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# The Economic Impact of the Smoking Ordinance on Restaurant Sales and Mixed Beverage Sales in Houston, Texas

As prepared by  
MGT of America, Inc.  
502 East 11<sup>th</sup> Street, Suite 300  
Austin, Texas 78701  
(512)476-4697 (T)  
(512)476-4699 (F)  
[www.mgtofamerica.com](http://www.mgtofamerica.com) (W)



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## BACKGROUND

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In March of 2005, the City of Houston passed an ordinance prohibiting smoking in restaurants and limiting smoking in a number of other public spaces, including restaurant bars. As part of this ordinance, the city council passed an amendment requiring an independent third-party evaluation of the ordinance's economic impact 18 months after its passage. The City of Houston contracted with MGT of America to prepare the initial evaluation. They also asked MGT to evaluate the economic impact of a similar ordinance passed in Dallas in order to determine the longer-term effects of smoking ordinances.

MGT's study analyzed the performance of the Houston and Dallas restaurant industries over the ten years prior to implementation of the ordinances. The first study analyzed municipal sales tax data for "Eating Places" and "Eating and Drinking Places," and municipal mixed beverage sales data for "Full-Service Restaurants" and "Drinking Places." MGT utilized the standard statistical technique used by other smoking ordinance studies referenced in our first study - multivariate regression analysis. The study also used an adaptive forecasting technique to overcome limited data. The study found that the Houston and Dallas smoking ordinances did not carry adverse outcomes for the restaurant sector.

On September 2007, an expanded version of the initial Houston smoking ordinance went into effect. The new ordinance included all enclosed public spaces. Public spaces constitute retail operations such as bars, bingo facilities, convention facilities, gaming facilities, health care facilities, hotels and motels (except for smoking rooms), pool halls, restaurants, retailers, shopping malls, sports arenas and theaters. The City of Houston contracted MGT to provide an update to the 2005 study. This study examines the longer-term effects of the initial ordinance as well as its expansion under the new 2007 provisions. Specifically, this interim report examines the impact on the economic activity of the Houston restaurant and drinking establishment sector. The study uses the same statistical technique – multivariate regression analysis – as its predecessor. It undertakes this analysis solely for the City of Houston.

Because sales data is not released by the State Comptroller's Office for several quarters, this is an interim report based on nine months of post-new ordinance data. An updated version of the study utilizing a year's worth of sales data will be completed in April 2009.

## METHODS

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MGT developed a dataset of the historical performance of the restaurants and drinking establishments in Houston. MGT then used statistical analysis to examine the relationship between the adoption of smoking ordinance policies and taxable restaurant sales and mixed beverage sales.

MGT's original study selected multivariate linear regression as its statistical technique. This technique was the consensus method used in similar smoking ordinance studies reviewed in the original report. As a result, MGT chose to use the same method again to facilitate comparisons. Our economic outcome (or "dependent variable") remains per-outlet sales. This is the case for both taxable restaurant sales per-outlet and mixed beverage sales per-outlet.

Differential effects could not be calculated to the same extent as in the original study due to a transition in data collection efforts by the Texas Comptroller of Public Accounts. Specifically, the differential effects focused on a comparison between the establishments that primarily sold alcohol and those that did not. MGT's original study examined differential effects of smoking ordinance policy on sales by type of establishment as defined by Standard Industrial Classification (SIC) codes. The original analysis examined several SIC codes. The original study examined taxable sales tax data for Eating Places (SIC 5812), which are restaurants that do not sell alcohol. The study also separately examined data from Eating and Drinking Places, which are restaurants that sell beer and wine (SIC 5816) and restaurants that sell alcoholic beverages (SIC 5817). The study then aggregated this data.

