The Battle for Clean Air

Assessing the Impact of a State-Wide Smoking Ban on Bar Revenues in Michigan

Nathan Calverley

Abstract: *This study analyzes the effect of the implementation of a 2010 Clean Indoor Air (CIA) policy implementation on bar revenues in Michigan. Previous studies have found that CIA policies have no significant effects on employment or market outcomes for restaurants and bars. Using liquor sales data obtained from Michigan's Liquor Control Commission, the effects of the CIA policy on Michigan bars is analyzed using a random coefficient mixed model with an auto-regressive residual structure. The CIA policy is found to have reduced monthly liquor sales by an average of 10-18% in the 3 months following the implementation of the smoking ban.*[*]

Introduction

Tobacco use is the leading cause of death in the U.S. according to the CDC, which actively advocates the implementation of Clean Indoor Air (CIA) policies.[1] However, despite generally being widely accepted by the public, CIA policies are very contentious; the tobacco and hospitality industries in particular usually offer enormous resistance to the implementation of these policies. Smoking bans are designed primarily to mitigate the health risks posed to non-smokers by second-hand smoke, which has been identified as a potential source of disease, and have also been linked to reductions in cigarette consumption[2] and heart attacks.[3] However, there are concerns that despite their benefits to physical health, smoking bans may lead to reductions in the economic health of the firms they affect.

CIA policies have become commonplace throughout the United States, particularly over the last decade. As of this publication, there are 35 states with comprehensive bans on all smoking in enclosed public spaces, including bars and restaurants.[4] Nearly 22,000 local municipalities across the U.S. are covered by some form of smoking ban, encompassing nearly 80% of the country's population, and more are on the way.[5] Oklahoma, for example, is attempting to pass a law that would allow municipalities to regulate smoking more freely (presently, municipalities are banned from regulating

[*] *The author would like to thank all those who provided helpful and insightful comments which made this work possible, especially Jim Sallee and the anonymous referees at the Chicago Policy Review. The author would also like to thank the staff of the Michigan Liquor Control Commission for their help in facilitating the data collection process. For data and replication materials, contact the author at ncalverley@uchicago.edu.*

smoking more strictly than the state.[6]) But more bans could be coming soon, and the U.S. is well on its way to becoming a country that bans smoking in all of its public places.

One of the most recent states to join those that prohibit smoking state-wide is Michigan. On May 1, 2010, smoking became illegal in all public places in Michigan, with the exception of cigar bars, retail tobacco stores, private home offices, and Detroit's three casinos' gambling floors.[7] In an attempt to contribute to the understanding of the economic effects of smoking bans, this paper will analyze the impact of the statewide smoking ban on bars in Michigan. It adds to the existing research by analyzing the effects of operational regulations on firms in the midst of a severe economic depression, in a state with one of the highest unemployment rates in the country.

This study attempts to evaluate the initial effects of the 2010 smoking ban on Michigan's bars. I argue that existing studies attempting to analyze the effects of CIA policies using basic OLS models are flawed in their design in that the fundamental assumptions of OLS fail in the face of the (inherently) seasonal data being analyzed. These failures prevent OLS from being the best estimation procedure. Instead, I implement a random coefficient mixed model with an auto-regressive residual structure to analyze liquor sales data and assess the economic impact of the ban. The analysis focuses on the first 3 months of implementation. Following the commencement of the ban, this study finds that liquor sales fell by an average of 10-18% during the 3 months in which the ban was in effect.

Background - Legislation

In February of 2002, following a string of legal battles, Ingham County exercised its right to regulate smoking in public areas (except restaurants and bars) by passing the state's first county-level CIA policy.[8] By mid-2008, 21 counties had followed Ingham's example and instituted their own clean indoor air policies[9], and by 2009, there was a large movement in place working to bring about a statewide ban on smoking in *all* public places, including bars and restaurants, which carried widespread public support.[10] The Dr. Ron Davis Smoke-free Air Law was passed by the Michigan legislature on December 10th, 2009, and signed into law by Governor Jennifer Granholm on December 18th, 2009.[11]

The law also prohibited smoking in outdoor areas "where patrons are intended to receive service or consume food, beverages, or both."[12]

On May 1st, 2010, the law went into effect, prohibiting smoking in all restaurants, bars, shopping malls, bowling alleys, concert halls, arenas, museums, mechanic shops, health facilities, nursing homes, educational facilities, and child care centers.[13]

Existing Studies

The study of the effects of these anti-smoking policies has been plagued by inconsistent findings over the years. Stolzenberg and D'Alessio (2007) studied the effects of the 1995 California smoking ban on both alcohol-serving and non-alcohol-serving restaurants. They found that restaurants which served alcohol were much more prone to negative revenue effects than those which did not serve alcohol. More surprising, however, was their finding that these negative effects were all but tempered within one fiscal quarter, with alcohol-serving restaurants seeing their revenue streams return to near normal levels within three months of implementation of the CIA policy.

