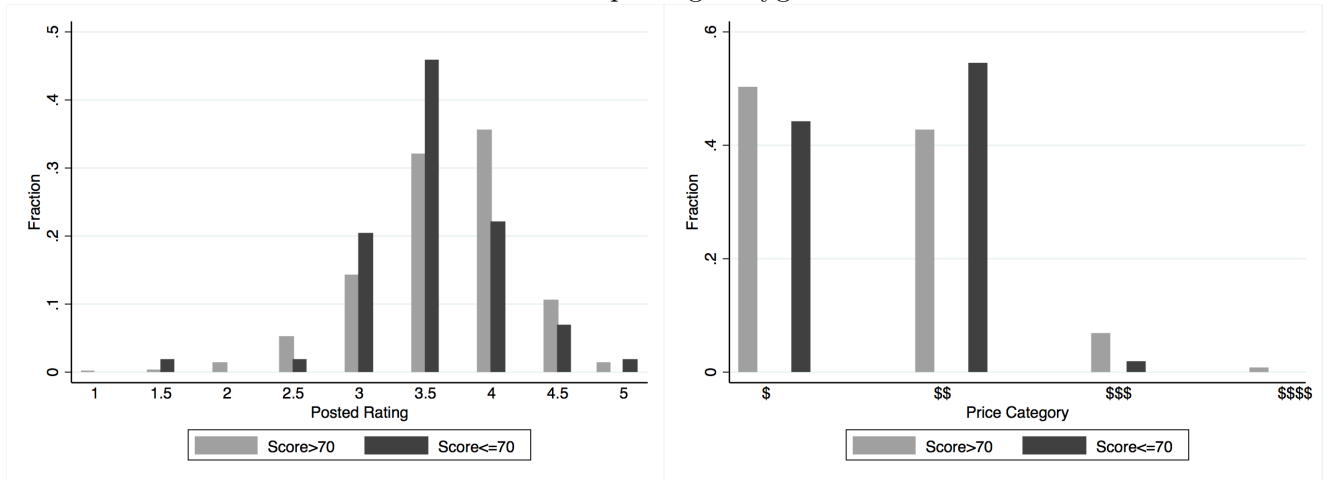


Online Appendix for Digitizing Disclosure: The Case of Restaurant Hygiene Scores

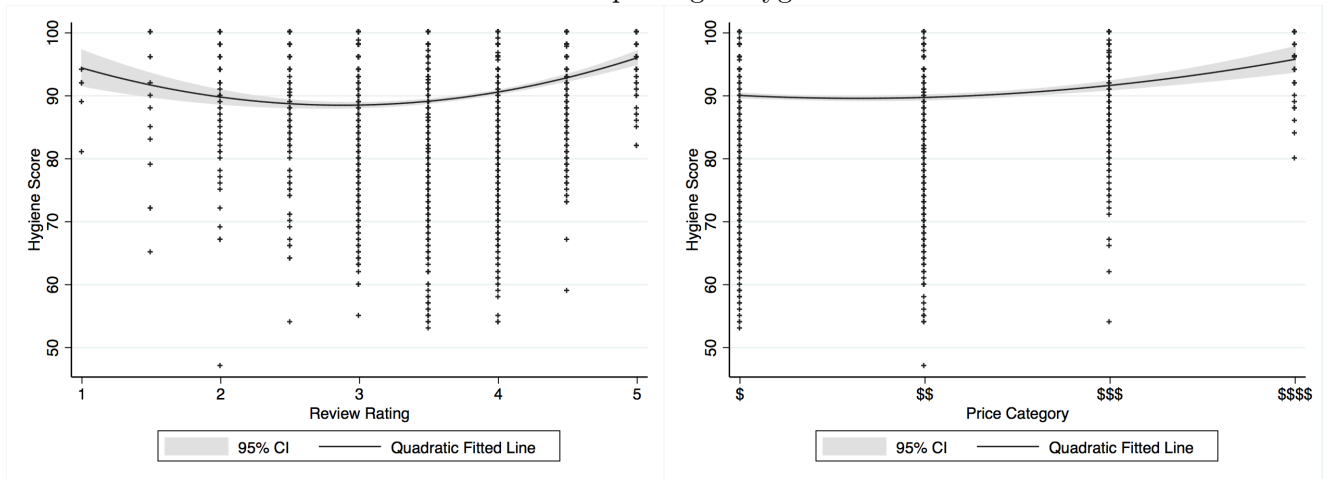
Weijia Dai, Michael Luca

Figure A1: Baseline Relationship Between Hygiene Scores and Restaurant Characteristics