As the Comptroller transitioned to using the North American Industry Classification System (NAICS) coding, the ability for consistent comparisons across the SIC and NAICS classifications was lost. Instead, MGT focused on aggregating several NAICS groups to make an "apples to apples" comparison with the SIC codes examined by the first study (SIC 5812, SIC 5816, SIC 5817.) MGT settled on aggregating the sales data and outlet counts for Houston's Full Service Restaurants (NAICS 722110), Limited-Service Restaurants (NAICS 722211), Cafeterias, Grill Buffets, and Buffets (NAICS 722212), and unclassified food service establishments (NAICS 722000.) These categories cover the same definitions as the definitions for SIC 5812, SIC 5816, and SIC 5817.

In the analysis of mixed beverage tax data, MGT's original study analyzed Full-Service Restaurants (NAICS 722110), which are establishments primarily engaged in providing food services to patrons who order and are served while seated. It also separately analyzed data from

Drinking Places (NAICS 722410), which are establishments primarily engaged in preparing and serving alcoholic beverages for immediate consumption. The study then aggregated the data from these two groups. In the present study, we focus on aggregated data from the two different code groups without a separate analysis by NAICS code.

Our original regression model featured several control variables for secular, economic and seasonal trends. Secular trends are general long-term trends not tied to the economy (such as the increasing popularity of eating out), while economic trends are specifically tied to the economy. Seasonal trends are associated with regular cycles that occur over the course of a particular time period—in this case, a year. (Examples of seasonal trends would include retail sales driven by Christmas.)

The following data were used to construct the dataset used in this analysis:

- quarterly taxable sales data for the SIC codes corresponding to Eating Places (5812) as well as Eating and Drinking Places (5816 and 5817) in Houston from 1993 through fourth quarter 2005. From the first quarter of 2006 to the second quarter of 2008, the study used NAICS codes corresponding to Full-Service Restaurants (NAICS 722110), Limited-Service Restaurants (NAICS 722211), Cafeterias, Grill Buffets, and Buffets (NAICS 722212), and unclassified food service establishments (NAICS 722000.) (Source: Texas Comptroller of Public Accounts).
- quarterly gross mixed beverage sales in Houston and from 1994 through first quarter 2008 (Source: Texas Comptroller of Public Accounts).
- the Consumer Price Index for Houston from 1993 through the fourth quarter of 2008 (Source: Bureau of Labor Statistics).
- the total retail sales for Houston from 1993 through the fourth quarter of 2008.

For Houston restaurant taxable and mixed beverage gross sales, we analyzed the data using a multivariate (that is, involving multiple variables) regression analysis. The following model was used to estimate the impact of the smoking ordinance:

$$Y = \beta_0 + \beta_1(Tm) + \beta_2(Q2) + \beta_3(Q3) + \beta_4(Q4) + \beta_5(Retail) + \beta_6(Ord1) + \beta_7(Ord2) + \varepsilon$$

where:

Y = Local quarterly taxable restaurant sales per-outlet in constant 2006 dollars, or local gross mixed beverage sales per-outlet in constant 2008 dollars through the use of the Consumer Price Index.

Tm = the time period in which the observation was taken.

Q2 = the value is 1 if the observation was in the first quarter and 0 if otherwise.

Q3 = the value is 1 if the observation was in the second quarter and 0 if otherwise.

Q4 = the value is 1 if the observation was in the third quarter and 0 if otherwise.

Retail = Total retail sales per-outlet for Houston for the appropriate time period.

Ord1 = the value is 1 if the first phase of the smoking ordinance was in effect and 0 if otherwise.

Ord2 = the value is 1 if the second phase of the smoking ordinance was in effect and 0 if otherwise.

The model employed per-outlet sales figures as the economic outcome that was measured. This economic outcome is the dependent variable. By setting per-outlet sales as the dependent variable, the model controls for sales growth through city annexations as well as restaurant openings and closings. Even if the volume of sales might have grown overall, division by the number of outlets allows us to look at the economic health of affected establishments. We used real (inflation-adjusted) sales rather than nominal sales to control for inflation; all sales figures were inflated to 2008 constant dollars through use of the Consumer Price Index.