In their study of Massachusetts community-level regulations, Bartosch and Pope (2002) found that such regulations did not have any significant effect on restaurant sales, regardless of whether or not they serve alcohol. They did, however, find data which suggests that, in states where individual towns set their own indoor air policies, patrons who smoke will move their business to nearby, unregulated restaurants if their town institutes a smoking ban. However, this finding was not robust to various specifications, and Bartosch and Pope conclude that this finding is "reflecting idiosyncratic, unmeasured factors affecting non-alcohol serving restaurants' business".[14] Nonetheless, this finding carries the inherent implication that smoking regulations can in fact harm the firms they regulate by shifting business away from the affected firms. Such a finding lends empirical weight to economic theories suggesting that smoking bans effectively reduce the demand for bars in which smoking is not allowed.

Indeed, there has been no shortage of studies that conclude that smoking bans have no significant economic effect on restaurants and bars, but there are some important criticisms of the methodology involved in many existing studies. The most important criticism is that differential effects of smoking bans are simply not being accounted for. Dunham and Marlow (2000) assert that, "on an aggregate basis, firms subject to a ban may show no net effect on sales even though one-half of firms showed gains and the other half exhibited losses. It is not particularly useful to conclude that nothing occurred."[15]

There are also problems to be found when examining levels of employment in bars and drinking establishments as an economic indicator. In the sample studied in this paper, nearly half of all establishments were listed as having only 1-4 full-time employees.[16] Many bars are simply small enough that they opt to function on minimal levels of employment in order to maximize profits. The possibility of a CIA policy enactment reducing employment in bars that operate on a mere 1-4 employees may not always be likely, as further reductions in employment are simply not possible if the establishment already operates on a skeleton crew.

Finally, using employment to model the effect of a CIA policy can be troublesome when using total number of employees as the primary outcome measure. This is because this measure is not sensitive at all to reductions in hours worked. If a business chooses to reduce the hours of its employees rather than terminate them, this (decidedly negative) effect will not be captured by the model.

Data

This study implements a panel data design. Because Michigan tax privacy laws make the procurement of taxable sales receipts difficult, this study uses liquor sales data from a random sample of Michigan bars. Because the main hypothesis behind a smoking ban is that it reduces the number of patrons an establishment receives, there is no logical reason for it to reduce only liquor sales while leaving beer, wine and food sales unaffected; therefore, it is reasonable to use liquor sales as a barometer for total sales.[17] Data was obtained via a Freedom of Information Act serviced by the

Table 1: Summary Statistics

Liquor Sales (Monthly Average)	2,889.22 (3309.61)
Bar Size (# of employees)	1-4 46.15% 5-9 25.27% 10-19 12.09% 20-49 14.29% 50+ 2.20%
Population	103,631 (263,414.3)
% of Population in Labor Force	61.7% (6.8)
Per Capita Income	20,617.92 (8047.69)
Unemployment Rate	14% (2.8)

Note: Standard deviations in parentheses. All variables are measured at the county level except bar size and liquor sales, which are measured at the establishment level. Per-capita income is in US dollars per year.

Michigan Liquor Control Commission to obtain liquor sales data from Michigan bars during the period of January 2009 to July 2010. In total, this study uses a panel of bars over 19 months of data. The smoking ban was in effect for the final 3 months of this period. Data regarding bar size (defined in terms of the number of employees a bar employs) were gathered via the Michigan Labor Market Information website.[18] Unemployment and GDP data were derived via the Bureau of Labor Statistics.[19]

In contrast to previous studies, this study uses monthly rather than quarterly sales data. The advantage of using monthly data is that it allows for a more robust derivation of seasonal trends, as well as allowing a more specific analysis of month-by-month effects (if any exist) of the smoking ban. Finally, given that the time frame examined by the data extends only through the first three months of

the ban, this study focuses on the nascent stages of the policy implementation. The analysis focuses on these first three months because these were the most extensive data available at the time.[20]

Model Specification

The Mixed Model Framework

This study utilizes, as its preferred model, a random coefficients model with an auto-regressive residual structure.[21] The benefits of using mixed models over standard OLS is that mixed models are robust to the failure of the independence assumption – they do not require the assumption that residuals are statistically independent of one another.[22] Additionally, random coefficient models provide us with a tool for modeling the serial correlation of the residuals that typically accompanies seasonal panel data. Specifically, this analysis fits an auto-regressive function to the residuals in order to model the serial correlation of the residuals over time.

The use of an auto-regressive structure is needed in a model of this type due to the fact that the existence of seasonal trends makes serial correlation of the error terms a near certainty. Consider a regression model in which a dependent variable y is regressed on a vector of independent variables, X, over time, t:

$$Y_{it} = \beta X_{it} + e_{it}$$

The independence of the residual error holds if observations are individually and independently distributed. However this condition is rarely met when considering multiple observations on the same subject over time. Figure 1 shows the log sales of Michigan bars over time.

In Figure 1, we see that the average sales level trends upward in some months and downwards in others. Because of these seasonal trends, running a simple regression of log sales on time will likely produce residuals that fluctuate systematically around zero, rather than exhibiting a random dispersion pattern. To test this hypothesis, Figure 2 shows the predicted residuals of a regression of log sales on time.

