers. Anderson and Coate (2005) and Armstrong (2005) study the market provision for broadcasting, where the public good element also applies. Anderson and Coate focus on the incidence of advertising, which has a nuisance value to consumers. They assume that consumers have the same disutility from advertising. Armstrong allows broadcasters to choose program quality, and assumes that consumers have homogenous valuations for quality. He shows that if broadcasters can charge the appropriate prices, then quality provision is optimal.

Our first aim is to examine the market provision of smoking versus non-smoking pubs, and to examine its efficiency properties. We model competition between pubs via the following extensive form game. First, both pubs simultaneously choose whether to be

smoking or non-smoking. They then observe each other's choices and choose a price. Consumers then choose which, if any, of the pubs to patronize.

Suppose that both pubs choose the same policy, i.e. either both of them permit smoking or both of them do not permit smoking. In this case, the pricing equilibrium is standard, and well known. Let us measure prices net of marginal costs, which are assumed to be constant. Both pubs will charge a price equal to *t*; and serve half the consumers. Profits in each pub will therefore be *t/2*. On the other hand, suppose that smoking in pubs is banned by the government. Again, the equilibrium prices will be *t* and profits will equal *t/2*. Thus, firms are equally well under either pair of symmetric policies; as we shall see, consumers will, in general, prefer one of these symmetric equilibria.

Let us now consider the incentives of an individual pub to introduce a voluntary ban, when there is no government regulation. Without loss of generality, assume that firm *B* has no restriction on smoking, while *A* introduces a no-smoking policy. Consider consumers of type *i,* who get a benefit u_i from smoking. When the two pubs adopt different policies, we shall assume that there is sufficient horizontal differentiation (i.e. the parameter *t* is sufficiently large), so that for all relevant price profiles, the consumer of any smoking preference type who is indifferent between the two firms belongs to the interior of the unit interval. $x_{ih} \in (0,1)$ for all values of u_i, and for the relevant equilibrium prices.[7] The marginal consumer of type *iH* who is indifferent between patronizing the two pubs is given by

$$x_{iH} = \frac{1}{2} + \frac{p_B - p_A - u_i}{2t}.$$

[7] If *t* is so small that *A* gets all the non-smokers and *B* all the smokers when prices are equal, then a pure strategy equilibrium will not, in general, exist. The pricing equilibrium in this case must be in mixed strategies and necessarily inefficient. Thus efficiency is not ensured even if horizontal differentiation is small.

Aggregating across all the types, total demand for pub *A*, as a function of prices is given by

$$D_A = \sum_{i=1}^{n} \lambda_{iH} \left(\frac{1}{2} + \frac{p_B - p_A - u_i}{2t} \right) = \frac{1}{2} + \frac{p_B - p_A - \theta_H}{2t},$$

where θ_H denotes the "average" valuation of smoking in the (high valuation) population:

$$\theta_H = \sum_{i=1}^{n} \lambda_{iH} u_i$$

Profits are given by $\Pi_A = p_A D_A$. From the first order condition for profit maximization, pub *A*'s best response, as a function of pub *B*'s price is given by

$$p_A = \frac{t + p_B - \theta_H}{2}.$$

Similarly, the best response for pub *B*, that does not restrict smoking, is given by

$$p_B = \frac{t + p_A + \theta_H}{2}.$$

Nash equilibrium prices are given by

$$p_A^* = t - \frac{\theta_H}{3},$$
$$p_B^* = t + \frac{\theta_H}{3}.$$

Equilibrium profits are given by

$$\Pi_A^* = \frac{(3t - \theta_H)^2}{18t},$$
$$\Pi_B^* = \frac{(3t + \theta_H)^2}{18t}.$$

Recall that profits equal *t/2* when both firms follow the same policy regarding smoking. We see therefore that pub *A*'s profits are greater when it unilaterally prohibits smoking as compared to its profits when both pubs permit smoking if and only if $\theta_H < 0$. Conversely, if *A*

permits smoking, then it is strictly better for B to prohibit it if and only if $\theta_H > 0$. We have therefore proved the following proposition.

Proposition 1 If $\theta_H < 0$ the unique equilibrium has both pubs permitting smoking. If $\theta_H > 0$ the unique equilibrium has both pubs restricting smoking.

To summarize, market equilibrium results in uniformity of amenity choice, since each pub seeks to cater to the "average" consumer where the average depends upon the weighted utility gain from smoking. If the average consumer is a smoker, then pubs will uniformly permit smoking.

Welfare

We now consider the welfare implications of partial restriction on smoking imposed by one of the pubs. Our welfare criterion is utilitarian, i.e. it equals the sum of consumer and producer surpluses. This is equivalent to the sum of type-dependent utilities from smoking (which may be negative), minus total transport costs. Our main finding is that if θ_H is close to zero, then it is optimal to have diversity in pub policies where one pub restricts smoking and the other does not. That is, the equilibrium provision of amenities will result in too much uniformity relative to the social optimum.

Before we proceed, we note that our welfare calculations refer to the consumer's own valuation u_i; on the basis of which he or she makes a decision regarding which pub to patronize. This has two implications. First, this is clearly a non-paternalistic welfare evaluation. Second, this makes a difference when there is a difference between the utilities of

the ex-ante and ex-post selves of the consumer - our welfare calculation utilizes the utility of the ex-ante self, since it is this self that makes the decision regarding which pub to patronize. This is relevant when we consider potential smokers with a self control problem, since we are assigning weight to their preference for self control, rather than their desire to yield to temptation.

Consider first welfare when both pubs permit smoking. Since prices are equal, consumers patronize whichever pub is closer, and welfare equals

$$W_{SS} = -t\left(\int_0^{0.5} x dx + \int_{0.5}^{1} (1-x)dx\right) + \sum_{i=1}^{n} \lambda_{iH} u_i = -0.25t + \theta_H .$$

On the other hand, when both pubs restrict smoking,

$$W_{NN} = -t\left(\int_0^{0.5} x dx + \int_{0.5}^{1} (1-x)dx\right) = -0.25t.$$

Notice that $W_{SS} > W_{NN}$ if $\theta_H > 0$ and $W_{SS} < W_{NN}$ if $\theta_H < 0$. That is, the market chooses the better of the uniform symmetric policies.

Finally consider the case where pub *A* restricts smoking while pub *B* does not. Given that we have shown that this is not an equilibrium outcome, one needs to specify how this asymmetric outcome comes about. One possibility is that the social planner dictates this outcome, and also optimally allocates individual consumers to the firm, so as to maximize the consumer's utility from the amenity minus his transport costs. This can be implemented in a decentralized fashion by price regulation decreeing that both pubs charge the same price, in which case consumers will allocate themselves to pubs in a welfare optimal way. In this case, "first-best" welfare is given by

$$W_{NS}^{FB} = \sum_{i=1}^{n} \lambda_{iH} u_i \left[-t \left(\int_{0}^{\frac{t-u_i}{2t}} x dx + t \int_{\frac{t-u_i}{2t}}^{1} (1-x) dx \right) + \left(\frac{t+u_i}{2t} \right) u_i \right] = -0.25t + \frac{\theta_H}{2} + \sum_{i=1}^{n} \lambda_{iH} u_i^{\,2}.$$

If regulation takes the form of dictating diversity in amenity provision (e.g. via licensing) without regulating prices, then equilibrium prices will be different across the two pubs. The equilibrium allocation of consumers to pubs will not be optimal. In equilibrium, the marginal type of the consumer of type *Hi* is given by

$$x_{iH}^{*} = \frac{1}{2} + \frac{2\theta_H - 3u_i}{6t}$$

$$W_{NS}^{SB} = -t \sum_{i=1}^{n} \lambda_{iH} u_i \left[-t \left(\int_{0}^{x_{iH}^{*}} x dx - t \int_{x_{iH}^{*}}^{1} (1-x) dx \right) + \left(\frac{1}{2} + \frac{u_i - 2\theta_H}{2t} \right) u_i \right].$$

While this expression is algebraically messy, we provide a simple proof, based on revealed preference arguments, that a diversity of policies is welfare improving provided that there is heterogeneity of smoking preferences in the population and if θ_H is close to zero. We shall say that smoking preferences satisfy *minimal heterogeneity* if the following condition is satisfied: there is a strictly positive lower bound on the mass of consumers belonging to types *i* such that $u_{iH} \geq \underline{u} > 0$ and there is strictly positive lower bound on the mass of consumers belonging to types *i* such that $u_{iH} \leq \underline{u} < 0$.

We shall now show that if there is minimal heterogeneity of smoking preferences, then second best welfare is strictly greater if one pub permits smoking while the other does not. Since first best welfare under diversity is greater than second best welfare, this is also greater than under uniformity of policies. Let pub *A* restricts smoking while *B* permits it and suppose that $\theta_H = 0$. In this case the equilibrium has equal prices for both firms. Now

suppose that we allocate all consumers to the left of the midpoint of the unit interval to firm *A*, and all consumers to the right of the midpoint to firm *B*. This allocation of consumers has the same aggregate welfare as W_{SS} or W_{NN} since $\theta_H = 0$. Now consider moving from this allocation to one where consumers freely choose. Smokers close to the midpoint will choose *B*, while non smokers close to the midpoint will choose *A*. Since the utility of each switcher increases, overall welfare must increase, and this increase must be bounded below by a number that is strictly greater than zero, since there is minimal heterogeneity of smoking preferences. That is, $W_{NS} > W_{NN} + b = W_{SS} + b$, with $b > 0$ when $\theta_H = 0$. Since equilibrium prices and welfare are continuous functions of θ_H, this implies that $W_{NS} > max\{W_{NN}, W_{SS}\}$ for θ_H close to zero provided that we retain minimal heterogeneity as θ_H varies. We have therefore proved the following proposition.