A time variable was included as a continuous variable to control for secular, or long-term, trends. In addition, MGT constructed variables to represent each quarter, to control for seasonal changes. Finally, to control for economic trends, MGT included total retail sales per-outlet for Houston. The previous study used the Dallas Federal Reserve Board's Business Cycle Index for the Houston. The BCI was substituted for a control that was specifically focused on movements in the retail sector. In this study, we utilized per-outlets sales for the entire retail sector in Houston. The BCI reflects the movement and growth of the Texas economy, making it a potentially unreliable indicator of retail strength due to a lack of seasonality and the inclusion of energy sector as a component in the index.

To measure the effect of both phases of the smoking ordinance, we constructed a variable that took a value of 1 in quarters in which the specific phase of the ordinance was in place and a value of 0 when the ordinance was not in place. These binary variables are referred to as “dummy variables” by statisticians. The two phases were considered to be discrete events with unique effects relevant to each ordinance’s implementation. There is no overlap in the period that they are in effect.

MGT analyzed restaurant sales data for Houston in aggregate across the different types of establishments. MGT also analyzed mixed beverage sales in aggregate. MGT undertook this separation to discern the impact on different types of consumption in restaurants and mixed beverages.

The results of MGT’s analysis are presented in the following section.

## RESULTS AND CONCLUSIONS

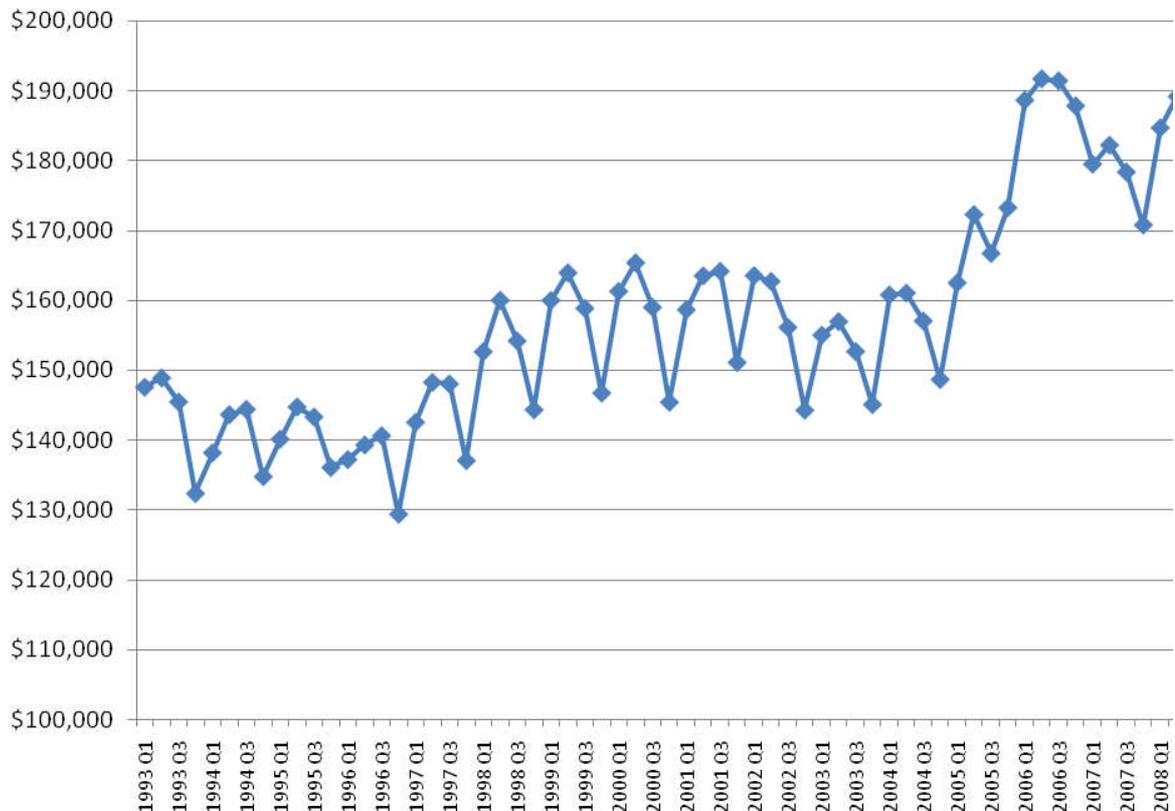
### *Performance of Houston's Restaurant and Drinking Establishments*

