

THE EFFECT OF INFORMATION SALIENCE ON PRODUCT QUALITY: LOUISVILLE RESTAURANT HYGIENE AND YELP.COM

Matthew Philip Makofske*

Abstract

In June 2013, Louisville, Kentucky, announced plans to provide restaurant health inspection scores—already available on the city’s website—for publication on Yelp.com. I find that this increased salience caused substantial hygiene improvements among independent Louisville restaurants across three different counterfactual models. Among independent Louisville restaurants, estimates suggest the partnership caused anywhere from a 9-14% relative decrease in inspection score point deductions, with the effect being entirely evident in restaurants’ first inspections following the partnership’s announcement. Relative to the rest of Kentucky, I find that the partnership significantly reduced rates of severe food poisoning in Louisville.

JEL: L15, I18, K32

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*Department of Economics and Finance, Murray State University, 307 Business Building, Murray, KY, 42071. Email: mmakofske@murraystate.edu I am very grateful to John Conlon, Carl Kitchens, Charles Moul, Austin Smith, Le Wang, seminar participants at Miami University and Xavier University, and two anonymous referees for many helpful comments. Any remaining errors are mine.

1 Introduction

Foodborne illness is a persistent public health issue in the United States. In 2011, the Centers for Disease Control and Prevention (CDC) estimated that foodborne illness makes 48 million Americans (about 1 in every 6) sick every year, resulting in roughly 128,000 hospitalizations, and 3,000 deaths.¹ Moreover, the CDC estimates that in 2013, restaurants accounted for 60 percent of the foodborne illness outbreaks in the US that had a single known food-preparation source.² Because foodborne illness due to improper food handling/preparation/storage is preventable, many governments have turned to mandatory disclosure policies as a means of inducing restaurant hygiene improvements.

Jin and Leslie (2003) find that the display of hygiene grade cards in restaurant windows, which was required by Los Angeles County in 1998, corresponded with a 5.3 percent increase in restaurant inspection scores, suggesting that restaurants improved hygiene quality in response to the policy change. Restaurant hygiene is an example of a product attribute for which a mandatory disclosure policy should motivate producers to improve quality. All else the same, consumers likely prefer restaurants with better hygiene, but substantial information asymmetries exist. Save for extremes, variation in hygiene across restaurants is typically imperceptible to consumers, both before and after purchase. By reducing these information asymmetries, mandatory disclosure of hygiene information should result in consumers substituting toward cleaner restaurants. In anticipation of this consumer response, restaurants should improve hygiene quality on average.

In light of the aforementioned statistics, the Jin and Leslie (2003) result makes mandatory disclosure policies an understandably attractive regulatory tool. If effective in inducing this salutary producer response, mandatory disclosure policies would seem a relatively inexpensive method for improving the quality of certain product attributes (like, *e.g.*, safety) in

¹See <http://www.cdc.gov/foodsafety/foodborne-germs.html>.

²See Centers for Disease Control and Prevention (2013), or <http://www.cdc.gov/features/foodborne-diseases-data/>.

a variety of industries.³ Ho (2012) assesses similar policies in San Diego and New York and points out that flawed implementation likely inhibited their effectiveness. Producer response will depend on the extent to which a given disclosure policy reduces the existing information asymmetries. Disclosed product quality information may not factor in consumer decisions if it is relatively costly to acquire or difficult to process,⁴ and information salience has been found to affect consumer choices in a variety of settings.⁵ In this paper, I use a partnership between the city of Louisville, Kentucky, and the online review forum Yelp.com, to examine how disclosure of product quality information on a popular digital platform compares to existing policies of “offline” disclosure, or online disclosure on seldom-visited government websites.

In late June of 2013, the city of Louisville announced plans to provide restaurant health inspection data to Yelp.com for publication on their website. At that time, this information had been publicly available on the city’s website for several years, and Louisville had required restaurants to post health inspection placards since 1996. Thus, the partnership between Louisville and Yelp did not change the extent, but rather the salience of restaurant hygiene information available to consumers. As such, it also reduced the costs to consumers of acquiring this information and comparing hygiene quality across restaurants. This partnership provides an opportunity to understand how producers of a multi-attribute good (food service), respond to the increased salience of information regarding a particular attribute of their product (hygiene), as well as the implications of disclosing product quality information on digital platforms where consumers actually make decisions about where to eat.⁶

In addition to the time-series variation this partnership creates, I exploit two sources

³Presumably, this is relatively less expensive than measures which would require the employment of additional inspectors, like increasing the frequency or duration of routine inspections.

⁴This information may be costly to acquire if consumers must go inside the establishment, or search city/county websites to learn about a restaurant’s most recent health inspection. The information may be difficult to process if the scale or criteria for scoring are unclear, or if there is little variation in scores across restaurants.

⁵See *e.g.*, Chetty et al. (2009), Bollinger et al. (2011), or Luca and Smith (2013).

⁶Disclosure in restaurant windows may stop a consumer from entering a restaurant who’s hygiene quality is poor. It would seem quite costly though for a consumer to visit multiple locations, or search multiple restaurant names in an obscure Government database, in the process of choosing where to eat.

of cross-sectional variation in information salience by: (1) comparing Louisville restaurants with those in Lexington, KY, where there was no such partnership, and (2) comparing independent and chain-affiliated restaurants within Louisville. Consumers use Yelp to gather information on multiple characteristics of a restaurant’s product, such as food quality, types of dishes, prices, and so on. The restaurant chain however, by conferring the reputation of a brand upon member establishments, precedes Yelp as a mechanism for conveying such information. For independent restaurants, information on Yelp takes the place of information that would be conveyed through a chain’s reputation; while for chain-affiliated restaurants, Yelp merely supplements such information. Thus, information acquired through Yelp will form a relatively more salient component of what consumers know about independent restaurants. Also, because Yelp provides relatively less additional information to consumers regarding chain-affiliated restaurants (and relatively more additional information regarding independent restaurants), consumers are more likely to use Yelp to acquire information on independent restaurants, than say, an Olive Garden or T.G.I. Friday’s.⁷

Empirically, I utilize detailed data from more than 10,000 Louisville Metro Department of Health and Wellness (DHW hereafter) restaurant inspections, which span January 2011 to January 2016. These are supplemented with data from more than 6,000 restaurant inspections in Lexington, KY. I estimate the effect of the Louisville-Yelp partnership (LYP hereafter) on hygiene quality among independent Louisville restaurants, and find evidence of significant and substantial improvement which is robust to three alternative counterfactual models.

Triple-difference estimates comparing independent and chain-affiliated restaurants in Louisville and Lexington, before and after the announcement of the LYP, suggest the increased information salience resulted in a 13.1 to 14 percent relative decrease in point deductions (from a perfect inspection score of 100 points) among independent Louisville

⁷Consistent with this, Luca (2016) finds that while revenue for independent restaurants in Seattle, Washington, is very sensitive to their Yelp rating, revenue for chain-affiliated restaurants is effectively unresponsive to changes in their Yelp rating.

restaurants. Within Louisville, comparing independent and chain-affiliated restaurants before and after the LYP announcement, I find that, per inspection, the partnership led to: a 10 percent relative decrease in health code violations, a 12.1 to 12.5 percent decrease in point deductions, and a 27 to 36 percent relative decrease in critical violations (those deemed to pose the greatest public health risk) among independent Louisville restaurants.⁸ Comparing independent restaurants from Louisville and Lexington, before and after the LYP announcement, estimates suggest that the partnership led to a 9 to 10.3 percent relative decrease in deducted points among independent Louisville restaurants.

I also find that this new form of disclosure carried substantial public health benefits. Disclosing health inspection scores on a digital platform like Yelp reduces the cost to consumers of comparing hygiene quality across restaurants, because Yelp is already designed to facilitate the comparison of restaurants within a price range, neighborhood, type of cuisine, or proximity to the user's current geographic location. Thus, beyond inducing average hygiene improvements by restaurants, the LYP may also reduce the incidence of foodborne illness by facilitating consumer sorting toward restaurants with better health inspection scores. Using emergency department discharge data from the Healthcare Cost and Utilization Project (HCUP) spanning 2011-2014, difference-in-differences estimates comparing Louisville to the rest of Kentucky suggest that Louisville avoided as many as 140 serious food poisoning cases in 2014 alone due to the partnership.

In the space remaining, I review the announcement and nature of the LYP, and the data used in this paper, and my approaches to estimation. My primary results, triple-difference estimates of the LYP's effect on independent Louisville restaurant hygiene, are then presented. Next, I estimate the LYP's effect on independent Louisville restaurants with difference-in-differences; first, comparing independent Louisville restaurants with chain-affiliated Louisville restaurants, and then comparing independent Louisville restaurants with independent Lexington restaurants. This is followed by assessment of the types of health

⁸Violation-specific data are not available for the Lexington inspections.

code violation involved in the response of independent Louisville restaurants to the LYP, the dynamics of this response, and the effect of the LYP on food-poisoning rates. I conclude with several checks of the robustness these results.

2 Overview of the Louisville-Yelp Partnership

On June 26, 2013, the Louisville Mayor’s office issued a press release announcing that Louisville was partnering with Yelp to incorporate restaurant health inspection scores into their popular consumer-review site.⁹ At the time of the announcement, the plan was to begin incorporating these scores later that same summer, and this was well underway by August of 2013.¹⁰

For the purposes of this paper, an important aspect of the LYP is that it did not change the type or extent of hygiene quality information available to the public. The Louisville Metro DHW conducts periodic unannounced health inspections of restaurants during which inspectors record any detected violations of the health code. Violations of the health code carry prescribed point deductions, and these deductions are subtracted from 100 to generate the restaurant’s health inspection score. The data provided to Yelp by the Louisville DHW have been available online at the city’s open data portal since 2011, and on the city’s website prior to that.¹¹ Because health inspection histories for restaurants were already publicly available, the LYP did not increase the provision of restaurant hygiene information. Rather, it increased the salience of this information for consumers who use Yelp to decide where to eat.

Yelp publishes each Louisville restaurant’s most recent health inspection score on the top page of an establishment’s profile. This means that the most recent health inspection

⁹The press release from the city of Louisville is found at <http://www.gotolouisville.com/media/news-releases/news-details/index.aspx?nid=978>.

¹⁰See <http://louisville.eater.com/2013>.

¹¹The city of Louisville open data portal is found online at <http://portal.louisvilleky.gov/service/data>. Prior to the launch of the open data portal, restaurant inspection scores could be found at <http://portal.louisvilleky.gov/applications/RestaurantInspectionScores>.

score is prominently displayed, and visible when consumers first land on an establishment's Yelp profile. As seen in Figure 1, the most recent health inspection score is found in a box on the right side of the profile's top page. The restaurant's hours of operation, price range, and a link to their menu are found in this same box. Immediately to the right of the most recent score is a hyper-link labeled "Health inspection". Clicking on this hyper-link takes consumers to a page like the one displayed in Figure 2. There, the date and type of the establishment's most recent health inspection are provided, along with a description of any reported violations. Below that, the restaurant's "Health Inspections" page gives a table with similar information from their prior inspections.

It is worth emphasizing that a restaurant's most recent inspection score is displayed atop their profile rather than an average, and visitors must navigate to a separate page to view a restaurant's health inspection history. This means that regardless of a restaurant's health inspection history, any future changes in the hygiene quality information displayed atop their Yelp profile will be determined only by their performance on their next inspection. Thus, for restaurants whose revenue is sensitive to information on Yelp, the LYP should increase the expected cost of performing poorly on their next health inspection, regardless of their health inspection history.