Figure 1

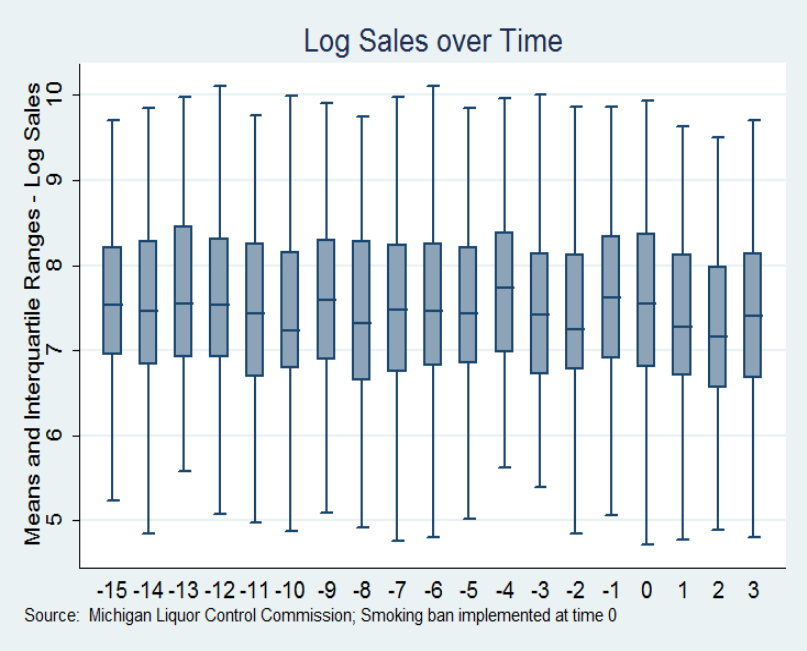
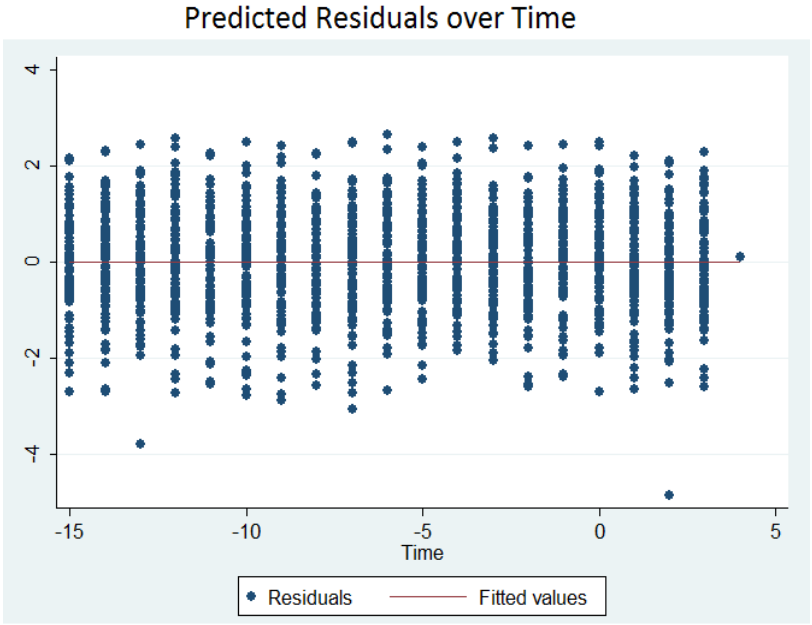


Figure 2



As predicted, the residuals display the same fluctuation patterns as the raw sales data. Clearly, attempting to fit an OLS model to seasonally-fluctuating data will result in serial correlation of the residuals, such that:

$$\text{cov}[(\, X_{i(t-k)} \,,\, e_{it} \,)] \neq 0 \text{ for all } k > 0$$

An auto-regressive model attempts to "map" this covariance by predicting an observation X at time t from a previous observation of the same subject at time t-k, where k is the order of the auto-regressive model:

$$(X_{it} - \bar{x}) = \alpha_1(X_{i(t-1)} - \bar{x}) + \alpha_2(X_{i(t-1)} - \bar{x}) + \ldots + \alpha_k(X_{i(t-k)} - \bar{x}) + e_{ti}$$

such that

$$\mathrm{E}[e_t] = 0, \text{ variance } \sigma^2_e, \text{ and } \mathrm{cov}[X_{i(t-k)} , e_{ti}] = 0 \text{ for all } k > 0$$

Thus the AR(k) model, if specified correctly, eliminates serial correlation of the residuals by "mapping" the correlation, and fitting a predictive model to the residuals which is mean zero, variance σ^2_e , and residuals that are i.i.d. To provide a check for the robustness of the auto-regressive model, alternative mixed models and OLS specifications will also be presented.

Functional Form of the Model

The OLS specifications take the form:

$$Y_{it} = \beta X_{it} + \varepsilon_{it}$$

In this model, X is a (n x p) vector of fixed effects for subject i at time t. Among the covariates included in X are the smoking ban dummy, bar size, a linear time trend, quarterly dummies, macroeconomic indicators, and demographic controls.