#### Restaurant Sales

The charts of restaurant and mixed beverage sales per-outlet provided below show strong seasonality. The second and fourth quarter restaurant sales per-outlet figures are generally higher than the first and third quarters. This seasonality creates the “ups and downs” apparent in **Exhibit 1**. MGT controlled for this seasonality with variables representing the quarters in which the observations were taken.

Houston's restaurant sector has a cyclical nature. The recovery from the economic slowdown in the early 90s, economic growth at the end of that decade, the downturn after 9/11 and the most recent boom and recession bear an imprint on the graph. To control for the cyclical nature of the retail sector, our model included entire retail per-outlet sales for Houston.

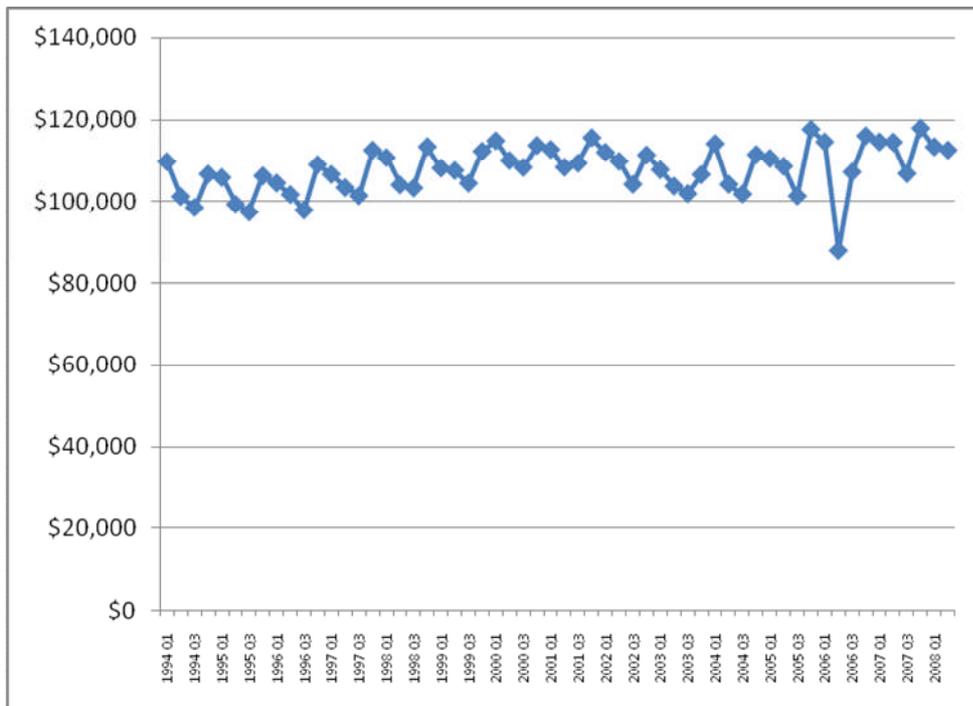
**Exhibit 1**  
**Houston Restaurant Sales per-outlet in Constant 2008 Dollars**



**Mixed Beverage Sales**

Mixed beverage sales also exhibit a cyclical effect. First and fourth quarter mixed beverage sales per-outlet are generally higher than the second and third quarters. The fourth quarter mixed beverage sales are the highest. **Exhibit 2** visualizes these trends. As indicated above, we controlled for this seasonality with variables representing the quarters in which the observations were taken. The model included the entire retail sector’s per-outlet sales for Houston to control for this effect.