Panel A. Before the posting of hygiene scores

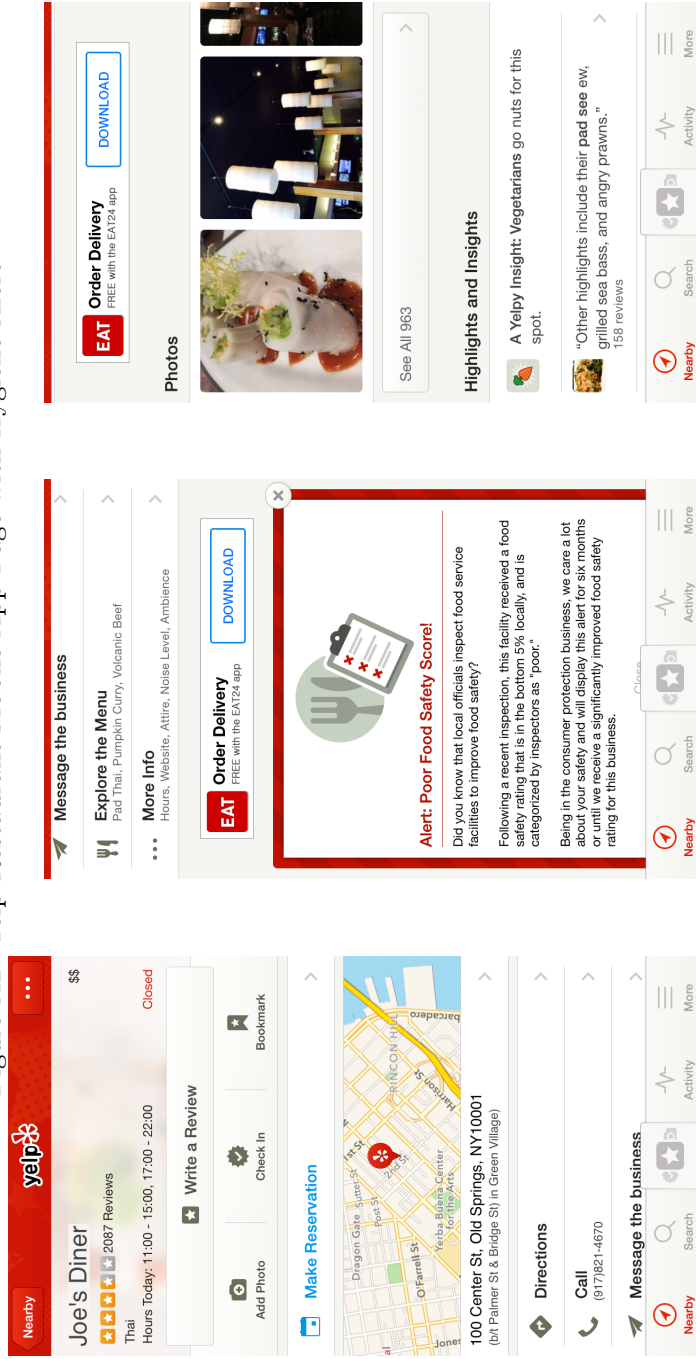


Panel B. Before the posting of hygiene alerts



Note: **1** The two figures in Panel A compares the distribution of restaurant displayed review ratings and price category for restaurants with scores of less than or equal to 70 and those above 70 before the posting of hygiene scores. **2** The two figures in Panel B shows the scatter plot of restaurant hygiene scores and displayed review rating (on the left) and the price category of the restaurant (on the right) before the posting of hygiene alerts, fitted with quadratic curves.