The mixed model specifications take the form:

$$Y_{it} = \beta X_{it} + uZ_{it} + e_{ij} \text{, where } e_{ij} = \varphi_1 e_{i,j-1} + \ldots + \varphi_p e_{i,j-k}$$

$$\text{and } e_{ij} \sim N(0, \sigma^2_e)$$

In the random effects model, X is the same (n x p) vector of covariates as in the OLS model, and Z is a (n x q) vector of random effects, with e_{ij} being a (n x 1) vector of errors assumed to have an auto-regressive covariance structure of order k. Bars are allowed to vary based on their size, and their sales growth rate over time conditional on size.

Outcome Variable. The dependent variable of interest being measured is the monthly log-transformed liquor sales. Sales figures were log-transformed in order to reduce variability, and to place interpretation in terms of percentages rather than raw sales numbers.

Control Variables. A wide range of control variables are used to account for as much of the variation in sales as possible, and most of the specifications control for a highly robust range of macroeconomic indicators: Per-Capita Income and unemployment rate are used to control for the relative wealth of each county; population and labor force size are used to control for counties with greater numbers of possible patrons; national gross domestic product and monthly retail sales of the Michigan restaurant industry are used to control for national and statewide macroeconomic trends; and finally, variables indicating the percentage of each county's population that is of White, Black, Native-American and Asian decent control for any demographic-specific effects on sales.

Results

Regression output for all models is presented in Table 2. The effect of the smoking ban on sales was negative among all specifications, although the variance among the estimates was sizable: the smoking ban was projected to reduce sales by an average of 11-18% per month depending on the specification. These estimates were significant at at least the 0.1 level among all specifications, and significant at the 0.01 level in all but two specifications.

All specifications displayed a modestly negative coefficient on the time variable, suggesting the existence of a downward trend in sales during the time period under observation. This is easily explained by the fact that Michigan was experiencing an economic depression during the months surveyed.[23]

The OLS models all displayed a positive and monotonic relationship between bar size and average sales; that is, larger-sized bars, as measured by the number of employees on the bar's payroll, tend to have significantly higher sales than smaller bars. For this reason, it was hypothesized that the variance in sales by bar size could contribute to producing heteroskedasticity of the residuals over time.

Table 2: Regression Output, All Models

	Specification[A]					
	OLS			Mixed		
Variable	(I)	(II)	(III)	(I)	(II)	(III)
Smokeban	-0.14***	-0.14**	-0.10*	-0.16***	-0.16***	-0.18***
(Std. Error)[B]	(.043)	(.058)	(.053)	(.041)	(.040)	(.040)
Size code:						
1	-	-	-	-	-	-
2	0.59***	0.51***	0.42**	0.40**	0.40**	0.41**
3	0.71**	0.76***	0.68**	0.67***	0.68***	0.66***
4	1.51***	1.37***	1.24***	1.17***	1.16***	1.17***
5	2.49***	2.24***	2.08***	2.08***	2.08***	2.08***
Time	-0.003	-0.024*	-0.03**	-0.02*	-0.02*	-.002
Quarterly Controls	Yes	Yes	Yes	Yes	Yes	Yes
Macroeconomic Factors	No	Yes	Yes	Yes	Yes	Yes
Demographic Variables	No	No	Yes	Yes	Yes	Yes
R-squared	0.35	0.41	0.47	-	-	-
Log Likelihood	-	-	-	-989.31	-987.64	-977.99

[A]Dependent variable log sales
[B]Reported OLS standard errors are robust to clustering effects
*Significant at the 0.1 level
**Significant at the 0.05 level
***Significant at the 0.01 level

In order to model this heteroskedasticity, a size-time interaction variable was generated, and then fitted into the mixed model specifications. This specification allows the sales growth slope to vary by the size of the bar, and by the interaction of bar size with time, thus relaxing the assumption of homoskedasticity.

In addition to modeling the heteroskedasticity, it was shown that the residuals would likely display an auto-regressive correlation. In order to account for this correlation, mixed model specifications II and III present modified versions of specification I, with residuals modeled with an auto-regressive order 1 structure, and an auto-regressive order 3 structure, respectively. A likelihood-ratio test of all three specifications favored the AR3 model[24], thus it is the preferred mixed model, but the results of all 3 specifications are presented.

Table 3: Regression Output, Preferred Model

Variable[A]	Estimates
Smokeban	-0.18***
	(0.040)
logpop	0.22***
	(0.062)
logpci	-0.53
	(0.37)
unemprate	-.36
	(.71)
quarter	
2	-0.06*
	(0.04)
3	-0.04
	(0.04)
4	-0.07**
	(0.03)

[A]Dependent Variable Log Sales
*Significant at the 0.1 level
**Significant at the 0.05 level
***Significant at the 0.01 level

Additional results of the AR(3) specification are presented in Table 3. The results suggest that population has a significant and large effect on sales, and that bars in highly populated areas experience higher levels of business. However, the coefficient on the log of the county's per-capita income suggests that areas with higher levels of average income experience lower average sales than bars in poorer areas. Although this finding was not statistically significant, it is consistent with results from the health studies literature, which often finds inverse associations between income and health outcomes,

such as alcohol consumption.[25] Higher levels of unemployment were found to have a negative effect on sales, but this effect was not found to be statistically significant.