**Exhibit 2**  
**Houston Mixed Beverage Sales per-outlet**  
**in Constant 2008 Dollars**



***Economic Impact of the Houston Smoking Ordinance***

MGT examined the effects of both phases of its smoking ordinance on restaurant taxable sales and gross mixed beverage sales. **Exhibit 3** summarizes the results of this analysis. Coefficient estimates are on the top line, with associated p-values beneath. The coefficient indicates whether the relationship is positive or negative and by how much. The impact is in dollars. At the 95 percent confidence level, a p-value of less than 0.05 is significant and greater than 0.05 is insignificant. If a variable does not achieve a statistically significant p-value, the

## **Results and Conclusions**

direction and magnitude of its coefficient is deemed to be too unreliable to be considered a valid indicator of impact. Instead, it is seen as being caused by chance.

All dollar amounts discussed below are in constant 2008 dollars.

The first phase of the ordinance was associated with a positive economic impact on total quarterly per-outlet restaurant sales of \$7,572.86. In our original study, MGT used the Holt-Winters forecasting technique due to a paucity of data. Our conclusion was that forecasted sales were higher than expected, but the prediction was not statistically significant. Our original analysis indicated that it was possible for the impact to be neutral or negative. The current data set allows MGT to confirm the positive impact of the first phase of the ordinance at a statistically significant level. The second phase of the ordinance was found to have a positive economic impact on restaurant per-outlet sales of \$1,763.40. Obviously, MGT's original study did not evaluate the second phase of the ordinance since it had not been adopted. The coefficient is statistically insignificant, with a very high p-value. This indicates that there is no statistically valid evidence of causation. The overall model is a strong predictor of per-outlet performance with an adjusted r-squared of 0.92. An r-squared of 1.00 indicates a perfect fit.

For mixed beverage sales, the first phase of the smoking ordinance was associated with a statistically insignificant decrease of \$1,904.63 in per-outlet mixed beverage sales. In our original study, the first phase of the ordinance had a statistically insignificant positive impact of \$1,299.72. This confirms the lack of a clear effect. The second phase of the ordinance had a statistically insignificant positive effect of \$1,673.81. Overall, the entire model is not as a strong a fit as the restaurant sales model. The r-squared for mixed beverages is only 0.51. The absence of statistically significant coefficients indicates that the ordinance does not have a discernible impact either for the positive or for the negative. In other words, the model's coefficients are likely to be a result of random chance, not of causation.

**Exhibit 3**  
**Houston Restaurant and Mixed Beverage Sales**  
**Analysis of the Economic Impact of the Houston Smoking Ordinance**

	Constant	Time	Q2	Q3	Q4	Retail	Ordinance 1	Ordinance 2
<i>Restaurant Taxable Sales per Outlet</i>								
Coefficient	\$69,629.20	\$125.72	\$907.10	-\$851.68	\$5,336.39	\$0.51	\$7,572.86	\$1,763.40
p-value	0.00	0.10	0.59	0.60	0.11	0.00	0.02	0.65
<b>Adj. R-squared= 0.92</b>								
<i>Mixed Beverage Sales per Outlet</i>								
Coefficient	\$97,480.47	\$86.00	-\$5,942.93	-\$7,612.36	\$3,438.89	\$0.07	-\$1,904.63	\$1,673.81
p-value	0.00	0.19	0.00	0.00	0.21	0.37	0.41	0.53
<b>Adj. R-squared= 0.51</b>								