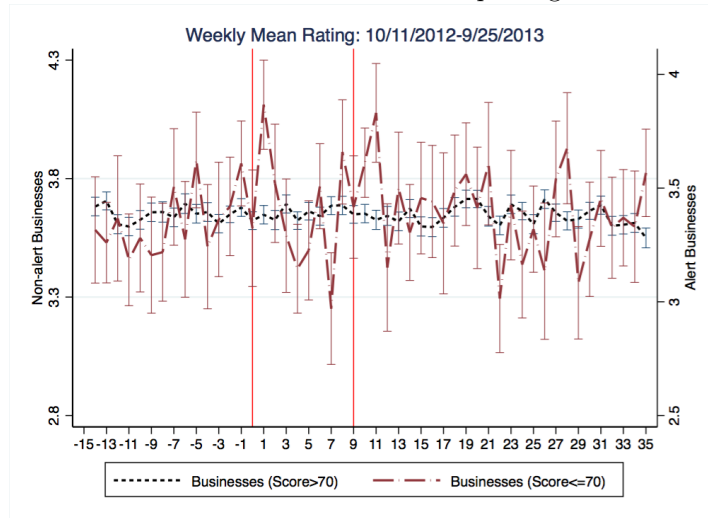
Figure A2: Yelp Restaurant Mobile App Page with Hygiene Alert



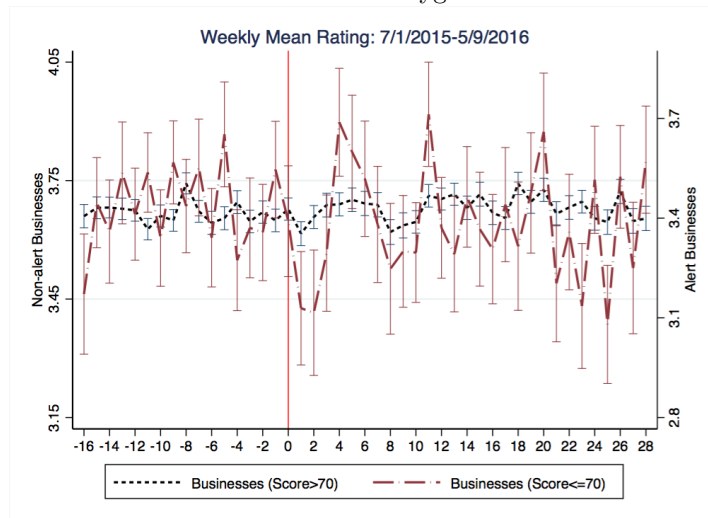
A. Top of the App Screen B. Scrolling Down the App Screen C. After Closing the Hygiene Alert Box

Note: The figures show the screenshots of a fake restaurant's Yelp mobile page. In the mobile app, the hygiene alert blocks the photos and reviews section. The alert is not immediately visible to the consumers who do not scroll down the mobile page.

Figure A3: The Impact on Yelp Ratings
Panel A. Effects of score posting



Panel B. Effects of hygiene alerts



Note: **1** The figures plot the weekly average rating of new reviews left on the restaurant's page with standard error bars separately for businesses with scores of 70 and below and businesses with scores above 70. **2** The two vertical lines in the top figure represent the start of the hygiene score posting test period (1/17/2013) and the official posting period (3/25/2013) respectively. The vertical line in the bottom figure represents the start of the hygiene alert posting period (10/20/2015).

Table A1: Hygiene Score Categories and Interpretations

- High risk: Violations that directly relate to the transmission of foodborne illnesses, the adulteration of food products ,and the contamination of food-contact surfaces.
- Moderate risk: Violations that are of a moderate risk to the public health and safety.
- Low risk: Violations that are low risk or have no immediate risk to the public health and safety.

Score	Operating Condition Category	Inspection Findings
>90	Good	<ul style="list-style-type: none"> • Typically, only lower-risk health and safety violations observed • May have high-risk violations
86-90	Adequate	<ul style="list-style-type: none"> • Several violations observed • May have high-risk violations
71-85	Needs Improvement	<ul style="list-style-type: none"> • Multiple violations observed • Typically, several high-risk violations
Less than or equal to 70	Poor	<ul style="list-style-type: none"> • Multiple violations observed • Typically, several high-risk violations

Note: The above table is replicated from the website of the San Francisco Department of Public Health (<https://www.sfdph.org/dph/EH/Food/Score/default.asp>).

Table A2: Two Interventions in San Francisco and the Population of Restaurants Directly Affected

	Intervention	Effective Time	Yelp Efforts and Restaurants Affected
1	Hygiene scores are posted on Yelp	(Test period) 2013/1/17– 2013/3/25	<ul style="list-style-type: none"> • Yelp publicly announces the hygiene score posting program on its official blog and on various media outlets • Hygiene scores are posted on the Yelp pages of San Francisco restaurants matched with the SFDPH records
		(Official posting period) 2013/3/25–present	<ul style="list-style-type: none"> • Hygiene scores are posted on the Yelp pages of all San Francisco restaurants matched with the SFDPH records
2	A hygiene alert is issued for restaurants with poor operating conditions	2015/10/20–present	<ul style="list-style-type: none"> • Consumer alerts are posted on 151 restaurants identified as having poor operating condition by the SFDPH in the most recent inspection within 6 months (hygiene score ≤ 70).