3 Data and Estimation Samples

3.1 Louisville Inspections

The data pertaining to Louisville restaurant health inspections come from the city of Louisville's online open data portal.¹² I merge information from the city's datasets titled "health inspections", "establishments", and "inspection violations" to form my initial raw dataset of 36,821 total observations on 5,649 unique establishments. Each observation is an

¹²The Louisville Metro Open Data Portal is cited in the references under Louisville Metro Government (2016).

inspection conducted by the Louisville DHW. Observations include the date of the inspection, the name of the establishment inspected, an identification number for the establishment, and the name, address, opening year, number of seats, and type of the establishment. Observations also include the number of violations detected (both critical and non-critical), the restaurant's overall inspection score (out of 100), and an identification number for the DHW employee who conducted the inspection.

I clean and parse these raw data over several steps to arrive at the sample used in estimation. First, I keep observations from regular/routine inspections only, and drop all observations from follow-up or other unconventional inspection types. The raw data from the city go back as early as 2006, but only 9 observations are of restaurant inspections conducted prior to 2011. I drop these 9 observations as the data prior to 2011 appear incomplete. I keep only observations from establishments that had at least two inspections before the announcement of the LYP, and at least one inspection after. I mark the post-announcement period as beginning July 1, 2013.¹³ I also exclude observations from non-restaurant establishments which leaves data from 10,928 inspections conducted by the DHW on 1,204 different food-service establishments.

In Louisville, food service establishments are supposed to receive routine or "regular" inspections approximately every 180 days. Naturally, restaurant inspections within the sample often occur at intervals substantially shorter or longer than 180 days, presumably, to prevent restaurants from anticipating when their next inspection will occur. Among 9,724 observations on restaurants, the average elapsed time between inspections is 191.36 days, with a standard deviation of 55.17 days.¹⁴ "Follow-up" inspections occur after a restaurant fails a routine inspection (receives an inspection score below 85). They are conducted at the request of the restaurant, and are supposed to occur within 10 business days (14 days total) of the request for a follow-up inspection. Within the remaining inspections of restaurants, I

¹³Although the city's statement was released Wednesday June 26, 2013, I mark the post-announcement period as beginning the following Monday, to allow for this information to spread.

¹⁴For restaurants' initial observations in the sample, days elapsed since the prior inspection is unobserved, hence the 9,724 observations.

exclude 25 observations which appear to have been follow-up inspections that were miscoded as regular inspections.¹⁵

For each observation, my data include the number of detected violations, as well as an overall inspection score. Violations are categorized as critical and non-critical, with critical violations being those deemed to pose more serious health risks.¹⁶ The inspection score is a function of the number critical and non-critical violations detected. Inspections in which no violations are detected results in a score of 100. Non-critical violations carry 1 or 2-point deductions, and critical violations carry 4 or 5-point deductions. It is important to note that for a given violation of the health code, there is a prescribed point deduction. Thus, for a given set of reported violations, the inspector has no discretion over the score assigned to the restaurant.

I use establishment names to account for which restaurants are chain-affiliated and which are independent. A complete list of the Louisville establishment names sorted as chain-affiliated is provided in Tables A15 and A16 of the Appendix. The final Louisville estimation sample contains 670 independent restaurants, and 534 chain-affiliated restaurants. After checking Yelp, I am able to match 643 of these independent restaurants to Yelp profiles. However, 27 of the independent restaurants do not presently have an existing (or former) Yelp profile, meaning they likely would not have had a Yelp profile at any point in the sample period. Seeing as these 27 restaurants would not have been exposed to the increased salience of the LYP, I group them among the chain-affiliated restaurants (the “control” group) in estimation.¹⁷

¹⁵Among 9,724 observations where this information is available, there are only 26 inspections which occurred within 16 days of the restaurants’ previous inspections, 25 of which followed failed inspections. That is, the inspections preceding these 26 observations were failed at a frequency of 0.9615. Among all 9,724 observations, inspections are failed at a frequency of 0.0692. Note also that 16 days elapsed since the previous inspection lies about 3.18 standard deviations away from the mean, and 99.72 percent of the 9,724 observations on days elapsed were greater than 16 days.

¹⁶A list of these critical violations is provided in Table A1 of the Appendix.

¹⁷Because these restaurants account for relatively few observations, estimates of interest change very little if they are grouped as independent, or if observations from these restaurants are simply dropped (estimates with the restaurants dropped are provided in Table A8 of the Appendix).

3.2 Lexington Inspections

I collect Lexington-Fayette County restaurant inspection data from two separate sources. A database maintained by the Lexington Herald-Leader contains inspection data, but the data only go back to late September 2013.¹⁸ I collect data on all routine inspections spanning September 24, 2013 to January 7, 2016. I merge these observations with inspections from City-Data.com spanning January 1, 2011 to October 18, 2013.¹⁹ The data include the date of the inspection, the name of the restaurant, and the inspection score. The City-Data.com observations do not record whether an inspection was routine or a follow-up. In the Lexington Herald-Leader observations, routine inspections of the same restaurant are always conducted at least 11 days apart.²⁰ Thus, I drop 44 observations from the City-Data sample which occurred within 10 days of a restaurant's most recent inspection.

Summary statistics for the Louisville and Lexington estimation samples are provided in Table 1. Deducted points (per inspection), inspections in the sample (per establishment), and inspections before and after the LYP announcement (per establishment), are summarized for all Louisville restaurants, all Lexington restaurants, and for chain-affiliated and independent restaurants within each city. Summaries of violations (per inspection), critical violations (per inspection), and number of seats (per establishment) are reported for Louisville restaurants only, because the Lexington data do not report these variables.

4 Empirical Considerations

4.1 Methodology

To identify the effect of information salience on restaurant hygiene, I first employ a triple-difference (or difference-in-difference-in-differences) approach, comparing independent

¹⁸The database is found at <http://www.kentucky.com/news/databases/article44492559.html>.

¹⁹The City-Data.com data are found at <http://www.city-data.com/ky-restaurants/>.

²⁰On average, 189.93 days elapse between routine inspections of the same restaurant in that sample, with a standard deviation of 83.13 days.

and chain-affiliated restaurants from Louisville and Lexington, before and after the LYP announcement. By utilizing variation along three dimensions (time, location, and restaurant type), this approach can account for both Louisville-specific and region-wide contemporaneous shocks which might otherwise confound estimation of the LYP's effect. Within Louisville, comparing the health inspection performances of independent and chain-affiliated restaurants before and after the LYP announcement, exploits the underlying difference in the salience of, and responsiveness to, information on Yelp between independent and chain-affiliated restaurants. Evaluating total deducted points per inspection, a simple difference-in-differences estimate is provided in Table 2 and suggests that, even before accounting for any other restaurant or inspection-specific characteristics which might affect inspection scores, independent Louisville restaurants were significantly more responsive to the LYP than chain-affiliated Louisville restaurants, as expected.

Utilizing this particular source of variation is supported by Figures 3 and 4 which compare the paths of deducted points among independent and chain-affiliated Louisville restaurants in inspections around the LYP announcement. Figure 3 plots average deducted points, and Figure 4 plots average residuals from regressing deducted points on an establishment's logged number of seats, logged age at the time of the inspection, and indicators for the year in which the restaurant opened, and the inspection's day of the week and inspector.²¹ Notice that in both figures, inspection outcomes for independent and chain-affiliated Louisville restaurants follow stable pre-announcement paths that are quite similar, suggesting that those common paths would have persisted in the absence of the LYP. Notice also from Figure 4 that, as expected, the LYP appears to have little if any effect on chain-affiliated Louisville restaurants.

Independent and chain-affiliated restaurants in Louisville were both exposed to the LYP. Thus, the use of difference-in-differences within Louisville will be confounded if some contemporaneous regional or nationwide shock affected independent restaurants' incentives for

²¹On the horizontal axis, 0 marks restaurants' last inspections prior to the LYP announcement, -1 marks their second-to-last inspections prior the announcement, and so on. The value 1 marks their first post-announcement inspections, 2 their second post-announcement inspections, and so on.

hygiene provision more so than chain-affiliated restaurants. For instance, perhaps the growing popularity of online review websites provided independent restaurants with stronger incentives to improve hygiene quality? After all, hygiene quality may directly factor in the consumer ratings of restaurants on Yelp, as well as correlate with other characteristics influencing consumer reviews. To account for the possibility of such a confounder, I merge the Louisville and Lexington samples and initially estimate the effect of the LYP using the triple-difference approach specified below:

$$\begin{aligned}
Y_{i,t} = & \beta_1 (Post_{i,t} \times Lou_i \times IND_i) + \beta_2 (Post_{i,t} \times Lou_i) + \beta_3 (Post_{i,t} \times IND_i) \\
& + \beta_4 Post_{i,t} + \beta_5 (IND_i \times Lou_i) + \beta_6 Lou_i + \beta_7 IND_i + \mathbf{X}_{i,t}' \boldsymbol{\beta} + b_i + \epsilon_{i,t}.
\end{aligned} \tag{1}$$

The initial outcome variable, $Y_{i,t}$, is the total number of points deducted from 100 in the t^{th} inspection of restaurant i . $Post_{i,t}$ is an indicator variable equal to 1 if the t^{th} inspection of restaurant i occurred after the LYP announcement, and equal to 0 otherwise. Lou_i is an indicator variable equal to 1 if restaurant i is in Louisville, and equal to 0 if restaurant i is in Lexington; and IND_i equals 1 if restaurant i is independent, and equals 0 otherwise. The vector \mathbf{X} includes fixed effects for the day of the week in which an inspection occurs, and a linear trend variable, t .

Equation (1) constructs an estimate of the LYP's effect on independent restaurants that should be robust to contemporaneous (with the LYP announcement) local or non-local shocks which might otherwise explain the effects observed in Louisville. To see this, note that the triple-difference estimate, $\hat{\beta}_1$, is equivalent to a difference-in-differences estimate between independent and chain-affiliated restaurants in Louisville ($\hat{\beta}_1 + \hat{\beta}_3$), minus a similar difference-in-differences (DD) estimate from Lexington ($\hat{\beta}_3$), where neither independent nor chain-affiliated restaurants were affected by the LYP. The Louisville DD uses the post-announcement change among chain-affiliated Louisville restaurants as a counterfactual estimate for independent Louisville restaurants. This should account for any contemporaneous and unobserved Louisville-specific shock that might have improved inspection performance

across all restaurants. Then, the Lexington DD serves as a counterfactual estimate for the difference-in-differences among independent and chain-affiliated restaurants in Louisville. If some contemporaneous regional or nationwide change caused independent restaurants to improve hygiene quality relative to chain-affiliated restaurants, the Louisville and Lexington DD estimates will be similar in sign and magnitude, and offset each other, pushing the triple-difference estimate toward zero.

4.2 Assessing Pre-Announcement Trends in Louisville

In equation (1), the change in average deducted points by chain-affiliated Louisville restaurants, before and after the LYP announcement, provides a counterfactual estimate for independent Louisville restaurants. The validity of this rests on the assumption that, in the absence of the LYP, average deducted points among independent and chain-affiliated Louisville restaurants would have followed similar trends in the post-announcement period. Figures 3 and 4 support that assumption by showing similar paths in the pre-announcement period. To supplement this graphical evidence, I statistically test for different pre-announcement trends among independent and chain-affiliated Louisville restaurants by estimating the following equation:

$$DeductedPts_{i,t} = \alpha_1(T_{i,t} \times IND_{i,t}) + \alpha_2 T_{i,t} + \mathbf{X}_{i,t}' \boldsymbol{\alpha} + a_i + u_{i,t}. \quad (2)$$

$T_{i,t}$ is a trend variable defined using the LYP announcement as a reference point (as opposed to $t_{i,t}$, where a restaurant's first inspection in the sample is the reference point). $T_{i,t}$ equals 1 in a restaurant's fifth inspection prior to the LYP announcement, and equals $1 + n$ in a restaurant's n^{th} inspection after that. Thus, for all restaurants in the Louisville sample, $T_{i,t}$ equals 5 in their last inspection before the LYP announcement. Equation (2) is estimated using Louisville observations from the pre-announcement period only. Under the null hypothesis that average deducted points for independent and chain-affiliated Louisville

restaurants followed common trends prior to the LYP announcement, $\alpha_1 = 0$.