Proposition 2 Suppose that smoking preferences satisfy minimal heterogeneity. If θ_H is sufficiently close to zero, then the welfare optimal allocation has one pub permitting smoking while the other pub does not.

We see therefore that the market may not provide an optimal choice of amenities, since it results in excessive uniformity. While welfare maximization requires a diversity of pub policies, with one pub prohibiting smoking and the other permitting it (if θ_H is not too large in absolute magnitude), the equilibrium provision implies either that both pubs allow smoking (if $\theta_H > 0$) or both prohibiting it (if $\theta_H < 0$). Some intuition for the inefficiency is

as follows. If $\theta_H < 0$ then a pub which prohibits smoking increases the utility of non-smokers while reducing that of smokers who are located closer to it. If it were able to charge the non-smokers higher prices, while at the same time reducing the prices it charges smokers, then it could appropriate some of the gains in utility it induces by the switch in policy. Indeed, if it could perfectly price discriminate - i.e. charge different consumers different prices depending upon their smoking preferences and location, then it is generally true that the welfare optimal allocation of amenities would be an equilibrium (see, for example, Bhaskar and To, 2004). In this context, it can be verified that even if pubs were able to discriminate between smokers and non-smokers and charge them different prices (for the same product), then one would have an efficient allocation. However, it is hard to see how a pub could implement such a policy, since a smoker in a non-smoking pub could easily pretend to be a non-smoker, and vice-versa.

Heterogeneity of policies can easily be implemented if the government auctions a license which would permit a pub to allow smoking (assuming that $\theta_H > 0$). Suppose that the government conducts an auction (either a first price or a second price auction) for a single license. Since the difference in firm profits between a smoking pub and non-smoking pub equals $\frac{2}{3}\theta_H$, both pubs will bid this amount and the license will be randomly allocated to one of them. Now suppose that the government distributes $\frac{1}{3}\theta_H$ to each of the pubs (independent of bids in the auction). It can be verified that both pubs will be better off, since their total income equals $\frac{t}{2}+\frac{\theta_H^2}{18t}$ which is greater than revenues where both permit smoking.

We have adopted a simple specification of amenity choice, where a pub can only choose to permit smoking or to disallow it. However our results extend to a more general model, where a pub has more general choices available to it. Specifically, we may consider a model where each pub must choose "quality" q from some set, and where associated with each q there is a marginal cost of provision, $c(q)$. Consumers differ in their evaluation of these quality levels. Under similar conditions that in the present model (i.e. provided transport costs are sufficiently high), one may show that the market equilibrium will be symmetric, with both pubs offering the same quality, which maximizes the surplus of the average consumer, i.e. the average valuation of quality minus the cost of provision. However, welfare optimality will require that the two pubs provide distinct qualities, as long as preferences are minimally heterogeneous.

Our analysis can also be applied to consider the preferences of workers regarding the smoking environment. Suppose that non-smokers suffer disutility from working in a smoking environment, while smokers do not mind (or prefer such an environment). Thus, non-smokers would demand a compensating differential for working in a smoking environment. Here again, the optimal allocation would require diversity, with some pubs permitting smoking while others do not, whereas the equilibrium allocation implies uniformity of policies.

Observational effects of a smoking ban

We now consider the effects of a government imposed smoking ban upon sales, prices and profits. To do this, we need to allow for some elasticity of demand - with only high valuation consumers, as we have considered so far, industry sales are necessarily invariant. Let v_L be the valuation of a low valuation customer, which is assumed to be sufficiently small that such a consumer at the midpoint patronizes neither pub. Let low valuation consumers get

utility $u_i, i \in \{1,2,...,n\}$ from smoking, and let λ_{iL} be the measure of low valuation consumers of type *i*.

Consider first the case where both firms follow the same amenity policy *q*. Let $\mathrm{I}(q)$ be an indicator variable that takes value one if $q = S$, i.e. if smoking is permitted. Let $x_{iL}, i \in \{1,2,...,n\}$ denote pub *A*'s marginal low valuation consumer with smoking preference u_i:

$$x_{iL}(q) = \frac{\upsilon_L + \mathrm{I}(q)u_i - p_A}{t}.$$

From this equation we can infer the direct effect of a smoking ban upon demand, abstracting from any price effects. A smoking ban reduces the number of low valuation consumers by

$$\frac{1}{t}\sum_{i=1}^{n} \lambda_{iL} u_i = \frac{\mu_L \theta_L}{t},$$

where θ_L denotes the average valuation of smoking by low valuation consumers in the population, and θ_L is the measure of low valuation consumers in the population (recall that the measure of high valuation consumers has been normalized to one). Thus, if average valuation of smoking among low valuation consumers is similar to (or greater than) the average valuation of smoking among high valuation consumers, then the effect of smoking ban will be to reduce pub sales if it is introduced in a situation where pubs are opting not to restrict smoking. This direct effect will be partially mitigated by fact that prices may fall somewhat, but this indirect effect will be small relative to the direct effect.

To see the effect on prices, note that total demand is given by

$$D_A(S,S,p_A,p_B) = \sum_{i=1}^{n} \lambda_{iL} x_{iL}(S) + \sum_{i=1}^{n} \frac{t + p_B - p_A}{2t}$$

From the first order condition for price setting, $D_A + p_A D_A^{'} = 0$, we get pub *A*'s best response as a function of pub *B*'s price. Solving for the unique symmetric equilibrium, for the case where both pubs permit smoking, and where both pubs restrict it, we get

$$p^*(S,S) = \frac{2\mu_L(\upsilon_L + \theta_L) + t}{1 + 4\mu_L},$$
$$p^*(N,N) = \frac{2\mu_L\upsilon_L + t}{1 + 4\mu_L}$$

Thus, the effect of a smoking ban upon prices is given by

$$\Delta p^* = p^*(N,N) - p^*(S,S) = -\frac{2\mu_L\theta_L}{1 + 4\mu_L}$$

The policy impact on prices depends upon the sign of θ_L; i.e. the same parameter as that which determines the direct effect on sales. If θ_L is positive, then the price goes down with a smoking ban.

The overall equilibrium effect on sales is given by

$$\Delta D^* = D^*(N,N) - D^*(S,S) = -\frac{\mu_L\theta_L}{t}\left(\frac{1 + 2\mu_L}{1 + 4\mu_L}\right).$$

That is, the effect on sales has the same sign as the direct effect, though it is partially dampened by the price effect. If the proportion of high valuation consumers is high, then the dampening will be small. We therefore have the following proposition:

Proposition 3 Suppose that smoking preferences are such that pubs uniformly permit smoking in unregulated equilibrium. Then a smoking ban reduces sales, profits and prices.

To date our analysis has assumed that pubs choose prices. Alternatively, we may allow for the possibility that they are boundedly rational, and follow simple pricing rules, such as charging a fixed mark-up of costs. In this case, there will obviously be no price effects, and the demand effects of a smoking ban will be accentuated.

Importantly our welfare result in proposition 2 is robust to the introduction of low valuation consumers, i.e. the same argument applies. That is, one can show that if there is minimal heterogeneity of smoking preferences, then welfare is strictly greater when one pub permits smoking and the other restricts it, provided that θ_H and θ_L are sufficiently small in absolute magnitude.[8]

4. Empirical Analysis

We now turn to our empirical findings and address the extent to which they are in line with the predictions of the model set out in the previous section. We draw on two sources of evidence. First, based upon the Scottish smoking ban, we use micro data on sales, prices and profitability of pubs which was collected for this study. Second, we use time-series evidence on share prices of companies affected by the bans in Scotland and England to investigate the long-term effects on pub performance.

Data Collection – The Scottish Smoking Ban

[8] If $\theta_L = \theta_H = 0$, then $W_{SS} = W_{NN}$. Now if pub *A* does not permit smoking and pub *B* does it, and if consumers to the left of the midpoint are allocated to pub *A* and those on the right to *B*, then welfare equals W_{SS}. If consumers are now permit to choose pubs freely, then high valuation consumers close to the midpoint would choose between pubs on the basis of their smoking preferences, so that welfare must increase, and this will be true as long as θ_H and θ_L are close to zero.

We collected data on public houses in Scotland before and after ban introduction and, so as to define a control group of pubs unaffected by the ban, in Northern England (Cleveland, County Durham, Cumbria, North Yorkshire, Northumberland and Tyne and Wear). This was done both from phone and postal surveys. In July 2005 we obtained a list of public houses from Experian, a company which compiles a comprehensive and up to date database of establishments. For each country, we divided the list in 8 random samples further stratified by the number of employees in the site.[9] In September 2005 we started mailing questionnaires the first Monday of every month for eight months.[10]

On average, the survey took about 15 minutes to complete and respondents were provided with a pre-paid envelope to return their answers. In the first wave, we posted 2608 questionnaires to pubs in England and 3146 questionnaires to pubs in Scotland. In July 2006, we obtained an updated sample and on September 2006 we started mailing a new set of questionnaires (2500 to England and 3071 to Scotland). Establishments that were in the initial sample were contacted in the same month than in the first wave and the new establishments in the sample were allocated to 8 random groups as in the previous wave.