Quarter 2 experienced, on average, about 6% lower sales than during quarter 1. The quarter in which the ban was instituted, quarter 3 (April, May, June), did not have significantly different seasonal sales than quarter 1. And finally, sales during quarter 4 were also about 7% lower than first quarter sales.

Sensitivity Analysis

In an attempt to better clarify the identification question, a false experiment was implemented in which the smoking ban was simulated in the corresponding months of the previous year. Using the same specifications, rather than observing May, June and July of 2010, an analysis was implemented assuming that the ban instead went into effect in May of 2009, and persisted through may, June and July of that year. This new false indicator is a dummy variable called "FakeSmoke". The results of the analysis are presented in Table 4.

Table 4: False Experiment Regression Output,
OLS specifications and Mixed Model Specifications

Variable	Specification[A]

	OLS			Mixed		
	(I)	(II)	(III)	(I)	(II)	(III)
FakeSmoke	-0.03	-0.01	-0.03	-0.005	-0.003	-0.01
(Std. Error)[B]	(.034)	(.046)	(.045)	(.035)	(.034)	(.033)
Size code:						
1	-	-	-	-	-	-
2	0.59***	0.52***	0.42**	0.41**	0.41**	0.42**
3	0.71**	0.76***	0.69**	0.68***	0.69***	0.68***
4	1.51***	1.37***	1.24***	1.16***	1.16***	1.17***
5	2.49***	2.25***	2.09***	2.08***	2.08***	2.08***
Time	-0.01***	-0.034***		-0.03***	-0.03***	-.04***
	-0.04***					
Quarterly Controls	Yes	Yes	Yes	Yes	Yes	Yes
Macroeconomic Factors	No	Yes	Yes	Yes	Yes	Yes
Demographic Variables	No	No	Yes	Yes	Yes	Yes
R-squared	0.35	0.41	0.47	-	-	-
				-997.10	-995.92	-987.61

Log Likelihood	-	-	-

[A]Dependent variable log sales
[B]Reported OLS standard errors are robust to clustering
*Significant at the 0.1 level
**Significant at the 0.05 level
***Significant at the 0.01 level

The first and most basic OLS specification contains the largest estimate of a potential false effect, but it is not significant at any level, and when further controls are added in subsequent specifications, the standard errors on the smokeban dummy increase, and the estimate itself attenuates. When the false experiment is implemented in the mixed model specifications, the dummy representing the false smoking ban attenuates further, producing estimates with large standard errors and no statistical significance. The inability of the false experiment to produce statistically significant results that are similar to those seen when the smoking ban is truly implemented lends credence to the robustness of the findings.

Another method of investigating the impact of the policy is to implement a fixed-effects design using month and establishment dummy variables. If the CIA policy truly had an effect, one would expect to see a break in the general trend of the month dummies during the months in which the smoking ban was in effect. Two fixed-effects specifications were run: specification 1 included only month and establishment dummies; specification 2 included month and establishment dummies, as well

as all socioeconomic and demographic controls (time and quarterly trends were not included, as they are contained within the month dummies).

Figure 3: Regression Output – Month Dummy Estimates Over Time

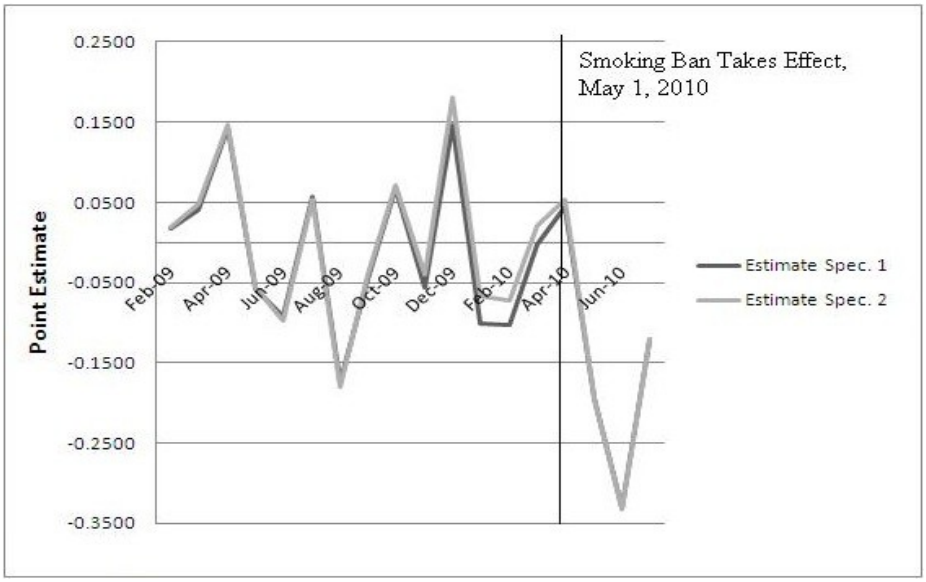


Figure 3 shows the estimates on the month dummies for each specification over time. At the time the smoking ban is implemented, a glaring break in the general trend is seen in both specifications. Following the ban taking effect, point estimates on the month dummies plummet, providing further evidence of the effect of the ban on sales.