Estimates of equation (2) are presented in Table 3. Notice that under all specifications, the pre-announcement trend for independent Louisville restaurants is not significantly different from the pre-announcement trend among chain-affiliated Louisville restaurants. While this evidence supports the existence of common pre-announcement trends across inspections, I also test whether different quarter-year or half-year trends might have existed between independent and chain-affiliated restaurants in the pre-announcement period. Estimates of equation (2) with quarter-year and half-year trends replacing $T_{i,t}$, are reported in Tables A2 and A3 of the Appendix respectively. All specifications fail to reject the null hypothesis of common pre-announcement trends within Louisville.

5 Results

5.1 The Effect of Information Salience on Deducted Points: Baseline Results

Given their robustness to both Louisville-specific and region-wide contemporaneous shocks that might have otherwise affected independent-restaurant hygiene quality, triple-difference estimates using the Louisville and Lexington samples provide my baseline results. Table 4 reports estimates of equation (1) under two specifications. Column (1) reports simple triple-difference estimates with no additional controls. Column (2) estimates include restaurant and day-of-week fixed effects as well as a linear trend variable, $t_{i,t}$, which equals t in the t^{th} inspection of the sample for restaurant i . Under both specifications, estimates suggest a significant and substantial response to the LYP by independent Louisville restaurants. Relative to their pre-announcement mean of 5.583, these estimates suggest a 13.11 to 14.06 percent decrease in deducted points per inspection.

Under the full specification in column (2), the average change in deducted points from the pre-announcement period to the post-announcement period was: -0.3215 for chain-affiliated

Lexington restaurants, -0.1934 for independent Lexington restaurants, -0.0921 for chain-affiliated Louisville restaurants, and -0.6960 for independent Louisville restaurants. Column (2) suggests a difference-in-differences (independent minus chain) estimate within Lexington of 0.1280, and a difference-in-differences estimate within Louisville of -0.6039. That is, after including controls, independent Louisville restaurants improved relative to Louisville chains following the LYP announcement by 0.6039 points per inspection on average. In Lexington however, chain-affiliated restaurants actually improved on average relative to independent restaurants in the post-announcement period by 0.1280 points per inspection. This suggests that the LYP was not coincident with other regional or nationwide changes inducing independent restaurants to improve hygiene quality relative to chains.

The triple-difference estimate treats the Lexington DD as the counterfactual difference-in-differences for Louisville restaurants, hence the estimate that, on average, independent Louisville restaurants improved by $0.6039 + 0.1280 = 0.7319$ points per inspection in response to the LYP. It assumes that, absent the LYP, chain-affiliated Louisville restaurants would have improved relative to independent Louisville restaurants in the post-announcement period by 0.1280 points per inspection. Alternatively, the Louisville difference-in-differences (of -0.6039) provides a more conservative estimate of the LYP's effect. The triple-difference approach is beneficial in that it will be robust to any coincidental regional or nationwide changes that may have induced independent restaurants to improve hygiene quality relative to chains. However, as the estimates in Table 4 do not suggest any such shock, difference-in-differences within Louisville assumes a counterfactual that is perhaps more credible. Independent and chain-affiliated restaurants in Louisville share a market, are subject to the same set of inspectors, and their average outcomes appear to follow common trends in the pre-announcement period. Additionally, because the Louisville data include restaurant and inspection-specific features that the Lexington data do not (notably, an identifier for the inspector conducting an inspection, as well as the number of critical and non-critical violations committed in an inspection), I now restrict the estimation sample to Louisville inspections only, and estimate

the effect of the LYP on deducted points with additional controls included. Following this, I estimate the effect of the LYP using independent Lexington restaurants as an alternative comparison group. Then, I assess the effect of the LYP on critical violations and the incidence of food poisoning.

5.2 The Effect of Information Salience on Deducted Points: Additional Controls

To control for a variety of additional characteristics which may affect deducted points, I restrict the estimation sample to Louisville inspections only, and estimate the following equation:

$$Y_{i,t} = \gamma_1(Post_{i,t} \times IND_i) + \gamma_2 Post_{i,t} + \gamma_3 t_{i,t} + \mathbf{X}_{i,t}' \boldsymbol{\gamma} + c_i + \epsilon_{i,t}. \quad (3)$$

Louisville difference-in-differences estimates under three additional specifications are reported in Table 5. In column (1), the included controls are a restaurant’s logged age and number of seats, fixed effects for a restaurant’s zip code and opening year, and fixed effects for an inspection’s inspector and day of the week. Column (2) reports estimates under a preferred specification in which the restaurant’s logged age, as well as restaurant, inspector, and inspection day-of-the-week fixed effects are included as controls. The estimates in column (3) include two additional controls beyond those from column (2). One is the log of the number of days elapsed since a restaurant’s last inspection. The other, $DiffInspector_{i,t}$, is an indicator equal to 1 if the inspector conducting the t^{th} inspection for restaurant i , is different than the inspector who conducted the restaurant’s $(t - 1)^{th}$ inspection. The inclusion of $DiffInspector_{i,t}$ is motivated by Jin and Lee (2014) and Jin and Lee (2018), who study restaurant inspections in Florida, and find evidence that inspectors who did not conduct a restaurant’s previous inspection, detect more violations. A drawback to this specification is that for all observations where $t = 1$, the values of both of these additional controls are

unknown, and these observations must be dropped in estimation.²²

Notice that the estimated effect of the LYP on independent restaurants is statistically significant, and similar in magnitude across all three specifications. Under the preferred specification in column (2), the average effect is estimated to be a reduction in deducted points per inspection of 0.6756, which is substantial. Relative to the pre-announcement average among independent Louisville restaurants, this represents a 12.1 percent decrease in deducted points per inspection in response to the LYP. Note also that under the preferred specification, the estimated response among chain-affiliated Louisville restaurants is statistically insignificant and very small, as expected.

In column (3), facing an inspector who did not conduct the restaurant’s preceding inspection is associated with a significant and substantial increase in point deductions. Specifically, an inspector who is different from the one who last inspected a restaurant, is projected to deduct 11.89 percent more points than an inspector on a repeat visit to an establishment. The sign, significance, and magnitude of this result is very consistent with the findings of Jin and Lee (2018), who find that inspectors who are new to a restaurant detect 12.7 to 17.5 percent more violations than inspectors in their first repeat inspections of restaurants. They attribute this result to “fresh eyes” better detecting violations.²³

To provide a slightly different frame of reference for interpreting these results, estimating equation (3) under the preferred specification with the number of violations per inspection as the dependent variable produces a coefficient on $(Post_{i,t} \times IND_i)$ of -0.3202 (nearly one third of a violation), which is statistically significant at the 99 percent significance level. Relative to the pre-announcement average of 3.5756 this represents a 8.96 percent decrease in violations per inspection among independent restaurants.

²²Even for restaurants whose first inspection in the sample is not their first inspection ever, the values of both controls are still unknown.

²³Table A4 in the Appendix presents Poisson model estimates of equation (3). Standard errors are robust to violations of the Poisson model’s equidispersion assumption, and are reported in parentheses. Again, estimates of the LYP’s effect are statistically significant and very similar in magnitude across all three specifications. These estimates are also very similar to their corresponding linear model estimates in sign, significance, and magnitude.

Recall from Table 2 that chain-affiliated restaurants were cleaner on average in the pre-announcement period. A potential concern is that the change over time (pre-announcement to post-announcement) observed among chain-affiliated restaurants may understate the counterfactual change for independent restaurants, because there is a fundamental lower bound on deducted points at zero. In an attempt to address this issue, I estimate equation (3) replacing restaurant fixed effects with fixed effects for the half-point interval to which a restaurant's pre-announcement average for deducted points belonged. In doing so, changes over time among independent restaurants are compared with the changes over time of chain-affiliated restaurants that exhibited very similar pre-announcement hygiene quality, and thus, had similar room for post-announcement improvement. These estimates, reported in Table A5 of the Appendix, are very similar in sign, significance, and magnitude to those reported in Tables 2 and 5. A limitation to this approach is that, within each of these half-point intervals, there will still be average differences in pre-announcement hygiene quality between independent and chain-affiliated restaurants.

Alternatively, by adding one to deducted points and using the log as a dependent variable, estimating equation (3) with restaurant fixed effects provides a different means of addressing this issue. This approach estimates the LYP's effect as a percentage change relative to a restaurant's pre-announcement average. For any particular post-announcement average change in deducted points, a larger pre-announcement average (greater room for improvement) means a larger base value, and thus, a smaller percentage change. As such, this approach provides an appealing adjustment for an individual restaurant's room for post-announcement improvement. These estimates, reported in Table A6 of the Appendix, suggest an improvement among independent Louisville restaurants of 8.18 percent relative to the pre-announcement levels.²⁴

²⁴Noting that one was added to the dependent variable to avoid having to drop zero observations, this magnitude seems appropriate to suggest that the estimated effect of the LYP on independent Louisville restaurants is largely not an artifact of having greater room for improvement pre-announcement.

5.3 The Effect of Information Salience on Deducted Points: Alternative Comparison Group

In choosing a comparison group for independent Louisville restaurants, the objective is to establish an appropriate counterfactual estimate for their inspection performance. The use of chain-affiliated Louisville restaurants as a comparison group utilizes the fact that, while these restaurants were exposed to the LYP, we expect them to be mostly unresponsive to the policy change.²⁵ Advantages of this approach are that independent and chain-affiliated Louisville restaurants share a market, and are subject to the same health code and inspectors. Thus, both will be exposed to Louisville-specific shocks throughout the sample that otherwise affect hygiene quality provision, and therefore should be included in the counterfactual estimate. Perhaps most importantly, they exhibit stable and common trends in the pre-announcement period.

Alternatively, independent Lexington restaurants present another possible comparison group. An advantage with these restaurants is that, unlike chain-affiliated Louisville restaurants, they were not exposed to the LYP at all. Another advantage is that, because these are independent restaurants as well, they will account for any possible region-wide shock that is specific to independent restaurants. One drawback with this group is that they don't share a market with independent Louisville restaurants. Thus, their performance over time will not account for possible Louisville-specific shocks other than the LYP which might affect the hygiene provision and should be included in the counterfactual estimate. Their performance will also reflect potential Lexington-specific shocks which should not be included in the counterfactual estimate.

Unlike chain-affiliated Louisville restaurants, the pre-announcement path for average deducted points among this group does raise some concerns. Figure 5 plots the residuals

²⁵Results thus far have failed to reject this notion. However, to the extent that chain-affiliated Louisville restaurants may have responded to the LYP with slight hygiene improvements, the approaches used in sections 5.1 and 5.2 do not attribute those improvements to the LYP, and if anything, err on the side of understating the LYP's true effect on independent Louisville restaurants.

of independent Louisville restaurants from Figure 4, against similar residuals for independent Lexington restaurants.²⁶ Compared with the paths of independent and chain-affiliated Louisville restaurants observed in Figure 4, the pre-announcement path among independent Lexington restaurants is less stable. Initially, the average residual among this group exhibits a downward trend not seen among independent Louisville restaurants. Then, in the last pre-announcement inspection, there is a sharp and temporary increase. In the first post-announcement inspection, there is an immediate return to more typical levels where the average residual then remains. Given that independent Louisville restaurants do not exhibit such a shock in the last pre-announcement period, this raises some doubt regarding the validity of independent Lexington restaurants as a comparison group for independent Louisville restaurants. However, because this positive and apparently temporary shock occurred in the pre-announcement period, estimates should err on the side of not finding an effect for the LYP. Thus, estimates with this alternative comparison group can provide something of a lower bound on the LYP’s effect.