The postal survey was well suited to capture the medium run effects of the ban. However, we were concerned about the representativeness of the sample when looking at the short run effect of the ban, as we have fewer observations shortly before and after the ban. Therefore, we also decided to carry out a 10 minutes telephone survey in the period just before and after the ban came into place. Establishments were contacted before the ban in the weeks from February 24 to March 10 and data was collected again for a second wave, after

[9] This information was provided with the list of public houses.
[10] The last set of questionnaires was mailed on April 2006 but all the questions refer to economic activity on the previous month.

the ban was imposed in Scotland, from May 3 to May 31. Ipsos MORI, a company that specializes in opinion polls and market survey data, did the survey for us. The interviews were obtained from a similar, but updated, sampling frame used for the postal survey. The sampling relied on quotas based on location (rural versus 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 theses quotas, the pubs were selected at random until the desired sample sizes were achieved. In the second wave, an effort was made to re-contact the establishments who responded in the first wave.

The questionnaires in both surveys were designed to obtain general information about the establishment (for example: ownership status, establishment capacity, availability of outdoor space) and business outcomes such as sales, profit margins, and the price of beer.[11] Given the different sampling methods and that there were differences in the design of the questionnaire we decided to analyze both surveys separately. We interpret the evidence from the phone survey as informing the short run and the evidence from the postal survey as picking up a medium run effect.

Descriptive Analysis

Table 1 shows summary statistics for both samples of public houses. The samples are labelled respectively as 'Short Run / Phone Survey' and 'Medium Run / Postal Survey'. Columns (1) to (4) of the Table refer to the phone survey, where we obtained a total of 1134 interviews in England and 1590 in Scotland. In our sample frame of Scottish (English) pubs, 22% (31%) employ 0 to 3 individuals, 44% (35%) employ 4 to 9 individuals, and 33% (34%) employ more than 10 individuals. Because of the sampling methodology the sample is

[11] The questionnaires are available from the authors on request.

representative of the population of pubs in Scotland and Northern England. Columns (5) to (8) refer to the postal survey. In this case we obtained 528 replies in England and 728 in Scotland, corresponding to a response rate of around 11 percent. Comparing with the phone survey, which is representative of our sampling population, the sample from the postal survey tends to under represent pubs that employ more than 10 people. Also, the sample obtained in the postal survey after the ban has a larger share of bigger pubs than the before sample both in England and Scotland[12].

In both surveys we asked the question 'What is the maximum number of customers that this establishment can accommodate at any given time?' Responses to this question reveal pubs in England to be larger than in Scotland. According to the phone survey, they accommodate on average a maximum of 202 people in England and 166 in Scotland. We find that both in England and Scotland the maximum capacity of the establishments in the postal survey is on average smaller than in the phone survey, reflecting the under-representation of the bigger pubs in the former. Also, in the postal survey, there is a statistically significant difference of 20 people comparing England and Scotland before and after the ban. In principle, this can be a behavioral response to the smoking ban. However, we find no change in reported employment size between the sampling frames used to mail the questionnaires before and after the ban which makes unlikely that the capacity of the pubs could have changed in England with respect to Scotland over this period of time. In the empirical section, we present results that control for these differences by conditioning on establishment

[12]However, the shares in the different employment categories do not change significantly between the two sampling frames.

capacity and we also focus on set of pubs that appear before and after the ban. We return to these points when we discuss our empirical specification in the next section.

We asked in both surveys whether smoking was allowed in the establishment before the ban both in Northern England and Scotland and only in Northern England after the ban. As our theoretical model predicts there is practically no differentiation in terms of this factor before the smoking ban. All of the establishments allowed smoking before the ban, thus our model implies a fall in sales, prices and profits after the introduction of the smoking ban[13].

In the phone survey we asked: "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?" In the short run, we find that on average sales are slightly bigger in Scotland than in England. Comparing the sales before and after the ban there is growth in sales both in England and Scotland. However, and importantly for our empirical analysis, sales in England grow faster than in Scotland.

In the postal survey we asked separate questions for the sales of alcohol and food: "In the past calendar month, what was your monthly turnover for the sale of alcoholic drinks (beer, wine, alcopop, etc)?" and "In the past calendar month, what was your monthly turnover for the sale of food, soft drinks, coffee/tea and packet snacks (crisps, etc)?" In columns (5)-(8) we present the sum of these two answers divided by 4.25 in order to ensure comparability with the phone survey answers.[14] Sales fall in Scotland from an average of 5544 pounds before the ban to 4893 pounds and in the English sample they increase from 4304 pounds to 5263 pounds. The trends in sales are similar if we focus only on the sales of alcoholic drinks.

[13] After the ban, Scottish pubs could not allow smoking and the proportion of public houses that allow smoking in England was between 92 and 95 percent.

[14] Measurement error generated in the dividing by 4.25 is not of any practical concern as we model the logarithm of sales in our empirical analysis.

Apart from pub sales the other key outcome in the theoretical model is prices. In a practical sense whilst pub landlords can use a number of instruments to attract customers and increase revenue, it is the price of beer that is the most salient. We asked our interviewees in the postal survey: "In the past calendar month, which was the price of a pint of your best selling beer?"[15] According to the responses, as shown in Table 1, the price of a pint of beer is between 4 and 10 pence higher in Scotland than in England and interestingly with prices increasing over time before and after the introduction of the Scottish ban in both England and Scotland.

Empirical Strategy

We study the effect of banning smoking in public places on public house sales and prices in pubs in Scotland before and after the ban was introduced relative to establishments across the English border where no ban was imposed during the period of our study. For this purpose, we use the observational data on public houses that we collected before and after the imposition of the ban through postal and phone surveys.

The objective of the statistical analysis is to estimate the causal effect of the smoking ban on sales and prices of public houses. For this purpose we rely on a differences-in-differences strategy where we estimate the following model:

$$Y_{pct} = \alpha + \beta[\text{AfterXScotland}]_{ct} + \lambda \text{After}_t + \delta \text{Scotland}_c + \theta X_{pct} + \varepsilon_{pct}$$

where Y_{pct} is the economic outcome of interest (in the initial analysis the Logarithm of sales or the Logarithm of the price of beer) for pub *p* in country *c* at time *t*, "After" is a dummy variable defining the period after the ban, "Scotland" is a dummy variable for whether the establishment is located in Scotland, X denotes a set of pub-level control variables and ε is an

[15] The question in the phone survey was: "What is the current price of your best selling beer or lager?".

error term. An ordinary least squares estimate of β is the average difference in the before-after ban imposition outcome for treated pubs (those in Scotland) relative to control pubs (those in England).

Under certain conditions the differences-in-differences estimator identifies the causal parameter of interest. It requires that pre-ban trends in outcomes are similar between Scotland and Northern England and that there are no systematic differences between the sample of public houses obtained before and after the ban. As we report in Table 1, there are some systematic differences on the capacity of the pubs within regions over time for the postal survey / medium run sample. In principle, this can be a behavioral response to the smoking ban but the similarity in the number of employees per pub reported in the sampling frames before and after the ban requires some caution with this interpretation. Therefore, our benchmark model, extends the basic differences-in-differences specification by including a set of county fixed effects (between 39 and 43 depending on the outcome) and by conditioning on the logarithm of the capacity of the pub interacted with the "After" dummy. Of course, it is also possible that there might be other fixed characteristics (unobserved for the econometrician) which we omit in this analysis and that might bias our analysis so we also look at the smaller sample of pubs which appear in both waves. Finally, we use the postal survey sample to look at the plausibility of common trends assumption with a placebo experiment. In all our regression analysis, we report standard errors clustered at the county level (between 39 and 43 clusters depending on the outcome).

Sales and Prices – Baseline Results

In Table 2, we present differences-in-differences estimates of the effect of the smoking ban on sales and prices. Columns (1) to (4) refer to the short run effect estimated

from the phone survey[16] and columns (5) to (8) refer to medium run effect estimated from the postal survey. In the first column, we show estimates from the basic differences-in-differences model where we condition on the "After" dummy, a "Scotland" dummy and the interaction of both. In the second column, we add to the set of regressors the logarithm of the capacity of the establishment interacted with the "After" dummy. In the third column, we include a full set of county dummies. Finally, in the fourth column, we focus on the sample of pubs that appears in both waves and we include a set of establishment fixed effects. For brevity, we only report the estimates for the parameter of interest (i.e. the estimated coefficient on the interaction between "After" and "Scotland").

The basic differences-in-differences specification in column (1) shows that sales fell in the short run by a statistically significant 9.7 percent in Scottish pubs relative to pubs in Northern England. On the other hand, the estimated impact of the ban on prices shows there to be a very small positive but statistically insignificant effect. Including controls for establishment capacity (column (2)) and counties (column (3)) does not qualitatively affect these results.

In our interviewing procedures we made a special effort in the phone survey to re-interview those that appear in the first wave. As a consequence of that we have a group of 917 establishments that appear in both waves (895 report information on prices and 381 on sales). In column (4) of Table 2 we therefore include establishment fixed effects and estimate the short run effect of the ban for those pubs that appear in both waves. Reassuringly, the results are very similar to those reported in columns (1) to (3). In the short run, the smoking

[16] The results in columns (1) and (4), for the outcomes sales and price of beer, are identical to those in Adda et al (2007) and are reproduced here only for presentational purposes.

ban reduced sales by approximately 10 percent without there being any short run effect on beer prices. The effect on sales is in line with the predictions of the theoretical model while the lack of changes in prices suggests that the possibility that pub landlords are boundedly rational, and follow simple pricing rule, such as charging a fixed mark-up of costs.