Table A3: Pre-trend Tests Before Interventions

Panel A. Pre-trend tests before the hygiene score posting intervention

	(1)	(2)	(3)
	Standardized # of Leads	Standardized # of Reviews	Rating
$t \times \ln(\text{Score})$	0.042 (0.043)	-0.129 (0.0854)	0.069 (0.151)
t	-0.179 (0.192)	0.618 (0.385)	-0.301 (0.679)
$\ln(\text{Score})$	0.480** (0.238)	-0.091 (0.301)	1.127*** (0.358)
N	6,149	5,806	4,400

Panel B. Pre-trend tests before the hygiene alert intervention

	(1)	(2)	(3)	(4)
	Standardized # of Leads	Standardized # of Reviews	Rating	Standardized #Orders
$t \times (\text{Score} \leq 70)$	0.005 (0.013)	-0.033 (0.165)	0.046 (0.057)	0.0165 (0.033)
t	-0.026*** (0.002)	-0.422*** (0.031)	-0.0005 (0.011)	0.103*** (0.0110)
$(\text{Score} \leq 70)$	0.010 (0.082)	0.062 (0.421)	-0.081 (0.134)	0.0330 (0.194)
N	13,600	12,262	9,780	2,529

Standard errors in parentheses, clustered at the business level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: **1** This table reports linear regression results investigating the differential pre-trends before the hygiene score posting intervention (Panel A) and the hygiene alert intervention (Panel B). **2** The samples for the regressions in Panel A are monthly observations at the business level during the three months before the hygiene score posting test period started on 1/17/2013. The samples for Panel B are monthly observations at the business level during the three months before the hygiene alert program started on 10/20/2015.

Table A4: The Impact of Score Posting (Log vs. Negative Binomial, Effects on Ratings)

Panel A. Differential effects by Ln(Score)					
	(1)	(2)	(3)	(4)	(5)
	Ln(# of Leads)	# of Leads	Ln(# of Reviews)	# of Reviews	Mean Rating
Test Period× Ln(Score)	0.397*** (0.108)	0.378*** (0.078)	0.248** (0.110)	0.333*** (0.125)	0.059 (0.199)
Posting Period× Ln(Score)	0.431*** (0.126)	0.390*** (0.069)	0.178** (0.093)	0.281** (0.115)	-0.073 (0.175)
N	16,409	16,409	15,491	15,491	11,830
Fixed Effects Model	Business Linear	Business Negative Binomial	Business Linear	Business Negative Binomial	Business Linear
Panel B. Differential effects by the 70 score cutoff					
	(1)	(2)	(3)	(4)	(5)
	Ln(# of Leads)	# of Leads	Ln(# of Reviews)	# of Reviews	Mean Rating
Test Period× (Score≤70)	-0.116* (0.068)	-0.129*** (0.047)	-0.066 (0.066)	-0.100 (0.071)	0.024 (0.107)
Posting Period× (Score≤70)	-0.127* (0.067)	-0.158*** (0.041)	-0.069 (0.055)	-0.110* (0.065)	0.086 (0.089)
N	16,409	16,409	15,491	15,491	11,830
Fixed Effects Model	Business Linear	Business Negative Binomial	Business Linear	Business Negative Binomial	Business Linear

a. Standard errors in parentheses, clustered at the business level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

b. All regressions have controlled for period dummies, a linear time trend, and attribute-specific linear time trends. The results are similar without controlling for the time trends.

Note: **1** Panel A reports regression results examining the differential effects of the hygiene score posting on consumer activities based on log-levels of hygiene scores, and Panel B reports results based on the 70 score cutoff. **2** The regressions use the same sample as the ones reported in Table 1. Results of the alternative negative binomial specification are reported. **3** The mean rating in column (5) is calculated from new reviews left on the restaurant. Not all restaurants receive reviews every month, which leads to the drop of the sample size in column (5).