Difference-in-difference estimates comparing independent Louisville and Lexington restaurants are reported in Table 6.²⁷ Column (1) reports simple DD estimates. The trend variable t , as well as restaurant and inspection-day-of-week fixed effects are included as additional controls in column (2). In columns (1) and (2), notice that despite their divergent pre-announcement paths, the effect of the LYP on independent Louisville restaurants is still statistically significant and substantial in magnitude (a 9 to 10.13 percent improvement relative to their pre-announcement average), albeit slightly smaller.²⁸ In columns (3) and (4), an indicator variable equal to 1 in Lexington restaurants’ final pre-announcement inspections is included as a control. Treating the divergence observed in that set of inspections as

²⁶Due to limitations of the Lexington data, the residuals are from regressing deducted points in t and fixed effects for the inspection’s day of the week.

²⁷The indicator for independent restaurants is not reported in that tables, as the observations for these estimates are from independent restaurants only.

²⁸Estimates using $\ln(Y_{i,t} + 1)$ as the dependent variable are reported in Table A7 of the Appendix. These estimates suggest a statistically significant 10.4 percent improvement among independent Louisville restaurants relative to pre-announcement levels.

a Lexington-specific shock produces estimates of the LYP’s effect very similar in magnitude to those found using in sections 5.1 and 5.2. Thus, the general result suggesting significant hygiene improvements in response to increases in the salience of hygiene information is robust to a variety of specifications and comparison groups.

5.4 How did the Partnership Affect the Most Serious Violations?

The evidence presented thus far suggests health code violations were detected at significantly lower frequencies among independent Louisville restaurants in response to the LYP. A related question is what types of violations were detected at lower frequencies? Recall that in Louisville, $DeductedPts_{i,t}$ accounts for both critical and non-critical violations of the health code, and weighs those violations according to severity (1 to 2 deducted points for non-critical violations, and 4 to 5 deducted points for critical violations). Critical violations of the Louisville DHW health code are those which pose high public health risks, and include: spoiled food, food stored at improper temperatures, improper disposal of sewage and waste, improper dish and equipment washing, and personnel with infections not barred from working, among others.²⁹ Because these critical violations are more likely to result in foodborne illnesses, the effect of information salience on these more severe violations, is of particular interest.

To assess the effect of the LYP on high-risk restaurant hygiene practices, I estimate equation (3) within Louisville, and using the number of detected critical violations (per inspection) as the dependent variable.³⁰ Linear model estimates are presented in Table 7.³¹ Under the preferred specification reported in column (2), it is estimated that the LYP led to a reduction of 0.0348 critical violations per inspection. Among independent restaurants, there

²⁹A complete list of critical violations is provided in Table A1 of the Appendix.

³⁰A battery of parallel trends tests on critical violations, identical to those covered in Section 4.2, were conducted. All tests fail to reject the null hypothesis that critical violations among independent and chain-affiliated restaurants were on different trends prior to the announcement of the LYP. The results of these tests are found in Tables A9, A10, and A11 in the Appendix.

³¹Poisson model estimates are provided in Table A12 of the Appendix. They are very similar to the corresponding linear model estimates in sign, significance, and magnitude.

were an average of 0.0957 critical violations per inspection during the pre-announcement period, which makes the effect quite substantial. Estimates from the specification in column (2) project a pre-announcement average of 0.0974 critical violations per inspection among independent restaurants, suggesting that the LYP led to a 35.73% relative decrease in critical violations per inspection.

This very large reduction in critical violations suggests that there may have been significant public health benefits associated with the LYP. Not only did independent Louisville restaurants respond to the increased salience of hygiene information by improving health inspection scores overall, they did so in part, by reducing some of the most serious health code violations. These results suggest that the LYP led to hygiene improvements among independent restaurants that likely reduced the probability that diners would contract foodborne illness, a point that is further explored in section 5.6.

5.5 The Effect of Information Salience Over Time

The results put forward in sections 5.1, 5.2, and 5.3, estimate the average effect of the LYP on independent Louisville restaurants from July 1, 2013, through to January 8, 2016. In this subsection, I evaluate how the effect of the LYP evolved over the course of the post-announcement period. There are two reasons for examining these dynamics. First, a pertinent question is whether the effect of the LYP on restaurant hygiene is more likely permanent or temporary. If, after several post-announcement inspections, independent restaurants suspect that their revenue is no more sensitive to health inspection scores than before, independent restaurant hygiene may return to pre-announcement levels. Second, it can further address concerns over whether an unobserved change during the post-announcement period might be driving results.³²

Recall that some of the critical violations listed earlier were food stored at incorrect tem-

³²Note that in light of the triple-difference and two difference-in-differences approaches employed, for an unobserved coincident change to cause the initial results, it would have to be something that either: affected independent Louisville restaurants only, or affected independent Louisville restaurants to a greater extent than either chain-affiliated Louisville restaurants or independent Lexington restaurants.

peratures, improper disposal of waste, or improper dish washing. Other violations include improper re-serving of food, bare-hand contact with ready-to-eat food, or food from an unapproved source. I list such violations to highlight that they result from practices which restaurants should be able to remedy quickly, if motivated to do so. Thus, if the estimates presented in Tables 4, 5, and 6, indeed capture the effect of the LYP on restaurant hygiene, we should expect to observe some effect in inspections immediately following the LYP announcement. Whereas, if the estimated effect develops intermittently, or is not evident until the later inspections of the post-announcement period, it would raise concerns that the primary results are influenced by some unobserved factor.

To assess the effect's evolution over time, I augment equation (3) by including lags of $Post_{i,t}$ as follows:

$$DeductedPts_{i,t} = \left(\sum_{h=0}^4 [\alpha_h (Post_{i,t-h} \times IND_i) + \beta_h Post_{i,t-h}] \right) + \gamma_1 t_{i,t} + \mathbf{X}_{i,t}' \boldsymbol{\gamma} + c_i + \epsilon_{i,t}. \quad (4)$$

Estimating this specification with the Louisville sample tracks how the LYP's effect evolves with each successive post-announcement inspection. For example, in a restaurant's first post-announcement inspection, $Post_{i,t} = 1$, and $Post_{i,t-1} = Post_{i,t-2} = Post_{i,t-3} = Post_{i,t-4} = 0$. In a restaurant's second post-announcement inspection, $Post_{i,t} = Post_{i,t-1} = 1$, and $Post_{i,t-2} = Post_{i,t-3} = Post_{i,t-4} = 0$, *et cetera*. Thus the parameter α_0 is the change in expected $DeductedPts_{i,t}$ for independent Louisville restaurants going from the pre-announcement period to their first post-announcement inspection, minus the analogous change in expected $DeductedPts_{i,t}$ for chain-affiliated Louisville restaurants. The parameter α_1 represents the change in expected $DeductedPts_{i,t}$ for independent Louisville restaurants going from their first post-announcement inspection to their second, minus the analogous change in expected $DeductedPts_{i,t}$ for chain-affiliated Louisville restaurants, and α_2 and α_3 have similar interpretations. The parameter α_4 represents the change in expected $DeductedPts_{i,t}$ for independent Louisville restaurants going from their fourth post-announcement inspection to

any subsequent post-announcement inspections, minus the analogous change in expected $DeductedPts_{i,t}$ for chain-affiliated Louisville restaurants.³³

Estimates of equation (4) are presented in Table 8, and suggest a substantial immediate decrease in point deductions among independent Louisville restaurants.³⁴ Recall that under the preferred specification, the LYP's estimated average effect reported in Table 5 was a decrease in point deductions of 0.6756. Now, notice that this entire effect is more than evident in independent restaurants' first post-announcement inspections. In column (2) of Table 8, there is a statistically significant estimated decrease in deducted points of 0.7879 among independent restaurants in their first post-announcement inspections. Relative to their pre-announcement average, this suggests that increased salience of hygiene quality information caused an immediate 14.11 percent decrease in deducted points among independent Louisville restaurants. Following that immediate improvement in inspection scores, deducted points among independent Louisville restaurants fluctuates slightly from one inspection to the next, but none of these changes are significantly different from zero.

Table 9 implements this same approach using independent Lexington restaurants as the comparison group. Similar to those in Table 8, these estimates suggest a substantial and immediate effect. The estimates in column (2) suggest a statistically significant decrease in deducted points of 0.8694 among independent Louisville restaurants in their first post-announcement inspections. This is a 15.57 percent decrease relative to their pre-announcement average. In column (4), when an indicator variable is included to allow for a Lexington-specific shock in final pre-announcement inspections, the estimated immediate effect is a statistically significant decrease in point deductions of 1.0288, an 18.43 percent improvement relative to pre-announcement averages.

Regarding the longevity of the LYP's effect, the estimates presented in Tables 8 and 9 pro-

³³Of the 1,204 Louisville restaurants in the sample, 902 (441 independent and 461 chain-affiliated) had a fifth post-announcement inspection in the sample, but only 117 (38 independent and 79 chain-affiliated) had a sixth post-announcement inspection. Because there are so few observations of a sixth post-announcement inspection, α_4 is defined as explained above.

³⁴Poisson model estimates of equation (4) are presented in table A13 of the Appendix. All estimates are similar to corresponding linear model estimates in sign, significance, and magnitude.

vide no indication that the effect is temporary, and within the observed post-announcement period, the effect is mostly permanent. Moreover, the stark improvement among independent Louisville restaurants immediately following the announcement suggests that this effect is very likely caused by the LYP.³⁵

5.6 Did the Partnership Impact Foodborne Illness?

In this subsection, I explore what effects the LYP might have had on the incidence foodborne illness in Louisville. There are two mechanisms by which the LYP might impact the frequency of foodborne illness. First, the results presented in sections 5.1, 5.2, 5.3, and 5.4, suggest that the LYP induced average restaurant hygiene improvements which, *cet. par.*, should reduce the probability that consumers contract foodborne illnesses from restaurants. Second, displaying inspection scores on Yelp profiles substantially reduces the cost to consumers of comparing hygiene quality across restaurants. Thus, the LYP might also reduce the incidence of foodborne illness by facilitating consumer sorting toward cleaner restaurants.

I assess the public health effects of the LYP utilizing emergency department discharge data from hospitals in the state of Kentucky. These data come from the Healthcare Cost and Utilization Project's (HCUP) State Emergency Department Databases (SEDD),³⁶ and provide individual-level observations on all hospital emergency department discharges in Kentucky from 2011 to 2014. A limitation of assessing the impact of the LYP with these data is that they only capture the most severe cases of food poisoning (those that result in hospital emergency department visits). The 2011 CDC estimates referenced in Section 1 suggest that while 48 million Americans contract a foodborne illness annually, relatively few (128,000) require hospitalization. Thus, much of the LYP's effect on foodborne illness might not be reflected in the HCUP data.

³⁵With the Louisville-only sample, I also estimated equation (4) under the same three specifications, with the number of critical violations per inspection replacing $DeductedPts_{i,t}$ as the dependent variable. Under all specifications the average effect in the first post-announcement inspection is negative and relatively large, but none are significantly different from zero at conventional significance levels.

³⁶See Healthcare Cost and Utilization Project (2017).

Figure 6 shows how emergency-department diagnoses of food poisoning evolved from 2011-2014.³⁷ Navy dots mark diagnoses made at emergency departments within Louisville-Jefferson County, and maroon triangles mark diagnoses made at emergency departments elsewhere in Kentucky. The first half of 2013 (2013:H1) ended with the announcement of the LYP. To my knowledge, no other jurisdictions in the state of Kentucky introduced or significantly altered restaurant inspection or hygiene disclosure programs during this time. Figure 7 presents these plots with pre-announcement means removed to facilitate comparisons. Notice that in the pre-announcement period, especially from 2011:H2 on, the number of food-poisoning cases in Louisville followed a very similar path as the rest of Kentucky. This continued into the first half-year of the post-announcement period, where cases of food poisoning increased both in Louisville and the rest of the state. After that however, food poisonings in Louisville appear to level off, while food poisonings elsewhere in the state maintain an upward trend. The fact that food-poisoning cases in both areas tracked each other so closely in the pre-announcement period supports the use of difference-in-differences to identify the effect of the LYP on severe cases of food poisoning.