We study medium run impacts in columns (5)-(8) by examining results from statistical models based on data from the postal survey. The basic differences-in-differences model of column (5) shows a bigger (in absolute terms) medium run impact on total sales which fall by 29 percent as a consequence of the smoking ban. Adding controls for establishment capacity and counties reduces this estimate by around 6 percentage points, but the medium run impact on sales remains economically and statistically significant. The sample of pubs that appear in both waves is relatively small in this case, at 185 establishments (180 report information on prices and 118 on sales). In column (8), where we condition on establishment fixed effects, we still find a medium run fall in sales of 11 percent but given the size of the standard errors – two times bigger than in the phone survey - we cannot reject the null hypothesis that the smoking ban has zero effect on sales at conventional levels of statistical significance.[17] Like in the short run, we find a precisely estimated zero effect of the smoking ban on the price of beer.

We have pooled the balanced sample of pubs in the phone survey and postal surveys[18] and estimated models for sales with fixed effects such as in columns (4) and (8). In a model where we impose a common effect, we find that the introduction of the smoking ban causes a fall in sales of 10.8 percentage points (standard error, 5.61) with a p-value of 0.062.

[17] In this case there are only 24 clusters.
[18] Results available upon request from the authors.

Furthermore, if we allow the coefficients to be differ between the short and medium run we cannot reject the null hypothesis that the medium run effects are at least as large as those in the short run. Therefore, and in accordance with the theory, this evidence seem to indicate that even after allowing pubs and individuals to adjust to the new reality of the smoking ban, sales continued to fall as a consequence of the smoking ban without a concomitant effect on prices of alcohol.

Sales and Prices - Pubs With and Without Outdoor Spaces

Smoking in outdoor spaces is not prohibited. In Table 3 we therefore study whether the effects of the smoking ban were different in establishments with and without outdoor space. We do so by interacting the treatment dummy with a variable that equals one if the establishment has outdoor space and zero otherwise. For brevity, we only report the most restrictive specifications. We condition on county dummies and establishment capacity and we introduce establishment fixed effects. Panel A of Table 3 shows the results for the phone survey and Panel B for the postal survey.

In general the results reported in Table 3 show there to be significant heterogeneity in the effects of the smoking ban for those pubs with and without outdoor space. Sales falls both in the short and medium run in pubs without outdoor space. However, pubs with outdoor space tend to fare better than their counterparts. On the other hand, there does not seem to be heterogeneous effects on pricing behavior. A possible interpretation of these results is that where there is an outdoor space, either for comfort or climatic conditions, customers are able to enjoy a drink and smoke as well unlike in establishments without outdoor space.

Sales and Prices - Robustness of Results

In our surveys there is a significant level of non-response, particularly for the sales questions, and we need to evaluate the impact of this on our results. If non-response is correlated both with factors that affect these outcomes and with treatment status, then our estimates of the effect of the smoking ban are likely to be biased and inconsistent. In Table 4 we therefore investigate whether having missing information for sales and/or for the price of beer is correlated with the "Scotland x After" interaction. For this purpose, we estimate the benchmark specification (i.e., we condition on county dummies and capacity variables) using as a dependent variable an indicator that takes the value of one if an observation is missing for the relevant outcome and zero otherwise. In Panel A of Table 4 we report results for the phone survey and in Panel B for the postal survey. Reassuringly, the coefficients we estimate for the interaction terms are small in magnitude and none are statistically significant at conventional levels.

One of the fundamental assumptions of identification with a differences-in-differences estimator is that there are common trends between the treatment and control areas. In Table 5 we scrutinise this assumption by performing a placebo or 'falsification' experiment. To do so we take the data from the first wave of questionnaires (i.e., before the smoking ban) and we create a "placebo" dummy equal to one for those questionnaires that were send during the second four months of the sampling and zero for those send in the first four months. The interaction between the "placebo" dummy and "Scotland" should be zero if there are common trends. As in our benchmark specifications, we condition on the capacity of the pub interacted with the "placebo" dummy and county fixed effects. We look at three outcomes: total sales, profit margin and price of beer. The estimates are close to zero in

magnitude and none of them are statistically different than zero, strongly supporting our identification assumption.

Profitability

In the previous sub-sections we showed there to be a negative short and medium run impact on pub sales. In the questionnaire, we also asked pub landlords: "In the past calendar month, what was your profit margin (pre-tax profits expressed as a percentage of sales)?" [19] Most landlords should be familiar with this measure of profitability. In Table 6 we present some descriptive statistics on the response to this question. Not unsurprisingly it is clear that, in the short run, profit margins do not seem to change. However, in the medium run, profit margins increase in the English sample from 35.98 to 37.81 while they decrease in Scotland from 38.76 to 35.88. The smoking ban appears to have had a negative medium run effect on profit margins.

In Table 7 we look at the impact of the Scottish ban on pub profit margins. In Panel A where we look at the medium-run results, the estimates are remarkably similar across columns (1)-(3), ranging from a statistically significant fall of 4.413 to a fall in 4.565 points. The fall in the common sample, column (4), is around 1.686, but it is not statistically different than zero at conventional levels.[20]

Evidence from Stock Market Share Value

[19] The respondents were given seven choices to answers this question: Less than 0%, 0% to 9%, 10% to 19%, 20% to 29%, 30% to 39%, 40% to 49%, and 50% or more. Respectively, we assigned the following values to each answer: 0, 5, 15, 25, 35, 45 and 55.

[20] We can also reproduce the results from Table 3 where we find that in the long-run establishments with outdoor space are somewhat shield from the impact of the smoking ban. The analogous estimations of Table 4 and 5 where we look at missing variables and the placebo experiment reveal that missing variables are not associated with treatment dummy and that the effect of the placebo treatment on profit margins is small and non-statistically significant. All these results are available upon request.

The second angle we use to consider the impact on financial performance uses an event study methodology to analyze the reaction of the stock market performance of companies that own or operate public houses to news about the progress of anti-smoking legislation in England and Scotland. The event study approach is widely used in financial economics[21] and is predicated on the notion that, in an efficient stock market, a new piece of legislation that is expected to affect the stream of profits of a set of firms triggers a change in the price of these assets as soon as the legislative change is anticipated (see Schwert, 1981). Market regulation is a clear candidate to have such an impact.

The magnitude of any asset price response to news about a smoking-ban depends on three factors. First, the sensitivity of public houses profits to the smoking ban. Second, it depends upon the time pattern of any regulatory change. Third, it depends upon how much of this new information is already built-in to investors' forecasts.

We therefore identified a series of events, beginning in 2003, which could have affected investors' expectations about the likelihood and extent of a ban on smoking in public places. In particular, we look for factors that could change the probability distribution of the realization of a legislative change. Then, we estimate the effect of the legislative change by comparing the return of a stock over an event window with respect to the return to the stock which we would have expected in the absence of the legislative change. The excess return to the stock measures the change in the stock price that can be attributed to the "news" about the legislative change.

[21] The approach has been used much less in other areas of economics although one notable exception from the labour economics literature is Ruback and Zimmerman's (1984) analysis of the stock market response of companies to outcomes from union representation elections.

Following Schwert (1981), when a legislative change affects a set of companies at the same point in time, the common effect of the new regulation can be measured by analyzing the return to a portfolio of affected assets: $R_{pt} = \sum_{i=1}^{N} x_{it} R_{it}$. Here R_{it} is the percentage change in the price of stock i from time t - 1 to t (i.e., the rate of return of stock i at time t), x_{it} is as set of weights and R_{pt} is the return of the portfolio of assets. If the portfolio of assets is weighted equally, x_{it}= l/N, and if it is weighted proportional to the value of the asset i (P_{it}) at time t, $x_{it} = P_{it} / \sum_{i=1}^{N} P_{it}$.

We implement the event study analysis by estimating the following statistical model:[22]

$$R_{pt} = \alpha + \beta R_{mt} + \lambda_0 D_0 + \sum_{n=T_0-N}^{T_0-1} \lambda_n [D_0 - D_n] + \sum_{n=T_0+1}^{T_0+N} \lambda_n [D_0 - D_n] + \varepsilon_{pt}$$

$$t = 1,..., T_0-20, T_0-N,..., T_0,..., T_0+N$$

where R_{pt} is the return of portfolio of assets at time t, R_{mt} is the return to the market index at time t, D_{nt} is a dummy variable equal to one on observation n and zero otherwise and there is one dummy for each observation in the forecast interval and ε_{pt} is a normally distributed random specification error.

In this specification T_0 is the event of interest and 1, …,T_0 – 20 is a 100 trading days estimation window that starts 120 trading days prior to the event date (i.e., what in the jargon of event study analysis is called "estimation interval"). Finally T_0-N, …, T_0+N is a window of

[22] This method produces results identical to the traditional method of estimating excess returns (see Karafiath, 1988). An alternative way of estimating the excess returns is by using a dummy equal to one for the event window and then multiplying by the number of days in the event window.

up to 5 trading days before and after the event date (i.e., what in the jargon of event study analysis is called "event window" or "forecast interval").