Table A5: The Impact of Hygiene Alerts (Log vs. Negative Binomial, Effects on Ratings and Orders)

Panel A. Effects on leads and reviews.					
	(1)	(2)	(3)	(4)	(5)
	Ln(# of Leads)	# of Leads	Ln(# of Reviews)	# of Reviews	Mean Rating
Alert Period× (Score≤70)	-0.074** (0.036)	-0.094*** (0.021)	-0.113*** (0.037)	-0.144*** (0.040)	-0.101 (0.072)
Alert Period	-0.033*** (0.009)	-0.0095 (0.0074)	-0.051*** (0.012)	-0.060*** (0.015)	-0.011 (0.027)
N	26,911	26,911	24,359	24,359	18,999
Fixed Effects	Business	Business	Business	Business	Business
Model	Linear	Negative Binomial	Linear	Negative Binomial	Linear
Panel B. Effects on take-out orders.					
	(1)	(2)	(3)		
	Ln(# of Orders)	# of Orders	Value per Order (\$)		
Alert Period× (Score≤70)	-0.128 (0.120)	-0.147** (0.066)	0.480 (0.722)		
Alert Period	0.0216 (0.0303)	0.0525 (0.0375)	0.581 (0.804)		
N	5,011	5,011	4,179		
Fixed Effects	Business	Business	Business		
Model	Linear	Negative Binomial	Linear		

a. Standard errors in parentheses, clustered at the business level. * p<0.10, ** p<0.05, *** p<0.01

b. All the regressions have controlled for period dummies, a linear time trend, and attribute-specific linear time trends. The results are similar without controlling for the time trends.

Note: **1** The regressions use the same sample as the ones reported in Table 2. Results of the alternative negative binomial specification are reported. **2** Column (5) of Panel A shows that the hygiene alert has no effect on the mean rating of of new reviews left for the restaurant. Column (3) of Panel B shows that the hygiene alert has no effect on the value of the take-out orders consumers placed.

Table A6: Analysis with Alternative Sample and Alert Threshold

Panel A. Use sample of restaurants above the alert threshold. Test impacts on restaurants with scores (70,75] and (75,100].

	(1)	(2)	(3)
	Standardized # of Leads	Standardized # of Reviews	Standardized # or Orders
Alert Period ×(Score≤75)	0.0117 (0.0216)	0.0118 (0.0305)	0.0603 (0.144)
Alert Period	0.00957*** (0.00310)	-0.0388*** (0.00871)	0.0411 (0.0254)
N	26116	23518	4697
Fixed Effects Model	Business Linear	Business Linear	Business Linear

Panel B. Test impacts on restaurants with scores (60,70] (just below the threshold) and (70,80] (just above the threshold).

	(1)	(2)	(3)
	Standardized # of Leads	Standardized # of Reviews	Standardized # of Orders
Alert Period ×(Score≤70)	-0.0893*** (0.0293)	-0.0992*** (0.0345)	-0.167 (0.104)
Alert Period	0.0104 (0.00979)	-0.0341* (0.0204)	0.0886 (0.0595)
N	3329	3088	878
Fixed Effects Model	Business Linear	Business Linear	Business Linear

Panel C. Use the sample of restaurants above the alert threshold. Test differential impacts on restaurants with different hygiene scores.

	(1)	(2)	(3)
	Standardized # of Leads	Standardized # Reviews	Standardized # Orders
Alert Period ×Ln(Score)	0.0103 (0.0115)	-0.0845 (0.0644)	-0.438 (0.282)
Alert Period	0.00902*** (0.00321)	0.343 (0.290)	2.010 (1.265)
N	26116	23518	4697
Fixed Effects Model	Business Linear	Business Linear	Business Linear

Standard errors in parentheses, clustered at the business level. * p<0.10, ** p<0.05, *** p<0.01

Note: The regressions use the same sample as the those reported in Table 1. In this section, we conduct robustness and placebo tests using alternative samples and placebo cutoffs for hygiene alerts.

Table A7: Do Alerts Improve Future Scores?