Introduction of a Control Group

A final sensitivity analysis was conducted utilizing the introduction of a control group. In order to test whether the results found above are simply the result of unobserved macro-economic effects on the liquor industry, liquor sales data for a control group of liquor markets, grocery stores that sell alcohol, and gas stations with liquor licenses were obtained. For these locations, smoking was already banned, and thus the implementation of the ban did not change the status quo in these establishments, meaning that the ban should have had no observable effect on the liquor sales of these establishments. This new group of establishments is hereafter referred to as the control group, while the set of bars used

in the original analysis is hereafter referred to as the treatment group. Figure 4 shows the breakdown of the control group.

Figure 4: Control Group Breakdown

	Type of Establishment			
	Market/Grocery	Gas Station	Party Store	Total

N	24	2	7	33
Average Sales (Monthly)	$15,258.49	$10,299.91	$15,650.39	$14,226.99

Data from the control group, like that of the treatment group, was obtained from the Michigan Liquor Control Commission for the same period of time – January 2009 to July 2010. These data are then included in the models from above, but with two additional variables: a treatment dummy indicating treatment status (1 = treatment group, 0 = control group) and a treatment-smokeban interact term.[26] If the smoking ban had a similar effect on both groups, we would expect the interaction term to have a small and statistically insignificant point estimate. Conversely, if there was any significant difference in the effect of the ban on bars versus markets, the estimate on the interaction term will be statistically and economically significant.

Table 5 shows the results of the analysis, which indicate that the effect of the smoking ban on the treatment group was significantly different from that of the control group. The negative point estimate on the smokeban-treatment interaction variable was negative and significant at the 0.01 level across all specifications. Because the model includes an interaction term, the process for determining the estimated total effect of the ban on bars is to sum the coefficients on the SmokeTreat interaction variable and the Smokeban variable. These sums are presented in the table as “Overall Effect on Bars”, which indicates that during the months that the smoking ban was in effect, sales of the treatment group were 16-22% lower. The coefficients on the “Smokeban” variable indicate the estimated effect of the

Table 5: Regression Output, OLS and Mixed Model Specifications Utilizing a Control Group

Variable	Specification[A]	
	OLS	Mixed

	(I)	(II)	(III)	(I)	(II)	(III)
SmokeTreat Interact	-0.16***	-0.15***	-0.16***	-0.18***	-0.18***	-0.16***
(Std. Error)[B]	(.051)	(.053)	(.052)	(.050)	(.051)	(.053)
Smokeban	-.003	-.056	.006	-.031	-.034	-.067
(Std. Error)[B]	(.034)	(.048)	(.044)	(.047)	(.049)	(.049)
Overall Effect on Bars[C] (SmokeTreat + Smokeban)	-0.163*** (15.62)	-0.206*** (15.17)	-0.166*** (9.37)	-0.211*** (37.22)	-0.214*** (36.26)	-0.227*** (39.98)
Time	-0.00	-0.005	-0.02	-0.01	-0.01	-0.01
Quarterly Controls	Yes	Yes	Yes	Yes	Yes	Yes
Macroeconomic Factors	No	Yes	Yes	Yes	Yes	Yes
Demographic Variables	No	No	Yes	Yes	Yes	Yes
R-squared	0.53	0.62	0.64	-	-	-
Log Likelihood	-	-	-	-1213.35	-1212.82	-1194.02

[A]Dependent variable log sales

[B]Reported OLS standard errors are robust to clustering

[C]Reported in parentheses are the results of a test of the hypothesis that SmokeTreat + Smokeban = 0. In the OLS models, the reported statistic is the F-stat value; in the mixed models, the reported statistic is the χ^2 value.

*Significant at the 0.1 level

**Significant at the 0.05 level

***Significant at the 0.01 level

ban on sales of the control group. The coefficients are small and not significant at any level across all specifications, suggesting that during the months of the ban, there was no significant change in the sales of the control group.

Finally, Table 6 shows the average monthly liquor sales of the treatment and control groups before and after the ban went into effect. The mean sales of the treatment group dropped 17% during the months of the ban, while the mean sales of the control group increased slightly, by about 6%. These findings are not consistent with the hypothesis that the downturn in sales during the months of the ban was the result of macroeconomic effects or seasonal fluctuations. The finding that sales of a closely related industry were not changed in any significant way during the months of the ban lends more weight to the suggestion of causality.