The event day is defined as the day where the event happens or the next trading day for events that occur on week-ends and holidays. Because information related to the event could have been leaked or anticipated prior to the event, or the market being slow to affect the asset prices, we have also calculated longer event windows around the event date. All models include a set of day of the week dummies. The parameter of interest is λ_0, namely the cumulative excess returns over the event window.

Chronology of Events

We have created a list of events related to the introduction of the smoking ban in England and Scotland searching for articles in the *Financial Times* which contained the words "SMOKING" and "BAN". The events we report correspond to the window January 1, 2003 to January 1, 2007. The search was carried using the service provided by LexisNexis. We have complemented this information in Scotland by searching for news in *The Scotsman* and *Scotland on Sunday* newspapers. Furthermore, we have also cross referenced the main events with information that appeared in the main UK newspapers and the *BBC News*.

This venture identified a total of fifteen events that might have led the market to revise their expectations about the likelihood and type of restrictions on smoking to be introduced in public places. The events range from the release of official government publications such as the Chief Medical Report to the voting outcomes of the Health Bill. There are in total five news events, two introductions of bills in parliament, four official publications, and four voting outcomes. These events are listed in Table 8 with further details about the chronology of events provided in Appendix 1.

Event Study – Results

In order to analyze the effect of the smoking ban on shareholder wealth, we collected stock market data for firms that trade in the main market of the London Stock Exchange. We focused on the UK Pubs sector during the period 2003-2006 and in the following six companies: Enterprise Inns, Greene King Plc, JD Wetherspoon Plc, Marstons Plc, Mitchells & Butlers Plc, and Punch Taverns Plc. These companies are consistently among the top five pub operators in the UK with, for example, revenues for 6500 million pounds and around 24000 pubs in 2006 (British Hospitality Association (2008)).[23]

Daily stock return information for the companies and the market index (FTSE all shares index) were obtained from Datastream. We use the 'current' price on Datastream's equity programs which is the prices at the close of market each day adjusted for subsequent capital actions.

In Table 8 we present the results of the event study analysis for a value weighted portfolio of these six pub companies.[24] We look at each event over four windows: event day, event day plus the following 5 trading days, event day plus the previous 5 trading days, event day plus the previous and following 5 trading days. Standard errors are reported in parentheses.

The key legislative events (publication of the White Paper on Health Strategy, Vote of Smoking Ban in Scotland, introduction of the Health Bill, and Vote of the Health Bill in England) show a negative and statistically significant effect on cumulative excess returns over the event window. Some of these excess returns appear in the previous five days to the

[23] The top five in 2006 were: 1. Punch Taverns (9240 pubs), 2. Enterprise Inn (8652 pubs), 3. Marston's (2544 pubs), 4. Greene King (1512 pubs), 5. Mitchell & Butlers (1389 pubs). JD Wetherspoon ranked in 10th place with 646 pubs. The operators between places 6 and 9 did not quote in the London Stock Exchange.
[24] The results are similar if we use an equally weighted portfolio.

event which indicate that the "news" has been leaked or anticipated by the market before the event. The largest effect we find is after the vote on the Scottish smoking ban. On the event day, there is of 2.4% fall in excess returns and the accumulated fall over the longer window is 8.6%. On the vote of the health bill in England the fall over the longer window is of 3.9%.

The other event where excess returns are negative is the publication of the 2003 Chief Annual Medical Report where over the longer window the index falls by 5.3%. In this report Sir Liam Donaldson, the Chief Medical Officer, makes his strongest case for the smoking ban by stating that the economic case against the ban was not an issue and that smoking should be banned from public places. There is only one event where the excess returns are positive and statistically significant at the 5 percent level and it is when a Member of the Scottish Parliament introduces a private bill to ban smoking in restaurants in Scotland without the support from the Scottish executive.

Scotland, Tobacco and Nicotine Patch Companies

Whilst the smoking ban adversely affected the share price of companies owing pubs it is entirely possible that it may have had wider effects. In Table 9 and Figure 2 we put the results on the pubs into perspective by looking at to what an extent these set of events affected a value weighted portfolio of tobacco companies and GlaxoSmithKline, a key supplier of nicotine patches.

We begin, however, by looking at the Belhaven Group in Table 9. This company was founded in 1719 and acquired by Greene King in 2006 and has all its pubs (270 in 2004) in Scotland. As we can see, the progress of the Scottish smoking ban legislation negatively affected its stock market value. The news that, after his visit to Ireland, the Scottish First Minister will consider a ban on smoking was accompanied by a fall of 7.5% over the longer

window. The announcement of the introduction of the smoking bill on November 10 lead to a 2.9% fall on the event day and negative excess returns of 6.3 % over the longer window.

GlaxoSmithKline, Novartis and Pfizer are the largest supplier of nicotine patches and other implements use to quit smoking, so we expect that the events that lead to the smoking ban may have increase the demand for their products. In contrast, the profit of tobacco companies should have reacted adversely if news about the smoking ban affected negatively the demand for their products. In Figure 2, we look at the cumulative excess return for GlaxoSmithKline over the longer window (Novartis and Pfizer do not quote on the London Stock Exchange), a value weighted portfolio of Tobacco companies and, for comparison purposes, the value weighted portfolio of pub companies. Interestingly, the movement of the excess returns of GlaxoSmithKline is strongly negatively correlated to the portfolio of Pub companies (correlation coefficient is -0.72). In contrast to our predictions, the portfolio of Tobacco companies is negatively correlated to the pub index as well though only moderately (correlation coefficient is -0.14). One possible interpretation of these findings is that the market may have expected a stronger effect on the demand for nicotine fixes than for cigarettes as a consequence of the smoking ban.

Event Study - Falsification Tests

The key in the analysis is that the events we present in our analysis provided "new" information about the progress of the ban. As a robustness check, we therefore look at events that should not have carry new information and we will expect not to affect asset valuation. We have picked the day the smoking ban was introduced in Ireland, Scotland, Wales, Northern Ireland and England. We also look at the publication of the Chief Medical reports of 2004 and 2005 that carry no information about second hand smoking. We present the result

of this analysis in Table 10. Over the longer window, four coefficients are negative and three are positive. None of these coefficients are statistically significant at conventional levels. In fact, over the 28 event windows there are only three coefficients (all in the same date and with different signs) that are statistically significant at the 10 percent level.

5. Conclusion

We have presented theoretical and empirical work on the economic impact of a high profile form of market regulation, namely a smoking ban. Our theoretical model sets out why some form of regulation may be appropriate, and also gives rise to empirical predictions regarding the economic performance of public houses. In particular the model predicts that a smoking ban is likely to reduce sales and profits. We consider empirical evidence testing this based on data we collected ourselves before and after the smoking ban that was introduced in Scotland in 2006. We complement this with an event study analysis looking at the impact of smoking ban related announcements on the share prices of UK companies that own or operate public houses to news about the progress of anti-smoking legislation in England and Scotland.

The evidence we present is in line with the model as smoking bans are shown to have a deleterious impact on firm performance. This works in both the short and medium run through reduced sales which then damaged medium run profitability, and through affecting stock market valuations of companies. As the theoretical model makes clear a comprehensive ban on smoking in pubs may not be socially optimal although there is a case for government regulation to ensure that there are some non-smoking pubs. The better way to achieve this would be by permitting diversity (e.g. by auctioning licenses to pubs to permit smoking). Indeed licensing smoking pubs may well have been a better route than the current blanket ban

policies in operation in Scotland and England, both in terms of having a less damaging impact on the economic performance of pubs and upon consumer welfare, at least if the latter is evaluated in a non-paternalistic way.

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Appendix 1

This Appendix gives more detail on the historical context of the introduction of the Scottish smoking ban in March 2006 and the English smoking ban in July 2007. The information provided here forms the basis for the events listed in Table 8.

History of the Scottish Ban

The formation of the Scottish Parliament and Executive to administer Scottish affairs in 1999 allowed Scotland to create anti-tobacco legislation independently of the rest of the UK. Before 2004, however, the Executive view was that legislation to ban smoking in bars and restaurants was a last resort. In 2000, the hospitality industry has signed up a Scottish Executive charter designed to encourage smoke-free policies, including better ventilation and prominently displayed official stickers outlining the establishment smoking policy. The idea was to rely on the voluntary approach as much as possible.

The first indication that smoking could be banned in all pubs, restaurants and cafes came after the Scottish Chief Medical Officer, Mac Armstrong, urged ministers to take a tougher approach on anti-smoking legislation. In a statement released after the UK's 2002 Chief Medical Annual Report he said: "I feel very strongly about this issue and I will be seeking to influence as many people as possible in public life, including the Scottish Executive, to pursue bold actions supporting the choice of non-smokers to breathe clean air in public places." (*Scotland on Sunday*, July 6 2003).

On January 14 2004 the Scottish Executive published its much awaited blueprint on tobacco, which aimed at creating a "smoke-free Scotland". The Tobacco Action Plan blueprint was in the form of a public consultation; while it included the option of a smoking ban, the First Minister, Jack McConnell, and his ministerial colleagues emphasized that this could be impractical in the short term. This behavior was against what was perceived to be the view of the Executive (*Scotsman*, December 29, 2003).

However, on February 5 2004 an MSP (Member of the Scottish Parliament) of the opposition SNP (Scottish National Party), Stewart Maxwell[25], unveiled a private member's bill which sought to ban smoking in areas where food was served. Representatives of the Executive refused to rule out support for the bill, but insisted ministers would first consult widely to gauge public support. The opinion of the First Minister at that time was against a blanket ban.