Difference-in-differences estimates of the LYP's effect on food-poisoning rates are presented in Table 10. In estimation, the unit of measure for the dependent variable is the number of emergency department discharges that included food-poisoning diagnoses. Observations are measured at the monthly level among two groups: emergency departments in Louisville-Jefferson County, and emergency departments elsewhere in Kentucky. Column (1) reports simple difference-in-differences estimates with the post period spanning July 1, 2013 onward. Under that specification, the estimated treatment effect of the LYP is a statistically significant decrease of 6.1111 food-poisoning cases per month. Figures 6 and 7 show that food-poisoning cases in Louisville continued to closely track cases in the rest of the state into the first half-year of the post-announcement period. In light of that, estimates in column (2)

³⁷I count any observation including at least one of the seven food poisoning diagnoses classified by the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-DM). These ICD-9-DM codes are: 0052, 0053, 0054, 0058, 00581, 0059, and 5070.

track how the effect evolved over the post-announcement period. Notice that in the second half of 2013, food-poisoning rates in Louisville and the rest of the state increased slightly, but in 2014, Louisville appears to have avoided as many as 11.667 serious food-poisoning cases each month. This assumes that, in the absence of the LYP, severe food-poisoning cases in Louisville would have continued to rise in 2014, as they did in the rest of Kentucky. Column (1) estimates suggest that, due to the LYP, Louisville may have avoided as many as 110 food-poisoning cases from July 2013 through December 2014. These results are especially striking given that they relate only to the most serious cases of foodborne illness.

6 Robustness Checks

6.1 Robustness to the Inclusion of Separate Trends

To further assess the validity of chain-affiliated Louisville restaurants as a comparison group, I test whether the estimated effects of the LYP are robust to the inclusion of separate trend variables for independent and chain-affiliated Louisville restaurants. This will account for any pre-existing difference in trends which might confound treatment effect estimates. However, if the LYP is effective in improving hygiene among independent restaurants, as my previous estimates suggest, the resulting post-announcement observations will cause estimates of β_3 to overstate any pre-announcement difference in trends between independent and chain-affiliated Louisville restaurants. This issue can be remedied by allowing for dynamic effects as done in equation (4). I augment equation (4) as follows:

$$\begin{aligned}
 DeductedPts_{i,t} = & \sum_{h=0}^4 [\alpha_h (Post_{i,t-h} \times IND_i) + \beta_h Post_{i,t-h}] \\
 & + \gamma_1 (IND_{i,t} \times t_{i,t}) + \gamma_2 t_{i,t} + \mathbf{X}_{i,t}' \boldsymbol{\gamma} + d_i + \epsilon_{i,t}.
 \end{aligned} \tag{5}$$

Estimates of equation (5) under the preferred specification and using the restaurants-

only sample, are reported in Table 11. Column (1) reports estimates of equation (5) as shown above. Columns (2) and (3) report estimates of equation (5) with the trend variable $t_{i,t}$ replaced by a quarter-year trend, $Q_{i,t}$, and a half-year trend, $Half_{i,t}$, respectively. Across all three specifications, estimates of the average treatment effect remain statistically significant and similar in magnitude to estimates without the inclusion of separate trends. Moreover, on the trend variables that are specific to independent restaurants, none of the coefficients are significantly different from zero. This provides further evidence that the average treatment effect estimates provided in Tables 5 and 8 do not the result of differences in pre-announcement trends between independent and chain-affiliated restaurants.

6.2 Placebo Tests Using Lead Indicators of the LYP Announcement

As a final check on the validity of chain-affiliated Louisville restaurants as a comparison group, I augment equation (3) by including leads of $Post_{i,t}$ as follows:

$$DeductedPts_{i,t} = \left(\sum_{h=0}^m [\alpha_h (Post_{i,t+h} \times IND_i) + \beta_h Post_{i,t+h}] \right) + \gamma_3 t_{i,t} + \mathbf{X}_{i,t}' \boldsymbol{\gamma} + d_i + \epsilon_{i,t}. \quad (6)$$

With the Louisville restaurant sample, I estimate equation (6) under the preferred specification four separate times with $m = 1, \dots, 4$. If coefficients on any of the leads of $(Post \times IND)$ are significantly different from zero, it might suggest that at some point in the pre-announcement period, the paths of $DeductedPts$ among independent and chain-affiliated restaurants diverged. This would call into question whether deducted points among chain-affiliated restaurants provide a reasonable counterfactual estimate for independent restaurants in the post-announcement period. The specification laid out in equation (6) provides estimates of the LYP's effect which account and penalize for, any such pre-announcement divergence.

Estimates of equation (6) are presented in Table 12. All four columns report estimates

under the preferred specification. Notice that across all four columns, the estimated average treatment effect remains statistically significant and fairly close in magnitude to, albeit slightly less than, the estimate reported in column (2) of Table 5. Notice also that across all specifications, none of the estimated coefficients on any of the leads of $(Post \times IND)$ are significantly different from zero. These results further support the difference-in-differences strategy used throughout this paper, and again suggest that the estimates of the LYP's effect reported in Table 5 identify the effect of the LYP on independent restaurant hygiene, and do not result from a pre-announcement divergence in the paths of deducted points among independent and chain-affiliated restaurants.

I also estimate equation (6) with critical violations per inspection replacing deducted points as the dependent variable. These estimates are presented in Table A14 of the Appendix. Again, all four columns report estimates under the preferred specification. Across all four columns, all estimates of the average treatment effect are very similar in magnitude to the estimate reported in column (2) of Table 7, but none of these estimates are significantly different from zero at traditional significance levels. However, notice once again that across all four specifications, none of the estimated coefficients on any of the leads of $(Post \times IND)$ are significantly different from zero.

6.3 Addressing Inspector Assignment

Recall that the estimates in column (3) of Table 5 suggest that point deductions increase significantly when restaurants face a different inspector than in their previous inspection. Changes over time in how inspectors are assigned to restaurants could potentially confound my treatment effect estimates. If, for whatever reason, independent Louisville restaurants faced different inspectors at a significantly lower frequency in the post-announcement period, then some of the observed decreases in deducted points and critical violations over that period might result from independent restaurants facing repeat inspectors more often, rather than hygiene improvements.

I address these concerns by testing whether the probability of facing a different inspector (than in the previous inspection), conditional on being an independent restaurant, decreased in the post-announcement period. To do this, I specify the following linear model:

$$DiffInspector_{i,t} = \alpha_1(Post_{i,t} \times IND_i) + \alpha_2 Post_{i,t} + \mathbf{X}_{i,t}' \boldsymbol{\alpha} + a_i + \epsilon_{i,t}. \quad (7)$$

Under the null hypothesis that the probability of facing different inspector, conditional on being an independent restaurant, decreases in the post-announcement period, $\alpha_1 < 0$. I estimate equation (7) under three specifications. The first specification is simple difference-in-differences. The second includes $t_{i,t}$, logged number of seats, logged age of the restaurant, logged days elapsed, and fixed effects for zip code, opening year of the restaurant, day of the week, and the inspector conducting the inspection. The third specification replaces all time-invariant controls with restaurant fixed effects.

Estimates of equation (7) are presented in Table 13. Notice that all three specifications reject the null hypothesis at conventional significance levels. This evidence suggests that, among independent restaurants, the observed decreases in point deductions and critical violations in the post-announcement period are not the result of a coincident decrease in the frequency with which independent restaurants were assigned different inspectors (than in their immediately preceding inspections). In fact, independent restaurants faced different inspectors at a significantly greater frequency in the post-announcement period.

7 Concluding Remarks

Mandatory disclosure policies have become a popular means of regulating product quality, but how should these policies be designed? Economic theory suggests a variety of conditions in which the reduction of information asymmetries regarding product quality will induce producers to increase product quality provision. This producer response will depend on the extent to which existing information asymmetries are reduced. In light of evidence that infor-

mation salience affects consumer decisions in many settings,³⁸ a natural question is whether producer response to mandatory disclosure policies depends on the salience of the disclosed information. This question is especially pertinent as it relates to restaurant hygiene. Recall that foodborne illness, despite being largely preventable, is a persistent public health concern in the United States. An estimated 48 million Americans are made sick by foodborne illness annually, and restaurants are estimated to account for 60 percent of all foodborne illness outbreaks in the US that have a single known food-preparation source.

Utilizing a partnership between the city of Louisville and Yelp.com, this paper demonstrates that the salience of disclosed information can substantially impact the response of producers to mandatory disclosure policies. In 2013, the city of Louisville began providing restaurant health inspection data to Yelp.com for publication on their consumer-review website. Because the data were already publicly available on the city’s website, the partnership had no effect on the extent of restaurant hygiene information available to consumers, but did increase the salience of this information for consumers who utilize Yelp in deciding where to eat. Between independent and chain-affiliated restaurants, there is an underlying disparity in the salience of information on Yelp, which I exploit, and find that the partnership resulted in significant and substantial hygiene improvements.

Among independent Louisville restaurants, I estimate that the partnership resulted in a significant decrease in inspection score point deductions, ranging anywhere from 8 to 14 percent relative to pre-announcement levels. These hygiene improvements were entirely evident restaurants’ first inspections following announcement of the partnership, and were persistent throughout the post-announcement period. I also find that the reduction in point deductions was partly driven by substantial (27 to 36 percent) decreases in critical health code violations, which are the violations deemed the most hazardous to diner health.

The estimated effects of the Louisville-Yelp partnership on independent restaurant hygiene show that increases in the salience of product quality information can induce producers

³⁸For instance, Chetty et al. (2009) , Bollinger et al. (2011), and Luca and Smith (2013).

to significantly improve product quality, even when this information has already been publicly disclosed. From the perspective of producers, it would appear that the simple disclosure of product quality information on a government website or in an arbitrary public area is viewed very differently from the prominent display of such information in places where consumers make purchase decisions.³⁹ With regard to inducing quality improvement from producers, my findings demonstrate that information salience can have a substantial impact on the effectiveness of mandatory disclosure policies. As such, information salience should be a major consideration in the design of disclosure policies, and also appears to be an effective tool for improving existing disclosure policies.

Beyond inducing average hygiene quality improvements, by publishing hygiene quality information on a website designed to facilitate restaurant comparisons, the LYP substantially reduced the cost to consumers of selecting cleaner restaurants. The combination of these two effects could yield substantial public health benefits. I find that within Louisville-Jefferson County, the rate of emergency-department food-poisoning diagnoses from 2011 through 2013 followed a very similar path to the rate of such diagnoses in the rest of Kentucky. In 2014 however, the rate in the rest of Kentucky continued on an upward trend while the rate in Louisville departed from that trend and began to decrease slightly. Estimates suggest that Louisville avoided as many 140 severe food-poisoning cases in 2014 by breaking from the trend exhibited in the rest of the state.

My findings are particularly promising for health departments because sharing inspection data with Yelp or similar platforms is a relatively inexpensive means of improving health code compliance. This is especially true for governments that already collect and share these data on their own websites. Since the adoption of the LYP, several other governments have formed similar partnerships with Yelp. The Louisville partnership is empirically advantageous among these because the data were publicly available online well before the announcement of the partnership with Yelp. Thus, the LYP provides a sufficient pre-announcement

³⁹This is not to say that the former has no effect on producers, but rather that the latter can have a significant additional effect on the provision of product quality by producers.

period to estimate the partnership's effect, and enables the effect of information salience to be isolated because the provision of hygiene quality information was unchanged. While mandatory disclosure is an understandably popular regulatory tool, design details like the manner in which information is disclosed can significantly impact disclosure's ability to regulate product quality, and thus, merit serious consideration from regulators and policymakers.