Table 6: Unconditional Average Monthly Liquor Sales of Treatment and Control Groups, Before and After Ban

	Average Monthly Sales Before Ban (1/09 – 4/10)	Average Monthly Sales After Ban (5/10 – 7/10)	Percent Change
Treatment Group (Std. Deviation)	2,980.00 (3,408.08)	2,471.87 (2,695.89)	-17.1%
Control Group (Std. Deviation)	14,098.24 (11,060.52)	14,910.57 (10,722.39)	5.8%

Discussion

The implementation of CIA policies has drawn fierce debate between public health advocates and supporters of smokers' rights over the last couple of decades. A common anti-CIA claim is that traditional economic theory precludes the possibility that a CIA policy will have no effect on the hospitality industry, while a common pro-CIA claim is that the only studies finding negative effects are those commissioned by tobacco companies. While many studies by health experts have found no effect of CIA policies on the hospitality industry, this study finds that a smoking ban instituted during a profound economic depression had negative consequences for Michigan's bars during the first three months in which the ban was in effect. This finding was found to be highly robust to a wide range of specifications and sensitivity analyses.

The major weakness of this study lies in its relatively small amount of data. Although the number of establishments surveyed is sufficient for a robust analysis, the time period covered is smaller than most researches would like. Further studies on the Michigan smoking ban using data that extends further back in time (and also further forward in time) would be desirable in obtaining a more wholesome picture of the effect of the smoking ban. For example, it is possible that, in the long run, any negative effects might be assuaged by the market returning to equilibrium. However, even if this were the case, this study retains its importance in showing that during the first three months after a smoking ban is implemented, bars in Michigan suffered financially.

It is important to note that this study exists in somewhat of a vacuum compared to other such studies in that it analyzes the economic effects of a ban which was implemented during the tail-end of one of the worst world-wide recessions in history, which no doubt worked to amplify the adverse effects of the ban. Michigan's bar owners were hit particularly hard by the sheer timing of the regulation, and policymakers would be well-served to choose the timing of such regulation more deliberately. Legislation that could potentially have negative consequences for an industry as vast as the hospitality industry should probably not be passed in the midst of an economic downturn.

Despite the findings of this paper, it is not meant to suggest that the Michigan smoking ban (or any other CIA policy) is bad policy. The detrimental health effects of second-hand smoke in public places are well documented[27]. These detrimental effects can have huge consequences for public health, inflation of healthcare costs, and general levels of well-being. Regulating these externalities can help to mitigate healthcare costs and even save lives, possibly rendering them highly cost-effective in the long run.

In the course of implementing CIA policies, policymakers must consider the differential effects of their actions. This study has shown that the Michigan Smoking Ban, which was instituted during an economic recession, was attributed to a decline in bar sales. Though it is beyond the scope of this paper, the recession in which the state was mired likely played a role in enhancing the negative effects

of the ban, and lawmakers would be better served to choose the timing of such legislation more deliberately. More forward-thinking with regards to CIA policy implementation can have enormous benefits for the hospitality industry and society as a whole. Finally, in contrast to previous studies, this paper finds that smoking bans can have adverse effects on the hospitality industry, and that these effects are economically significant enough that they should not be hastily discounted in the public discourse on CIA policies.

Notes

1 Center for Disease Control <http://www.cdc.gov/chronicdisease/resources/publications/aag/osh.htm>

2 http://www.todayszaman.com/newsDetail_getNewsById.action?load=detay&link=154044&bolum=101

3 http://www.msnbc.msn.com/id/28450513/ns/health-heart_health/

4 American Nonsmokers' Rights Foundation <http://www.no-smoke.org/pdf/mediaordlist.pdf>

5 American Nonsmokers' Rights Foundation <http://www.no-smoke.org/pdf/mediaordlist.pdf>

6 Oklahoma State Legislature < http://www.oklegislature.gov/BillInfo.aspx?Bill=HB2135

7 For details of the Michigan Smoking Ban, see < http://www.michigan.gov/documents/mdch/FAQMISmokeFreeFINAL_5.20.10_321926_7.pdf>; Full text of the law, < http://www.legislature.mi.gov/documents/2009-2010/publicact/pdf/2009-PA-0188.pdf>

8 Full text of the ordinance: http://www.ingham.org/bc/Ordinances/regulation%20eliminating%20smoking%20in%20public%20and%20private%20worksites.pdf

9 http://www.tcsg.org/sfelp/smokereg.htm

10 http://michiganmessenger.com/15700/majority-supports-smoking-ban

11 http://www.legislature.mi.gov/documents/2009-2010/publicact/pdf/2009-PA-0188.pdf

12Michigan Smoke-free law FAQ, http://www.michigan.gov/documents/mdch/FAQMISmokeFreeFINAL_5.20.10_321926_7.pdf

13 Full text of the law, < http://www.legislature.mi.gov/documents/2009-2010/publicact/pdf/2009-PA-0188.pdf>

14Bartosch and Pope, 2002

15For a detailed list of criticism of existing studies, see Dunham and Marlow, 2000, section II

16 Data on bar size taken from Michigan Labor Market Information website < http://www.milmi.org/cgi/dataanalysis/AreaSelection.asp?tableName=Labforce>

17 In Michigan, the term "Liquor" means hard liquor, beer and wine, as these are the products whose sale is regulated by the Michigan Liquor Control Commission. For more information on the regulation of firms possessing a liquor license in Michigan, see http://www.michigan.gov/documents/dleg/FINAL-_Retail_Guide_2009_WEB_304923_7.pdf

18http://www.milmi.org/cgi/dataanalysis/AreaSelection.asp?tableName=Labforce

19http://www.bls.gov/data/#unemployment

20 A reasonable criticism of these data is that focusing on only the first three months of the ban does not allow for any long-term effects to be studied. While this is entirely true, I contend that examining initial effects still provides useful information, and that the lack of data only enhances the need for further studies of CIA policies, and in particular the Michigan case.