On June 10 2004 the Scottish Executive started a consultation on a possible smoking ban. A source close to the Deputy Health Minister, Tom McCabe, who was steering the Executive's consultation on a possible smoking ban said: "Although he is waiting for the end of the

[25] Maxwell's bill was drawn from Kenny Gibson's abandoned proposal after he lost his Glasgow seat in the May 2003 elections. The bill, which was proposed in 2001, attracted substantial cross-party support and was backed by health professionals.

consultation he is very much of the view that there should be a ban on smoking in pubs and restaurants." (*Scotland on Sunday*, July 4 2004).

More significantly, following a visit to Ireland at the beginning of September, the First Minister announced: "I am now much closer to the idea that a consistent ban could be advantageous and would make such a law much easier to observe." (*The Scotsman*, September 1 2004). However, the UK Westminster government told McConnell that he will have to go alone if he wanted to introduce a blanket ban on smoking.

In fact, *The Scotsman* reports on November 2 2004 that the First Minister was facing fierce opposition from within his own cabinet over his proposal to introduce a ban on smoking in public places. Some Ministers were understood to be concerned about the effect that a smoking ban would have on Labour's electoral prospects, particularly as John Reid, then the Health Secretary, had publicly questioned the wisdom of a blanket ban.

In a bold move, however, the Executive announced[26] on November 10 2004 the introduction of a bill in the Scottish parliament to ban smoking in all public places. On April 28 2005 MSPs voted by 83 to 15 in favor of a blanket smoking ban, with only the Conservatives opposing the move. After the vote, the legislation went back to the committee for further scrutiny but it was almost certain that the law would be passed.

On June 30 2005 Scotland became the first part of the United Kingdom to ban smoking in public places when MSPs voted by an overwhelming majority to implement an all-out ban from Spring 2006. The ban started on March 26 2006.

The English Smoking Ban

The first strong public signal by someone appointed by the government in favor of a smoking ban in all public places in England came from the publication of the 2002 Chief Medical Annual Report.[27] Published on July 3 2003 the report prepared by the governments' Chief Medical Officer, Sir Liam Donaldson, highlighted the potential dangers of second hand smoking and made a number of recommendations for action. Chief among them was the introduction of a ban on smoking in public places in the near future.

In reaction to the publication of this influential report the Department of Health said that it would give serious consideration to the proposal but that "would prefer to continue working with the industry to raise awareness and change behaviour." (*Financial Times*, July 4 2003). In fact, this was the government's position for much of 2003. This view was also shared by the Tobacco and Hospitality industry which advocated continuing with a voluntary approach to regulation rather than using legislation.

[26] In his speech the First Minister announced that the smoking legislation will be introduced in the Health Service (Miscellaneous Provisions) Bill due to be presented to parliament before Christmas 2004.

[27] On May 10, 2003, Labour MP Gareth Thomas introduced a private member bill to secure a ban on smoking in cafes and restaurants. The Smoking (Restaurants) Bill, which was not passed, prevented people from lighting up in any premises that sells food.

Representatives of the medical profession and other health practitioners were unhappy with the Government position. On November 25 2003, a public letter endorsed by the Royal College of Physicians and 17 other medical colleges appeared in *The Times* newspaper calling for a ban on smoking in public places. The letter warned that there was now compelling evidence about the dangers of passive smoking and argued that the system of voluntary self-regulation in bars and restaurants had failed.

Once again the Department of Health reiterated its backing of the system then in place and said that the Government had no plans to introduce a ban. However, a consultation exercise launched by Labour's party only a few days later asked whether Local Authorities should be able to introduce smoking bans at work and in public places.

The year 2004 saw a clear move towards the idea of introducing legislation that would restrict smoking in public places. For example, the *Financial Times* of July 26 2004 reported a meeting held by John Reid (the Health Secretary) with publicans and restaurateurs to discuss plans to ban smoking gradually in all public places. Several options were considered, but both pub operators and anti-smoking groups were against the idea of devolving the decision on smoking bans to Local Authorities. At that time, the government and business were believed to be moving towards the idea of a gradual ban on smoking.

The publication of the 2003 Chief Medical Annual Report on July 28 2004 marked the strongest support yet from Sir Liam Donaldson to the introduction of a smoking ban. The report, titled: "Going Smoke Free: The Economic Case", pointed out that there was currently no evidence that smoking bans in other countries have damaged the profits of hospitality companies and that actually the number of customers had risen after a ban was introduced. The report recommended that: "Smoke-free workplaces and smoke-free enclosed public places should be created as a priority through legislation."

In the run up to the publication of the White Paper on Public Health Strategy that would provide, among other issues, a strategy on anti-smoking regulation the government felt that there was no public support for extending a ban to pubs (*Financial Times*, 29 September 2004). In fact, the Health Secretary appeared as the cabinet's leading liberal on lifestyle issues and suggested that anti-tobacco campaigners were patronizing working class smokers.

Towards the end of September the idea of introducing targeted restrictions on smoking in public places received increased media attention. On November 16 2004 the government published the much awaited White Paper. The document offered a set of national restrictions that ban smoking in all restaurants that provide hot food. Thus, it decided against allowing pubs, restaurants and offices to apply to their Local Authorities for licenses that would allow smoking.

The position of the government seemed to please no one. The document was received bitterly by the Chief Medical Officer and anti-tobacco groups because it failed to provide a blanket ban on smoking in public places. 'The British Beer and Pub Association also attacked the plans - calling the distinction "artificial" and "arbitrary" - and saying that it seemed "designed

to drive pubs back to the days when they were drinking dens".' (*Financial Times*, November 17 2004)

In spite of these criticisms the idea of a ban was introduced in Labour's election manifesto prior to the 2005 general election and a tortuous and uncertain road to the Public Health Bill of October 27 2005, started when the Labour party was elected for a third consecutive period on May 5 2005.

The Prime Minister reshuffled the cabinet after the General Election. Patricia Hewitt became Health Secretary and John Reid moved to Defense. On June 19 2005 Hewitt signalled that she wanted to take a tougher stance on the smoking regulation than her predecessor. Although Department of Health officials repeatedly denied plans to outlaw smoking in public places completely, they indicated they could change their mind if a public consultation revealed support for this policy.

But on October 10 2005 - 16 days before the Public Health Bill was due - the Health Secretary got approval from the Prime Minister to push for a tougher approach. Patricia Hewitt proposed an outright ban or sealed off rooms in pubs for smokers. The cabinet was much divided over this issue. The bill was due on October 26, but ministers failed to agree on a possible compromise to allow dedicated smoking rooms in pubs and clubs.

In the end, to the embarrassment of the Health Secretary and the Prime Minister, the Public Health Bill proposed to parliament on October 27 2005, returned to the original formula used in the Labour manifesto that allowed smoking in pubs and bars that did not serve food. Although the industry saw the original formula difficult to implement it was relieved by the fact that private club operators will not be allowed special dispensations. Some MPs, particularly those in the Commons Health Committee, were outraged by the decision of not proposing an outright ban.

On January 10 2006 a group of backbenchers, led by Mr Barron, tabled an amendment to the Health Bill demanding no exemptions to a ban. The next day the Prime Minister agreed to give Labour MPs a free vote on this particular point which made a total ban on smoking in pubs and clubs in England more likely but not inevitable. Although the Liberal Democrats backed a total ban, the Conservatives were also offered a free vote.

After a heated debate which exposed the differences in government on this issue, on February 14 2006 MPs voted by 384 to 184 for an outright smoking ban. The ban was finally introduced in England on July 1 2007.