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98 [Health inspection](#) 98 out of 100

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Figure 1: Top Page of an Establishment's Yelp Profile

Notice that the establishment's most recent health inspection score is found in the box at the lower right corner of this figure. This screenshot was taken on March 15, 2016, and collected online at <http://www.yelp.com/biz/chickfilalouisville8?osq=chickfila>.

Find tacos, cheap dinner, Max's

Near Louisville, KY

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[Chick-fil-A](#) Health Inspections

Chick-fil-A

December 8, 2014 — Routine Inspection

Violations

- Premises not free of litter or miscellaneous articles OR cleaning/maintenance equipment improperly stored OR lockers not provided

Inspections

Date	Inspection Type	Violations	Score
December 8, 2014	Routine	1	98
May 8, 2014	Routine	0	100
December 4, 2013	Routine	0	100
May 14, 2013	Routine	0	100
November 29, 2012	Routine	1	99
April 18, 2012	Routine	2	96
November 1, 2011	Routine	3	95

Health Inspection

98

out of 100

About Health Inspections

We collect public inspection data directly from your local health department. Due to the local health department's inspection schedule as well as the time it takes to pass that information on to us, it is possible that we may not display the most recent inspection data.

Please report any health complaints about this business such as potential food borne illnesses or any unreasonable delay and data inaccuracies via one of the methods below:

- [Email](#)
- [Website](#)

Figure 2: An Establishment's Health Inspections Page

Visitors who click on the "Health inspection" hyperlink seen in Figure 1 are directed to this page. This screenshot was taken on March 15, 2016, and was collected online at <https://www.yelp.com/inspections/chickfilalouisville8>.

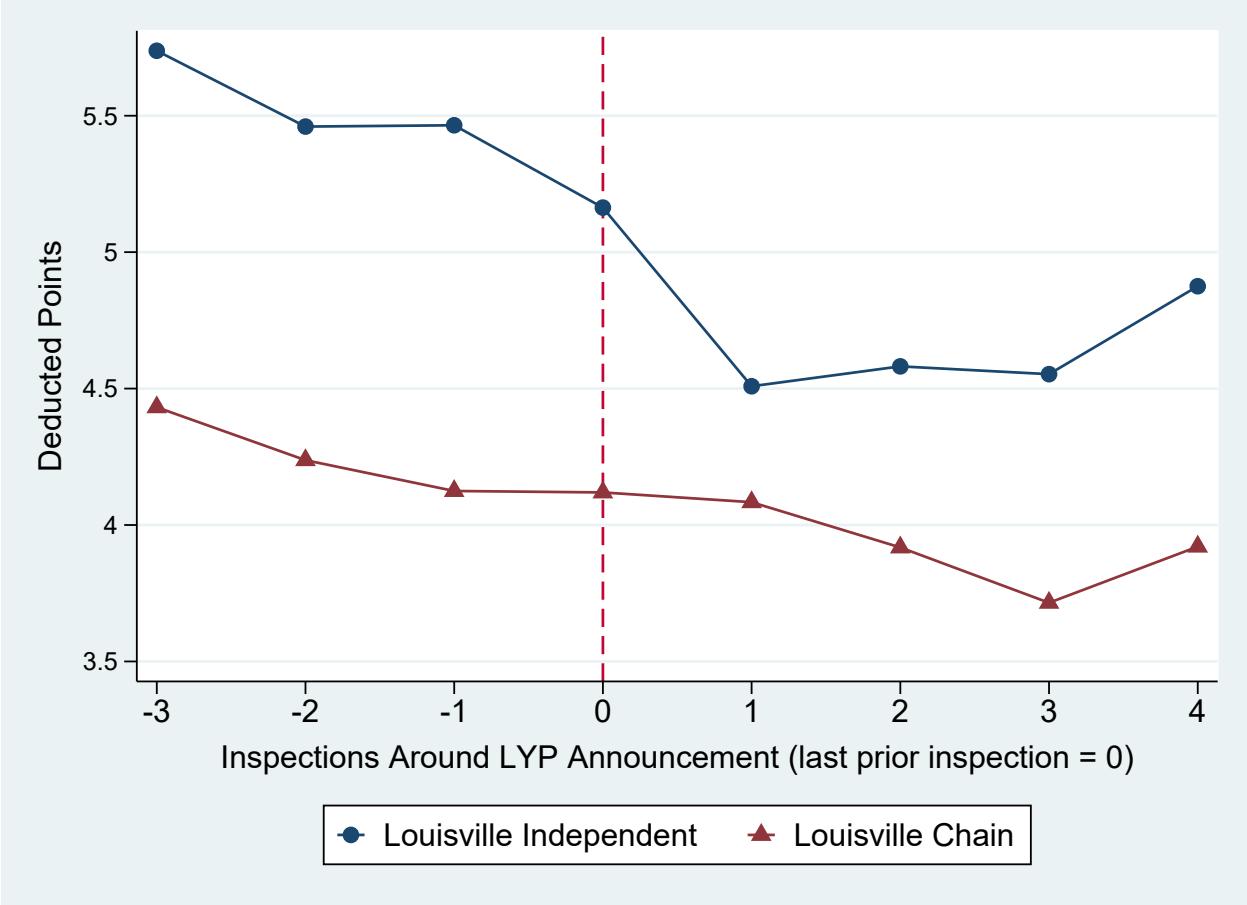


Figure 3: Deducted Points by Inspections Around the Policy Change

The horizontal axis represents the inspections around the announcement of the LYP, which is marked by the dashed line. The 0 value indicates a restaurant’s last inspection before the announcement, -1 indicates the restaurant’s second-to-last inspection before the announcement, *etc.* The 1 value indicates a restaurant’s first inspection after the announcement, 2 indicates a restaurant’s second inspection after the announcement, *etc.*

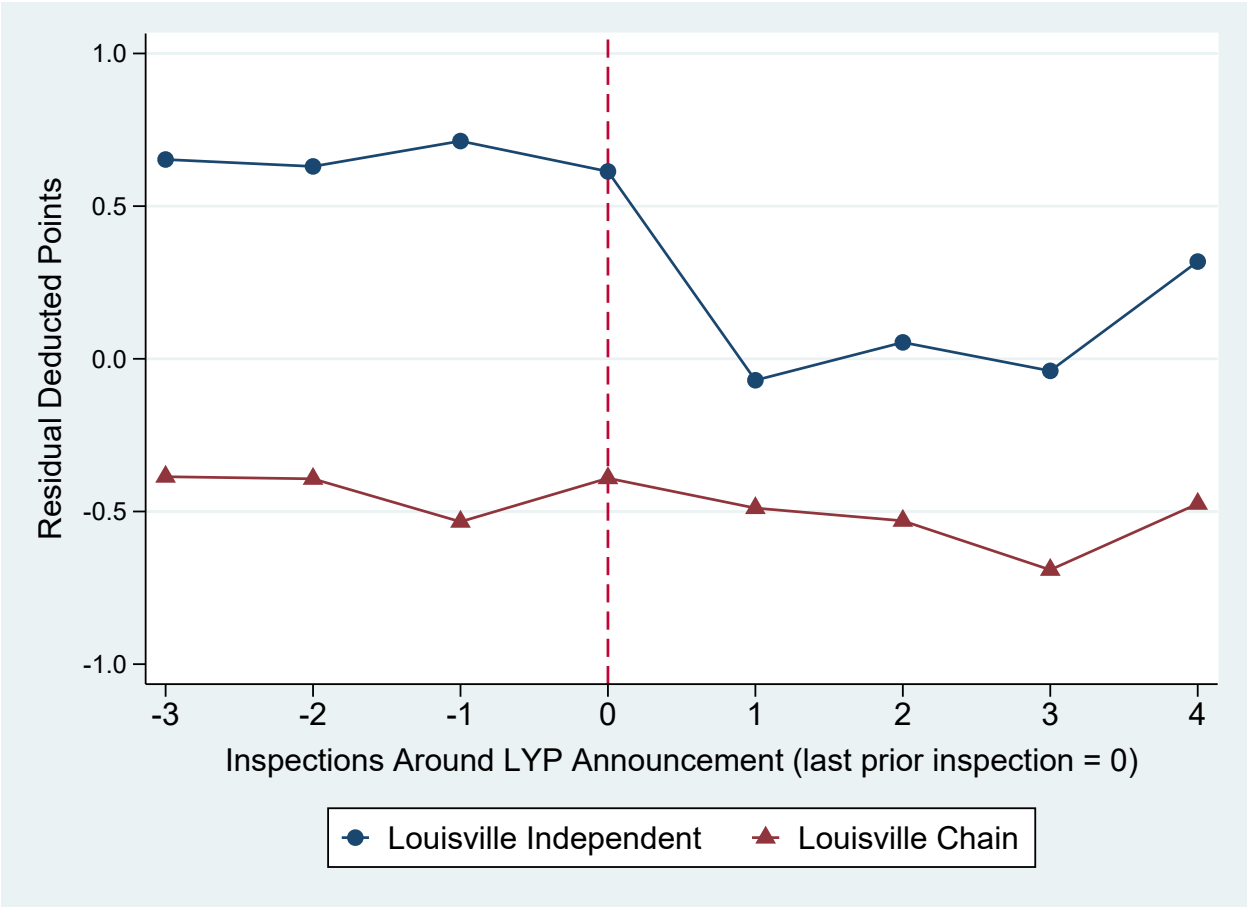


Figure 4: Residual Deducted Points by Inspections Around the Policy Change

Residuals are from OLS estimates. The dependent variable is the number of points deducted from a restaurant’s score in an inspection. Restaurant-specific controls are the establishment’s logged number of seats, and indicators for the year in which the establishment opened, and the restaurant’s zip code. Inspection-specific controls are the logged age of the restaurant at the time of the inspection, and indicators for the day of the week, and the inspector conducting the inspection.

The horizontal axis represents the inspections around the announcement of the LYP, which is marked by the dashed line. The 0 value indicates a restaurant’s last inspection before the announcement, -1 indicates the restaurant’s second-to-last inspection before the announcement, *etc.* The 1 value indicates a restaurant’s first inspection after the announcement, 2 indicates a restaurant’s second inspection after the announcement, *etc.*