21 Statistical analyses performed in Stata 11. The Stata command associated with this model is *xtmixed*, which is part of the larger library of time-series analyses commands.

22 For a detailed text on the nature of mixed models, see Raudenbush and Bryk (1992).

23 http://www2.timesdispatch.com/news/2009/sep/01/ed-nuech01_20090831-175803-ar-32222/

24In addition to testing vs. an AR(1) model, the AR(3) model was tested vs an AR(2), AR(4), AR(5) and AR(6) model. Though the results of these tests are not shown, in all cases, likelihood-ratio testing favored the AR(3) specification.

25For example, Kenkel and Ribar (1994) found that, "Once simultaneity is addressed using instrumental variable estimators, alcohol problems are estimated to lead to significantly reduced earnings."

26[26] Ibid.

27 The CDC has compiled a large list of resources regarding the effects of secondhand smoke. It is available here < http://www.cdc.gov/tobacco/basic_information/secondhand_smoke/>

References

Adams S, Cotti D. "The Effect of Smoking Bans on Bars and Restaurants: An Analysis of Changes in Employment," *The B.E. Journal of Economic Analysis & Policy*: 7(1) (Contributions) 2007, Article 12.

Alamar B, Glantz S. "Smoke-Free Ordinances Increase Restaurant Profit and Value." *Contemporary Economic Policy.* 22(4), 2004: 520-525.

Alamar B, Glantz A. "Efffects of Smoke-Free Laws on Bar Value and Profits.*" American Journal of Public Health*. 97(8), 2007: 1400-1402.

Bartosch W, Pope G. "The Economic Effect of Smoke-Free Restaurant Policies on Restaurant Business in Massachusetts." *Journal of Public Health Management Practice*. 5(1), 1999: 53-62.

Bartosch W, Pope G. "Economic Effect of Restaurant Smoking Restrictions on Restaurant Business in Massachusetts, 1992 to 1998." *Tobacco Control*. 11(supplement 2), June, 2002: ii38-ii42.

Box, George and Jenkins, Gwilym (1970) *Time series analysis: Forecasting and control*, San Francisco: Holden-Day.

Dunham J, Marlow M. "Smoking Laws and Their Differential Effects on Restaurants, Bars, and Taverns." *Contemporary Economic Policy.* 18(3), 2000: 326-333.

Glantz S, Smith L. "The Effect of Ordinances Requiring Smoke-Free Restaurants on Restaurant Sales." *American Journal of Public Health.* 84(7), 1994: 1081-1085.

Glantz S, Smith L. "The Effect of Ordinances Requiring Smoke-Free Restaurants and Bars on Revenues: A Follow-Up." *American Journal of Public Health.* 87(10), 1994: 1687-1693.

Hyland A, Vena C, Cummings K, Lubin A. "The Effect of the Clean Air Act of Erie County, New York on Restaurant Employment." *Journal of Public Health Management Practice.* 6(6), 2000: 76-85.

Klein E, Forster J, Erickson D, Lytle L, Schillo B. "Economic Effects of Clean Indoor Air Policies on Bar and Restaurant Employment in Minneapolis and St. Paul, Minnesota." *Journal of Public Health*

Management Practice. 16(4), 2010: 285-293.

McCusker M, Huang P. "One-Year Assessment of the Impact of a Smoking Ban on Restaurant and Bar Revenues in El Paso, Texas." Bureau of Chronic Disease and Tobacco Prevention, Texas Department of Health, August 2003.

Pyles M, Mullineaux D, Okoli C, Hahn E. "Economic Effect of a Smoke-Free Law in a Tobacco-Growing Community." *Tobacco Control.* 16, 2007: 66-68.

Raudenbush, S. and Bryk, A. 2002. Hierarchical Linear Models: Applications and Data Analysis Methods. Thousand Oaks, CA: Sage Publications, Inc.

Schoenborn CA, Adams PF. *Health Behaviors of Adults: United States, 2005–2007*. National Center for Health Statistics. Vital Health Stat 10(245). 2010.

StataCorp. 2009. *Stata: Release 11.* Statistical Software. College Station, TX: StataCorp LP.

Stolzenberg L, D'Alessio S. "Is Nonsmoking Dangerous to the Health of Restaurants? The Effect of California's Indoor Smoking Ban on Restaurant Revenues." *Evaluation Review.* 31(1), 2007: 75-92.

West B. "Amalyzing Longitudinal Data with the Linear Mixed Models Procedure in SPSS." *Evaluation & the Health Professions.* 32(3), 2009: 207-228.