	(1)	(2)
	(Score \leq 70)	(Score \leq 70)
(LagScore \leq 70) \times 1st Inspection After Alert	-0.114** (0.0527)	-0.233*** (0.0757)
(70<LagScore \leq 85) \times 1st Inspection After Alert	0.0140 (0.0136)	0.0248 (0.0187)
(LagScore \leq 70)	-0.182*** (0.0257)	0.0424 (0.0495)
(70<LagScore \leq 85)	-0.00138 (0.00598)	-0.00739 (0.0137)
1st Inspection After Alert	-0.000282 (0.00449)	-0.00573 (0.0145)
Month Dummies	x	x
Linear Time Trend (by month)	x	x
Business Fixed Effects	x	x
	15,754	8,209

Standard errors in parentheses, clustered at the business level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: **1** The table reports panel regression results that investigate hygiene score changes for restaurants with a score of 70 or below in the previous inspection. **2** The sample in column (1) consists of all inspections before the alert period and the first inspection after the alert. The sample in column (2) only includes the last inspection before the alert period and the first inspection after the alert.

Table A8: Effects of Hygiene Alerts on Restaurant Exit
Panel A. Cross-sectional Regression

	$I(Exit_i)$			
	(1)	(2)	(3)	(4)
<i>ScoreEverBelow70</i>	0.0032 (0.0180)	-0.0009 (0.0184)		
$\overline{Ln(\overline{Score}_{i,mth})}$			-0.0938 (0.0622)	-0.0732 (0.0644)
$\overline{ReviewRating}_{i,mth}$		-0.0225** (0.0092)		-0.0210** (0.0092)
<i>Constant</i>	0.0231 (0.0238)	0.112** (0.0496)	0.447 (0.282)	0.436 (0.290)
Price Category Dummies	X	X	X	X
N	3,817	3,705	3,817	3,705

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01

Note: **1** The regressions in Panel A analyzes whether restaurants with lower hygiene scores are more likely to exit during the sample period. **2** We focus on the sample of 3,817 restaurants for which we observe hygiene scores since January 2014 and are operating in January 2014. **3** *ScoreEverBelow70* is an indicator of whether the restaurant has ever received a hygiene score 70 or below between January 2014 and December 2016. $\overline{Score}_{i,mth}$ and $\overline{ReviewRating}_{i,mth}$ are average monthly ratings between January 2014 and December 2016. **4** The number of observations in columns (2) and (4) is less than 3,817 since some restaurants do not have review ratings.

Panel B. Panel Regression

	$I(Exit_{i,regime})$		$I(Exit_{i,mth})$	
	(1)	(2)	(3)	(4)
<i>ScoreEverBelow70</i> × <i>AlertPeriod</i>	0.00027 (0.0134)		0.0045* (0.0026)	
<i>ScoreEverBelow70</i>	0.00763 (0.0233)		-0.0005 (0.0009)	
$\overline{Ln(\overline{Score}_{i,mth})}$ × <i>AlertPeriod</i>		-0.0204 (0.0363)		-0.0112** (0.00442)
$\overline{Ln(\overline{Score}_{i,mth})}$		-0.0961 (0.0678)		0.0012 (0.0015)
<i>AlertPeriod</i>	0.0275*** (0.0055)	0.459 (0.305)	-0.0016* (0.0009)	0.0491** (0.0200)
<i>Constant</i>	-0.0022 (0.0063)	0.0916 (0.164)	0.0010** (0.0004)	-0.0043 (0.0066)
Price Category Dummies	X	X	X	X
Linear and Quadratic Time Trend			X	X
N	7,473	7,473	129,401	129,401

Standard errors in parentheses, clustered at the restaurant level. * p<0.10, ** p<0.05, *** p<0.01

Note: **1** The table in Panel B show the effects of the hygiene alert intervention on restaurant exits. Note that since we cannot obtain historical hygiene score data before the hygiene score posting intervention, we are not able to analyze the effect of the hygiene score posting on exits. **2** We focus on the sample of 3,817 restaurants on which we observe hygiene scores since January 2014 and are operating in January 2014. Among all restaurants, 417 restaurants, or 10.9%, have exited between January 2014 and December 2016. The unit of observation in column (1) and (2) is a restaurant is a given “regime” (before or after the hygiene alert intervention). To control for general time trend due to seasonality or restaurant aging, we use restaurant monthly data in column (3) and (4) and control for linear and quadratic time trend. **3** *ScoreEverBelow70* is a dummy variable indicating whether the restaurant’s hygiene score has hit 70 or below in the given regime or a quarter. $\overline{Score}_{i,mth}$ is the average of the restaurant’s monthly hygiene scores. The sample average of score is 90, and its log value is 4.5. *AlertPeriod* is the indicator of the period after the hygiene alert intervention.