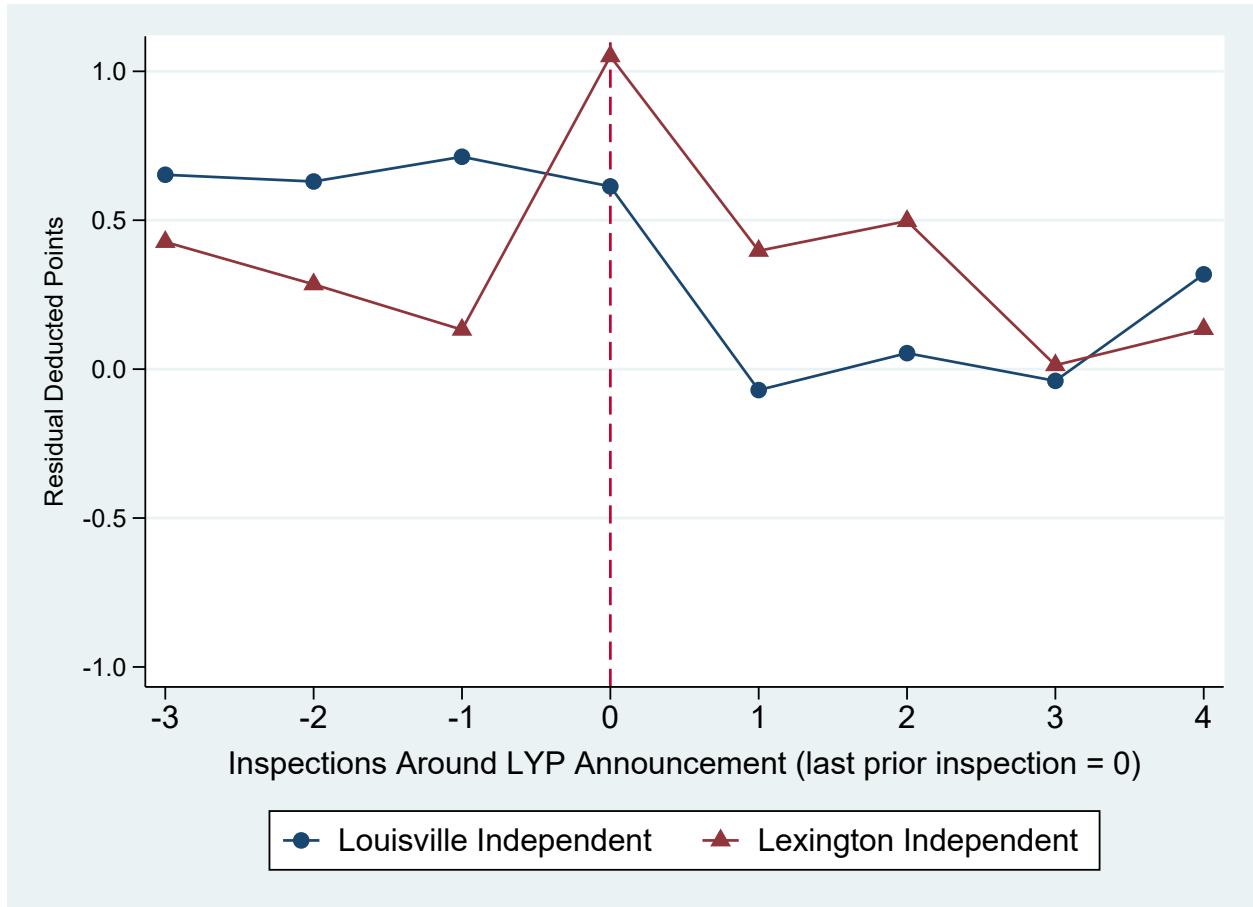


Figure 5: Residual Deducted Points by Inspections Around the Policy Change: Louisville and Lexington Independent Restaurants

Louisville-Independent residuals come from regressing deducted points on logged number of seats, logged age of the restaurant, and indicators for the year in which the establishment opened, the restaurant’s zip code, inspector, and inspection day of the week. Lexington-Independent residuals come from regressing deducted points on t and indicators for the inspection day of the week.

The horizontal axis represents the inspections around the announcement of the LYP, which is marked by the dashed line. The 0 value indicates a restaurant’s last inspection before the announcement, -1 indicates the restaurant’s second-to-last inspection before the announcement, *etc.* The 1 value indicates a restaurant’s first inspection after the announcement, 2 indicates a restaurant’s second inspection after the announcement, *etc.*

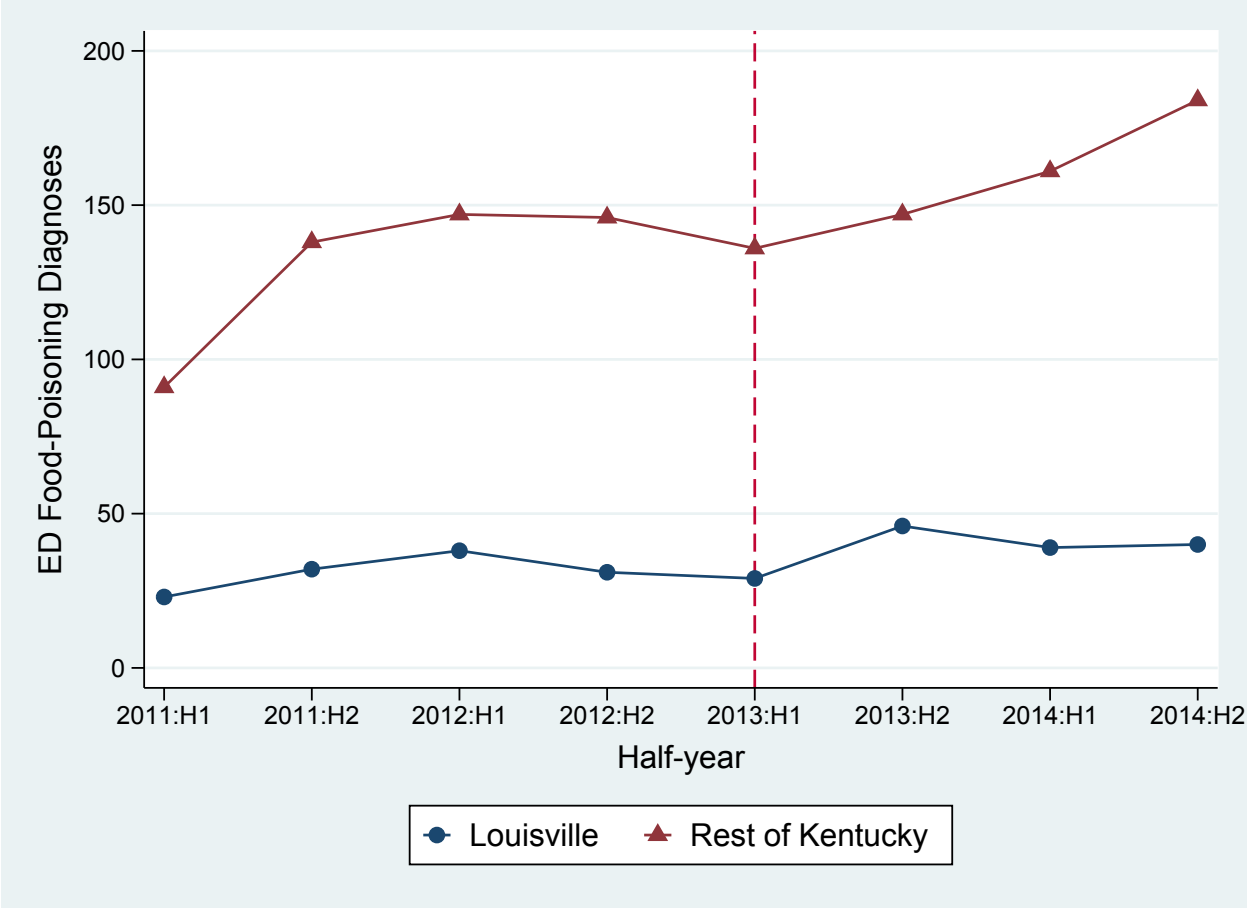


Figure 6: Emergency Department Food Poisoning Diagnoses

Navy circles mark food poisoning diagnoses in Louisville-Jefferson County. Maroon triangles mark food poisoning diagnoses in metropolitan and micropolitan areas other than Louisville-Jefferson County. The dashed line marks the last half-year before the LYP announcement.

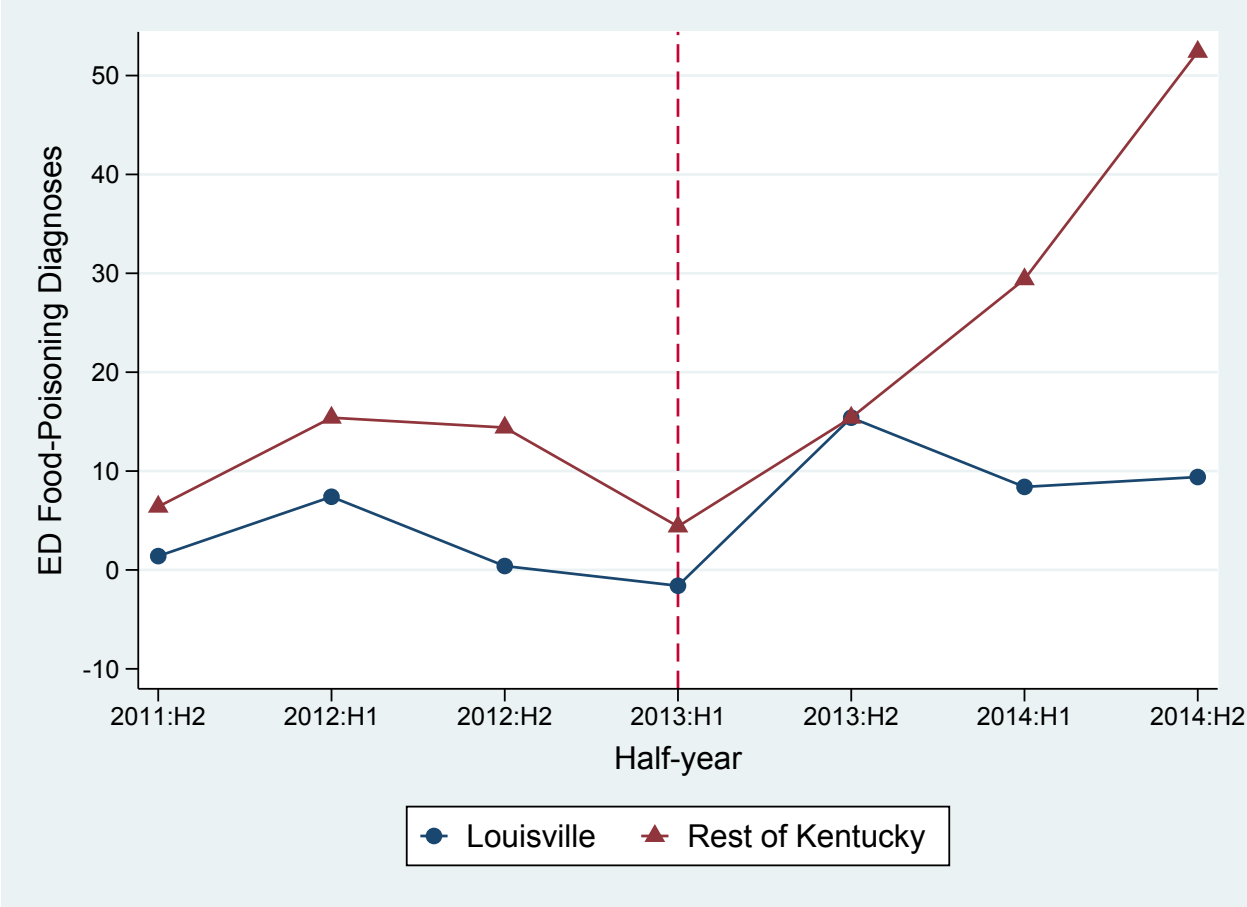


Figure 7: Residual Emergency Department Food Poisoning Diagnoses

Navy circles mark demeaned food poisoning diagnoses in Louisville-Jefferson County. Maroon triangles mark demeaned food poisoning diagnoses in metropolitan and micropolitan areas other than Louisville-Jefferson County. The dashed line marks the last half-year before the LYP announcement.