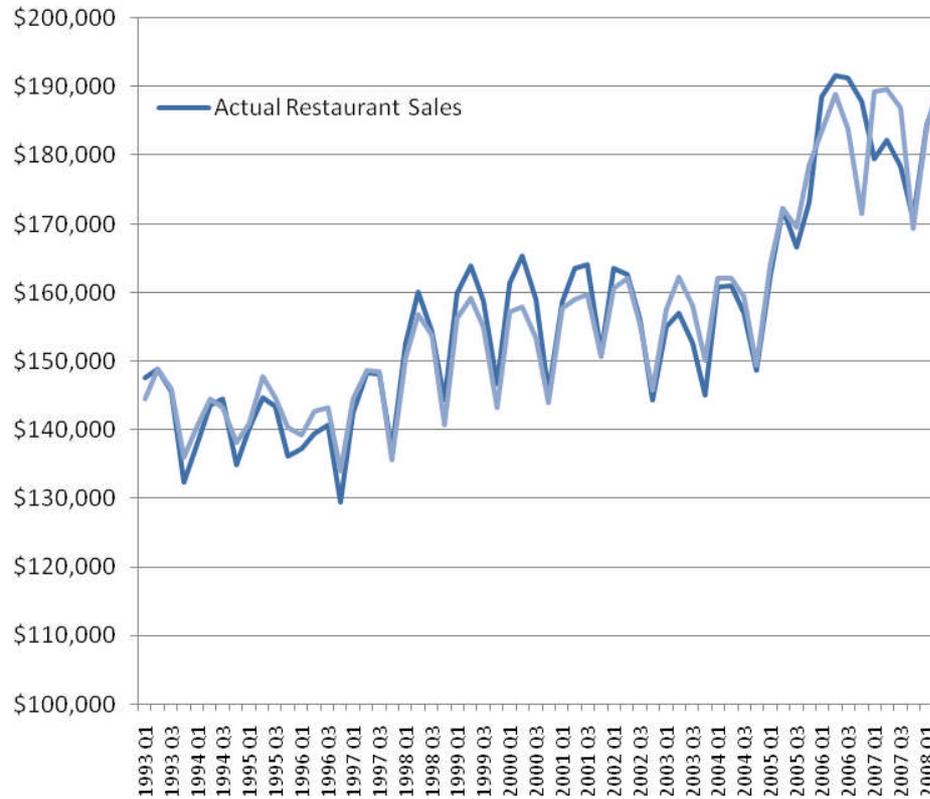
## ***Results and Conclusions***

To help explain the pieces of the model and how they contribute to quarterly sales, this section illustrates one example culled from restaurant sales. MGT randomly chose the third quarter of 2007 as the data point to use as an example.

First, the model begins with the “constant.” The “constant” is simply a starting point that is constant across all quarters. The constant amount for the restaurant taxable sales model is \$69,629.20. To that amount we add the contribution from the secular trend “time” variable. Since the third quarter of 2007 would be the fifty-ninth quarter of time elapsed since the start of our sample, we multiply the \$125.72 contribution per time unit by fifty nine for a total of \$7,419.25. This is added to the constant for a total of \$77,048.45. Since it is the third quarter, we subtract \$831.68 from this amount for a new running total of \$76, 216.77. In the third quarter of 2007, the retail sales per-outlet figure in Houston was \$ 204,080.42. Of that amount, the model awards 51 cents on the dollar to the taxable restaurant sales total. This component’s contribution to be added to our running total is \$104,081.01 for a new running total of \$180,297.78. Finally, we add the contribution from the ordinance in effect at the time for a final total of 187,870.64. This is the model’s prediction for that quarter.

The actual amount for the quarter was \$178,351.79 or a miss by the model of \$9,518.85. The miss constitutes 5% of the actual amount. **Exhibit 4** below traces the model’s predicted sales for each quarter and the actual sales. As the graph illustrates, the model has a strong fit as indicated by the high r-squared mentioned above.

**Exhibit 4  
Houston Restaurant Per-outlet Sales  
Analysis of Actual vs. Predicted Sales**



**Conclusions**

MGT’s analyses of per-outlet sales in Houston indicates that the first and second phases of the smoking ordinances did not appear to carry adverse outcomes for the restaurant and drinking establishment sector in aggregate. The first phase actually contributed a positive amount to per-outlet sales at a statistically significant level. As for mixed beverage sales, the result of our new study matches our previous findings: the lack of a statistically significant relationship. As a result, at this point neither phase of the ordinance indicates statistically significant adverse effects on per-outlet mixed beverage sales.