Figure 1: Smoking bans around the world

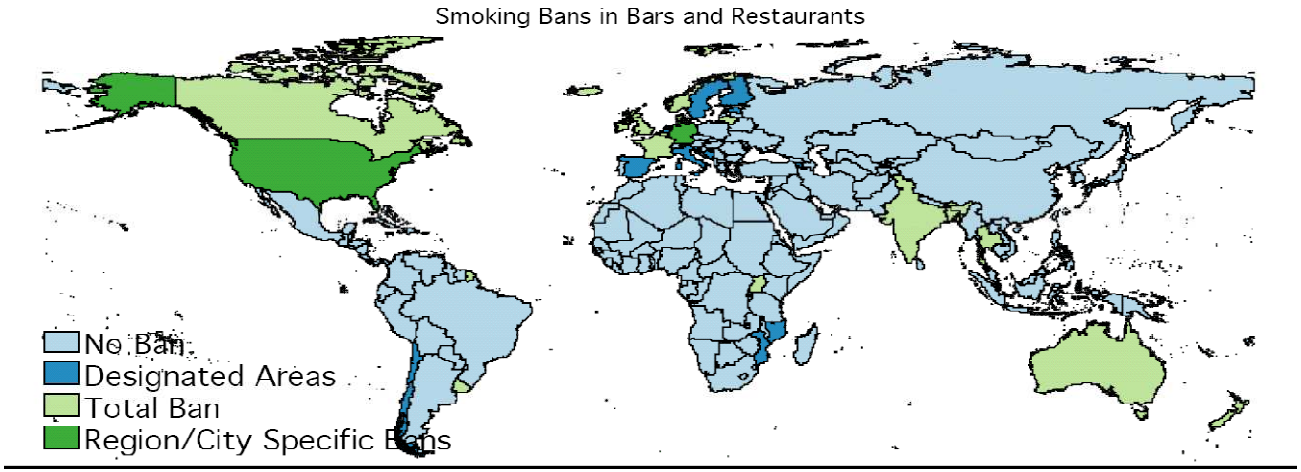
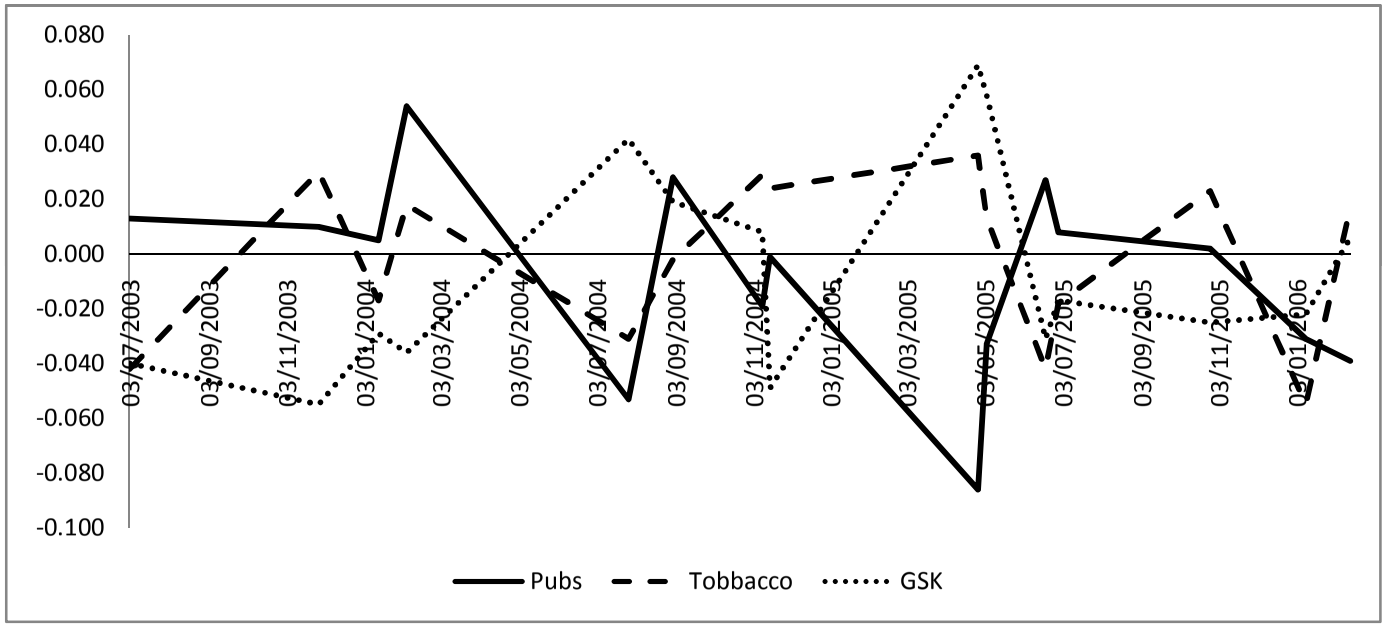


Figure 2: Cumulative excess returns for GlaxoSmithKlein, and a value weighted index of tobacco and pub companies at event dates



Note: Cumulative excess returns correspond to the event window -5 to 5.

Table 1. Descriptive statistics

	Short Run / Phone Survey				Medium Run / Postal Survey			
	Before Ban		After Ban		Before Ban		After Ban	
	Northern England	Scotland	Northern England	Scotland	Northern England	Scotland	Northern England	Scotland
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Number of replies received:	565	781	569	809	318	405	210	323
Number of employees:								
Employees 0 to 3 (%)	31.15	21.90	31.81	21.88	44.03	30.00	38.57	23.84
Employees 4 to 9 (%)	35.93	45.20	33.22	43.63	39.31	49.75	36.67	51.70
Employees 10 + (%)	32.92	32.91	34.97	34.49	16.67	20.25	24.76	24.46
Establishment capacity:								
Mean	201	162	203	170	155	134	170	129
Median	150	128	150	140	120	120	140	100
Standard Deviation	168	123	170	132	96	81	114	74
Observations	548	766	520	739	318	400	210	323
Is smoking allowed in this establishment:								
Yes (%)	98.00	98.00	92.00	0.00	97.00	99.00	95.00	0.00
Observations	565	781	569	809	317	400	209	323
Weekly Total Sales								
Mean	7,375	7,796	7,681	7,983	4,304	5,544	5,263	4,893
Median	5,000	6,000	5,000	5,500	3,360	4,287	3,529	3,882
Standard Deviation	7,329	6,725	7,610	7,991	4,006	5,080	5,719	3,981
Observations	292	398	297	418	215	289	157	242
Price of Beer (in Pounds)								
Mean	2.17	2.20	2.20	2.24	2.10	2.18	2.18	2.28
Median	2.20	2.20	2.24	2.25	2.10	2.20	2.20	2.28
Standard Deviation	0.26	0.23	0.26	0.24	0.24	0.20	0.28	0.21
Observations	554	764	561	794	312	395	207	319

Table 2. The effect of the smoking ban on sales and prices

	Short Run / Phone Survey				Medium Run / Postal Survey			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Variable: Log (Total Weekly Sales)	-0.097	-0.085	-0.090	-0.104	-0.292	-0.232	-0.246	-0.110
	[0.044]**	[0.040]**	[0.042]**	[0.050]**	[0.119]**	[0.109]**	[0.111]**	[0.115]
Observations	1,405	1,347	1,347	762	903	903	903	236
Dependent Variable: Log (Price of Beer)	0.005	0.005	0.004	0.004	0.001	0.006	0.003	0.002
	[0.005]	[0.005]	[0.005]	[0.004]	[0.008]	[0.009]	[0.009]	[0.007]
Observations	2,673	2,530	2,530	1,790	1,247	1,247	1,247	360
				Specification includes:				
After Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Scotland Dummy	Yes	Yes	No	No	Yes	Yes	No	No
Log(Establishment Capacity) X After	No	Yes	Yes	No	No	Yes	Yes	No
County Fixed Effects	No	No	Yes	No	No	No	Yes	No
Establishment Fixed Effects	No	No	No	Yes	No	No	No	Yes

Notes: OLS regression. Standard errors clustered by county in brackets (40 clusters). * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 3. The effect of the smoking ban on sales, and prices in pubs with and without outdoor space

	Dependent Variable:			
	Log (Weekly Total Sales)		Log(Price of Beer)	
	(1)	(2)	(3)	(4)
	Panel A: Short Run / Phone Survey			
Scotland X After Smoking Ban	-0.149	-0.149	0.009	0.002
	[0.056]**	[0.057]**	[0.005]*	[0.004]
Scotland X After Smoking Ban X Outdoor	0.160	0.133	-0.017	0.007
	[0.073]**	[0.076]*	[0.011]	[0.004]
Outdoor Dummy	0.157		0.029	
	[0.060]**		[0.007]***	
Observations	1,347	762	2,530	1,790
	Panel B: Medium Run / Postal Survey			
Scotland X After Smoking Ban	-0.319	-0.104	0.006	0.006
	[0.134]**	[0.124]	[0.011]	[0.008]
Scotland X After Smoking Ban X Outdoor	0.198	-0.024	-0.010	-0.015
	[0.118]	[0.207]	[0.013]	[0.009]
Outdoor Dummy	0.031		0.025	
	[0.059]		[0.009]***	
Observations	903	1,004	1,101	1,101
	Specification includes:			
After Dummy	Yes	Yes	Yes	Yes
Log(Establishment Capacity) X After	Yes	No	Yes	No
County Fixed Effects	Yes	No	Yes	No
Establishment Fixed Effects	No	Yes	No	Yes

Notes: OLS regression. Standard errors clustered by county in brackets (40 clusters). * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 4. Missing information and correlation with treatment status

	Dependent Variable:	
	Missing Sales	Missing Price
	(1)	(2)
	Panel A: Short Run / Phone Survey	
Scotland X After Smoking Ban	0.018	0.001
	[0.040]	[0.009]
Observations	2,573	2,573
	Panel B: Medium Run / Postal Survey	
Scotland X After Smoking Ban	0.059	-0.002
	[0.060]	[0.010]
Observations	1,251	1,251
	Specification includes:	
After Dummy	Yes	Yes
Log(Establishment Capacity) X After	Yes	Yes
County Fixed Effects	Yes	Yes

Notes: OLS regression. Standard errors clustered by county in brackets (40 clusters). * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 5. Placebo experiment (Medium Run / Postal Survey)

	Dependent Variable:	
	Log (Weekly Total Sales)	Log (Price Beer)
	(1)	(3)
Scotland X Placebo Dummy	-0.028	-0.008
	[0.100]	[0.015]
Observations	504	716
	Specification includes:	
Placebo Dummy	Yes	Yes
Log(Establishment Capacity) X Placebo	Yes	Yes
County Fixed Effects	Yes	Yes

Notes: OLS regression. We only use questionnaires for periods before the ban was enacted. Placebo is a dummy equal to one for establishment interviewed in the last 4 months of the period and 0 otherwise. Standard errors clustered by county in brackets (40 clusters). * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 6. Descriptive statistics: Profit margins in the short and medium run

	Short Run / Phone Survey				Medium Run / Postal Survey			
	Before Ban		After Ban		Before Ban		After Ban	
	Northern England	Scotland	Northern England	Scotland	Northern England	Scotland	Northern England	Scotland
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Number of replies received:	565	781	569	809	318	405	210	323
Profit Margin:								
Mean	43.31	42.76	42.96	43.62	36.12	38.73	37.81	36.00
Median	55.00	55.00	45.00	55.00	45.00	45.00	45.00	45.00
Standard Deviation	17.01	16.77	16.29	16.23	15.39	14.60	15.64	17.56
Observations	237	286	203	269	241	322	171	270

Table 7. The effect of the smoking ban on profit margins

	Dependent Variable: Profit Margin			
	(1)	(2)	(3)	(4)
	Panel A: Short Run / Phone Survey			
Scotland X After Smoking Ban	1.219	1.033	1.240	1.906
	[1.792]	[1.650]	[1.635]	[1.568]
Observations	995	952	952	428
	Panel B: Medium Run / Postal Survey			
Scotland X After Smoking Ban	-4.413	-4.529	-4.565	-1.686
	[1.524]***	[1.566]***	[1.557]***	[4.228]
Observations	1,004	1,004	1,004	274
	Specification includes:			
After Dummy	Yes	Yes	Yes	Yes
Log(Establishment Capacity) X After	No	Yes	Yes	No
County Fixed Effects	No	No	Yes	No
Establishment Fixed Effects	No	No	No	Yes

Notes: OLS regression. Standard errors clustered by county in brackets (40 clusters). * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 8. Cumulative excess returns for a value weighted portfolio of pub companies

Date	Event	Type	Cumulative Excess Returns			
			0	-5 to 0	0 to 5	-5 to 5
03-Jul-03	Chief Annual Medical Report (2002) highlights the dangers of second-hand smoking and recommends action.	Official publication	0.009 [0.011]	0.015 [0.027]	0.006 [0.027]	0.013 [0.037]
28-Nov-03	Labour party document asks whether local authorities should be able to introduce smoking bans.	News	-0.002 [0.006]	0.000 [0.015]	0.008 [0.015]	0.010 [0.021]
14-Jan-04	The Scottish executive publishes the smoking action blue print; it points out that a smoking ban could be impractical in the short run.	Official publication	0.008 [0.007]	0.013 [0.017]	0.000 [0.017]	0.005 [0.024]
05-Feb-04	MSP Maxwell introduces bill to ban smoking from restaurants in Scotland but without support from the Executive.	News	0.006 [0.007]	0.025 [0.017]	0.034 [0.017]**	0.054 [0.023]**
28-Jul-04	Chief Annual Medical Report (2003) recommends creating smoke free public places through legislation.	Official publication	-0.009 [0.009]	-0.040 [0.021]*	-0.021 [0.021]	-0.053 [0.029]*
01-Sep-04	The First Minister of Scotland considers that a smoking ban could be advantageous.	News	-0.005 [0.008]	0.007 [0.020]	0.016 [0.020]	0.028 [0.028]
10-Nov-04	Scotland announces the introduction in the Scottish parliament of a blanket ban on smoking in public places.	Introduction of bill	-0.004 [0.007]	0.009 [0.017]	-0.032 [0.017]*	-0.019 [0.023]
16-Nov-04	White Paper on Public Health Strategy proposes to ban smoking from all Pubs that serve hot food in England	Official publication	-0.021 [0.007]***	-0.040 [0.017]**	0.018 [0.017]	-0.001 [0.023]
28-Apr-05	MSPs vote overwhelmingly in favor of a smoking ban in Scotland. The bill goes back to commission for further scrutiny	Vote	-0.024 [0.008]***	-0.090 [0.021]***	-0.020 [0.021]	-0.086 [0.028]***
05-May-05	Labour wins general election carrying in its manifesto the idea of banning smoking from all pubs that serve hot food in England.	Vote	0.003 [0.008]	-0.021 [0.020]	-0.008 [0.020]	-0.033 [0.027]
20-Jun-05	The new Health Secretary proposes going the Scotland way.	News	-0.006 [0.008]	0.019 [0.019]	0.003 [0.019]	0.027 [0.027]
30-Jun-05	MSPs final vote to pass the smoking ban in Scotland.	Vote	0.002 [0.008]	0.013 [0.019]	-0.003 [0.019]	0.008 [0.026]
27-Oct-05	Health bill introduced in British parliament. After considering the a blanket ban the government sticks to the original plan.	Introduction of bill	-0.011 [0.006]*	-0.004 [0.014]	-0.004 [0.015]	0.002 [0.020]
10-Jan-06	Rebels table amendment to Health bill proposing blanket ban.	Amendment to bill	-0.003 [0.006]	-0.017 [0.015]	-0.017 [0.015]	-0.031 [0.021]
14-Feb-06	After a heated debate, MPs voted by 384 to 184 for a blanket ban on smoking in public places in England.	Vote	-0.011 [0.006]*	-0.015 [0.016]	-0.036 [0.016]**	-0.039 [0.022]*

Notes: Standard errors in parentheses. *** indicates statistical significance at 1%, ** at 5%, and * at 10%.

Table 9. Cumulative excess returns for Belhaven Group

Date	Event	Type	Cumulative Excess Returns			
			0	-5 to 0	0 to 5	-5 to 5
03-Jul-03	Chief Annual Medical Report (2002) highlights the dangers	Official publication	-0.001	-0.031	-0.003	-0.033
	of second-hand smoking and recommends action.		[0.008]	[0.020]	[0.020]	[0.029]
28-Nov-03	Labour party document asks whether local authorities	News	0.007	-0.010	0.048	0.031
	should be able to introduce smoking bans.		[0.007]	[0.018]	[0.018]**	[0.025]
14-Jan-04	The Scottish executive publishes the smoking action blue print; it	Official publication	-0.005	-0.012	0.036	0.029
	points out that a smoking ban could be impractical in the short run.		[0.007]	[0.018]	[0.018]*	[0.025]
05-Feb-04	MSP Maxwell introduces bill to ban smoking from restaurants	News	0.001	-0.002	0.001	-0.003
	in Scotland but without support from the Executive.		[0.008]	[0.019]	[0.019]	[0.026]
28-Jul-04	Chief Annual Medical Report (2003) recommends creating smoke	Official publication	-0.002	-0.006	-0.001	-0.005
	free public places through legislation.		[0.008]	[0.021]	[0.021]	[0.028]
01-Sep-04	The First Minister of Scotland considers that a smoking ban could	News	-0.005	-0.028	-0.051	-0.075
	be advantageous.		[0.008]	[0.021]	[0.021]**	[0.029]**
10-Nov-04	Scotland announces the introduction in the Scottish parliament of	Introduction of bill	-0.029	-0.032	-0.017	-0.021
	a blanket ban on smoking in public places.		[0.009]***	[0.023]	[0.023]	[0.032]
16-Nov-04	White Paper on Public Health Strategy proposes to ban smoking	Official publication	-0.011	-0.017	0.007	0.001
	from all Pubs that serve hot food in England.		[0.009]	[0.022]	[0.022]	[0.031]
28-Apr-05	MSPs vote overwhelmingly in favor of a smoking ban in Scotland.	Vote	-0.002	-0.056	-0.010	-0.063
	The bill goes back to commission for further scrutiny		[0.010]	[0.026]**	[0.026]	[0.035]*
05-May-05	Labour wins general election carrying in its manifesto the idea of	Vote	-0.003	-0.013	-0.041	-0.050
	banning smoking from all pubs that serve hot food in England.		[0.011]	[0.028]	[0.028]	[0.039]
20-Jun-05	The new Health Secretary proposes going the Scotland way.	News	0.014	0.022	0.032	0.040
			[0.014]	[0.034]	[0.034]	[0.047]
30-Jun-05	MSPs final vote to pass the smoking ban in Scotland.	Vote	-0.002	-0.007	-0.041	-0.047
			[0.013]	[0.033]	[0.033]	[0.046]

Notes: Standard errors in parentheses. *** indicates statistical significance at 1%, ** at 5%, and * at 10%.

Table 10. Cumulative excess returns for a value weighted portfolio of pub companies

Date	Event	Type	Cumulative Excess Returns			
			0	-5 to 0	0 to 5	-5 to 5
29-Mar-04	Irish smoking ban takes effect	Ban	0.006	-0.009	-0.018	-0.033
			[0.007]	[0.018]	[0.018]	[0.025]
19-Jul-05	2004 Chief Annual Medical Report	Official publication	-0.002	-0.015	0.004	-0.009
			[0.008]	[0.019]	[0.018]	[0.026]
21-Jul-06	2005 Chief Annual Medical Report	Official publication	0.016	0.026	-0.002	0.009
			[0.011]	[0.027]	[0.028]	[0.038]
02-Apr-07	Wales smoking ban takes effect	Ban	0.001	-0.01	-0.031	-0.041
			[0.009]	[0.022]	[0.022]	[0.031]
30-Apr-07	Northern Ireland smoking ban takes effect	Ban	0.008	0.013	-0.008	-0.004
			[0.009]	[0.022]	[0.022]	[0.030]
01-Jul-07	England smoking ban takes effect	Ban	-0.015	-0.037	0.038	0.016
			[0.008]*	[0.021]*	[0.021]*	[0.029]
17-Jul-07	2006 Chief Annual Medical Report	Official publication	-0.006	0.001	0.008	0.014
			[0.008]	[0.021]	[0.021]	[0.029]

Notes: Standard errors in parentheses. *** indicates statistical significance at 1%, ** at 5%, and * at 10%.