Table 1: Summary Statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Deducted Points (per inspection)					
Louisville restaurants	10,903	4.6172	(4.3971)	0	36
<i>Chain restaurants</i>	5,218	4.1261	(4.1731)	0	36
<i>Independent restaurants</i>	5,685	5.0679	(4.5470)	0	36
Lexington restaurants	6,500	3.7498	(4.6092)	0	46
<i>Chain restaurants</i>	2,939	3.2845	(3.8748)	0	34
<i>Independent restaurants</i>	3,561	4.1340	(5.1054)	0	46
Total Inspections (per establishment)					
Louisville restaurants	1,204	9.0556	(1.3128)	3	13
<i>Chain restaurants</i>	561	9.3012	(1.2901)	3	13
<i>Independent restaurants</i>	643	8.8414	(1.2957)	3	12
Lexington restaurants	704	9.2330	(1.7438)	3	14
<i>Chain restaurants</i>	303	9.6997	(1.4802)	4	14
<i>Independent restaurants</i>	401	8.8803	(1.8441)	3	13
Inspections Before LYP Announcement (per establishment)					
Louisville restaurants	1,204	4.2741	(0.9852)	2	7
<i>Chain restaurants</i>	561	4.3761	(0.9979)	2	7
<i>Independent restaurants</i>	643	4.1851	(0.9659)	2	7
Lexington restaurants	704	4.6847	(0.9391)	2	8
<i>Chain restaurants</i>	303	4.8944	(0.7819)	2	8
<i>Independent restaurants</i>	401	4.5262	(1.0149)	2	7
Inspections After LYP Announcement (per establishment)					
Louisville restaurants	1,204	4.7816	(0.7359)	1	7
<i>Chain restaurants</i>	561	4.9251	(0.6746)	1	7
<i>Independent restaurants</i>	643	4.6563	(0.7643)	1	6
Lexington restaurants	704	4.5483	(1.2534)	1	8
<i>Chain restaurants</i>	303	4.8053	(1.0971)	1	7
<i>Independent restaurants</i>	401	4.3541	(1.3283)	1	8
Violations (per inspection)					
Louisville restaurants	10,903	2.9863	(2.2439)	0	15
<i>Chain restaurants</i>	5,218	2.6276	(2.1162)	0	15
<i>Independent restaurants</i>	5,685	3.3156	(2.3066)	0	15
Critical Violations (per inspection)					
Louisville restaurants	10,903	0.0907	(0.3570)	0	2
<i>Chain restaurants</i>	5,218	0.0853	(0.3428)	0	2
<i>Independent restaurants</i>	5,685	0.0957	(0.3695)	0	2
Number of Seats (per establishment)					
Louisville restaurants	1,204	88.248	(77.988)	1	483
<i>Chain restaurants</i>	561	80.916	(74.865)	1	450
<i>Independent restaurants</i>	643	94.644	(80.126)	1	483

Table 2: Mean Deducted Points: Before and After Announcement of Louisville-Yelp Partnership

	Restaurant Type		(3) Difference (Independent – Chain)
	(1) Independent	(2) Chain	
Mean Deducted Points Before	5.5834 (0.1359)	4.3214 (0.1264)	1.2620*** (0.1856)
Mean Deducted Points After	4.6045 (0.1172)	3.9526 (0.1204)	0.6520*** (0.1680)
Change in Mean Deducted Points	-0.9789*** (0.1094)	-0.3688*** (0.1082)	-0.6101*** (0.1539)
R-squared			0.0187
N			10,903

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Observations are from 10,903 inspections of 1,204 Louisville restaurants that had at least two pre-announcement inspections, and at least one post-announcement inspection. Standard errors, clustered by restaurant, are reported in parentheses.

Table 3: Tests of Parallel Trends by Inspection

Variable	(1) Deducted Points	(2) Deducted Points	(3) Deducted Points	(4) Deducted Points
$T \times (\text{Independent})$	-0.1353 (0.0912)	-0.1316 (0.0923)	-0.1173 (0.0982)	-0.0412 (0.1472)
T	-0.1420** (0.0595)	-0.2354*** (0.0665)	-0.2575*** (0.0734)	-0.2607** (0.1165)
Independent	1.7412*** (0.3720)	1.9289*** (0.3743)	— —	— —
$\ln(\text{Seats})$	N	Y	N	N
Zip Code FE	N	Y	N	N
Opening Year FE	N	Y	N	N
$\ln(\text{Age})$	N	Y	Y	Y
Restaurant FE	N	N	Y	Y
Day of Week FE	N	Y	Y	Y
Inspector FE	N	Y	Y	Y
DiffInspector	N	N	N	Y
$\ln(\text{Days Elapsed})$	N	N	N	Y
R-squared	0.0234	0.1261	0.5092	0.5586
N	5,064	5,064	5,064	3,939

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Observations are from pre-announcement inspections of 1,204 Louisville restaurants. T equals: 1 in a restaurant's 5th, 2 in their 4th, 3 in their 3rd, 4 in their 2nd, and 5 in their last, inspections before the announcement. $\text{DiffInspector}_{i,t}$ is an indicator variable equal to 1 if the inspector conducting a restaurant's t^{th} inspection is different than the inspector who conducted their $(t - 1)^{\text{th}}$ inspection. Days Elapsed is the number of days that elapsed between a restaurant's t^{th} inspection, and their $(t - 1)^{\text{th}}$ inspection. Standard errors, clustered by restaurant, are reported in parentheses.

Table 4: The LYP's Effect on Deducted Points: Triple-Difference Estimates

Variable	(1) Deducted Points	(2) Deducted Points
(Post) × (Independent) × (Louisville)	-0.7849*** (0.2662)	-0.7319*** (0.2776)
(Post) × (Louisville)	0.2194 (0.1774)	0.2294 (0.1859)
(Post) × (Independent)	0.1748 (0.2172)	0.1280 (0.2292)
Post	-0.5882*** (0.1405)	-0.3215* (0.1804)
Restaurant FE	N	Y
Day of Week FE	N	Y
t	N	Y
R-squared	0.0244	0.4148
N	17,403	17,403

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

OLS estimates from inspections of 1,204 Louisville restaurants and 704 Lexington restaurants that had at least two pre-announcement inspections, and at least one post-announcement inspection. Standard errors, clustered by restaurant, are reported in parentheses.

Table 5: The LYP's Effect on Deducted Points: Difference-in-Differences Estimates

Variable	(1) Deducted Points	(2) Deducted Points	(3) Deducted Points
(Post) × (Independent)	-0.6995*** (0.1561)	-0.6756*** (0.1603)	-0.5683*** (0.1691)
Post	-0.1477 (0.1652)	0.0173 (0.1681)	-0.1708 (0.1774)
Independent	1.4155*** (0.1884)	— —	— —
<i>DiffInspector</i>	— —	— —	0.5177*** (0.1109)
<i>ln</i> (Seats)	Y	N	N
Zip Code FE	Y	N	N
Opening Year FE	Y	N	N
<i>t</i>	Y	Y	Y
<i>ln</i> (Age)	Y	Y	Y
Restaurant FE	N	Y	Y
Day of Week FE	Y	Y	Y
Inspector FE	Y	Y	Y
<i>ln</i> (Days Elapsed)	N	N	Y
R-squared	0.1102	0.4221	0.4348
N	10,903	10,903	9,699

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Results are OLS estimates from inspections conducted on 643 independent Louisville restaurants and 561 chain-affiliated Louisville restaurants. Standard errors, clustered by restaurant, are reported in parentheses.

Table 6: The LYP's Effect on Deducted Points: Alternative Comparison Group

Variable	(1)	(2)	(3)	(4)
(Post)×(Louisville)	-0.5655*** (0.1986)	-0.5026** (0.2077)	-0.7034*** (0.2068)	-0.7179*** (0.2161)
Post	-0.4134** (0.1657)	-0.1612 (0.2332)	-0.2755 (0.1754)	0.2314 (0.2543)
Louisville	1.2468*** (0.2412)	— —	1.3847*** (0.2437)	— —
(Last Pre Inspection)×(Lexington)	— —	— —	0.6242** (0.2572)	0.9282*** (0.2800)
<i>t</i>	N	Y	N	Y
Restaurant FE	N	Y	N	Y
Day of Week FE	N	Y	N	Y
R-squared	0.0161	0.4162	0.0167	0.4173
N	9,246	9,246	9,246	9,246

Results are OLS estimates from inspections conducted on 643 independent Louisville restaurants, and 401 independent Lexington restaurants. In all columns, deducted points is the dependent variable. (Last Pre Inspection)×(Lexington) is an indicator equal to 1 in a Lexington restaurants last pre-announcement inspection, and equal to 0 otherwise. Standard errors, clustered by restaurant, are reported in parentheses.

Table 7: The LYP's Effect on Critical Violations

Variable	(1) Critical Violations	(2) Critical Violations	(3) Critical Violations
(Post) × (Independent)	-0.0332** (0.0138)	-0.0348** (0.0145)	-0.0245 (0.0155)
Post	0.0034 (0.0142)	0.0142 (0.0161)	-0.0052 (0.0166)
Independent	0.0378*** (0.0124)	— —	— —
<i>DiffInspector</i>	— —	— —	0.0140 (0.0106)
<i>ln</i> (Seats)	Y	N	N
Zip Code FE	Y	N	N
Opening Year FE	Y	N	N
<i>t</i>	Y	Y	Y
<i>ln</i> (Age)	Y	Y	Y
Restaurant FE	N	Y	Y
Day of Week FE	Y	Y	Y
Inspector FE	Y	Y	Y
<i>ln</i> (Days Elapsed)	N	N	Y
R-squared	0.0267	0.1679	0.1789
N	10,903	10,903	9,699

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Observations are inspections of Louisville restaurants. Standard errors, clustered by restaurant, are reported in parentheses.

Table 8: The LYP's Effect on Deducted Points Over Time: Louisville-Chain Comparison Group

Variable	(1) Deducted Points	(2) Deducted Points	(3) Deducted Points
$Post_t \times (\text{Independent})$	-0.8078*** (0.2281)	-0.7879*** (0.2352)	-0.6712*** (0.2411)
$Post_{t-1} \times (\text{Independent})$	0.1574 (0.2671)	0.1750 (0.2800)	0.1538 (0.2821)
$Post_{t-2} \times (\text{Independent})$	0.1087 (0.2497)	0.1046 (0.2604)	0.0885 (0.2632)
$Post_{t-3} \times (\text{Independent})$	0.0693 (0.2769)	0.0454 (0.2914)	0.0580 (0.2944)
$Post_{t-4} \times (\text{Independent})$	-0.5716* (0.3197)	-0.5557* (0.3277)	-0.5357 (0.3306)
$Post_t$	-0.0219 (0.2072)	0.2773 (0.2126)	0.1842 (0.2281)
$Post_{t-1}$	-0.0628 (0.2014)	0.0086 (0.2129)	0.0234 (0.2217)
$Post_{t-2}$	-0.0790 (0.1872)	0.0796 (0.1939)	0.0831 (0.2052)
$Post_{t-3}$	0.2358 (0.1947)	0.3631* (0.2025)	0.4070* (0.2084)
$Post_{t-4}$	0.2778 (0.2270)	0.4769** (0.2425)	0.4578* (0.2522)
$\ln(\text{Seats})$	Y	N	N
Zip Code FE	Y	N	N
Opening Year FE	Y	N	N
$\ln(\text{Age})$	Y	Y	Y
Restaurant FE	N	Y	Y
Day of Week FE	Y	Y	Y
Inspector FE	Y	Y	Y
$\ln(\text{Days Elapsed})$	N	N	Y
R-squared	0.1107	0.4235	0.4360
N	10,903	10,903	9,699

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Observations are inspections of Louisville restaurants only. Standard errors, clustered by restaurant, are reported in parentheses.

Table 9: The LYP's Effect on Deducted Points Over Time: Lexington-Independent Comparison Group

Variable	(1) Deducted Points	(2) Deducted Points	(3) Deducted Points	(4) Deducted Points
$Post_t \times (\text{Louisville})$	-0.8579*** (0.2984)	-0.8694*** (0.3139)	-0.9958*** (0.3063)	-1.0288*** (0.3201)
$Post_{t-1} \times (\text{Louisville})$	0.0211 (0.3454)	0.0521 (0.3598)	0.0211 (0.3455)	0.0533 (0.3598)
$Post_{t-2} \times (\text{Louisville})$	0.4907 (0.3354)	0.5427 (0.3575)	0.4907 (0.3355)	0.5442 (0.3575)
$Post_{t-3} \times (\text{Louisville})$	0.2581 (0.3574)	0.2374 (0.3837)	0.2581 (0.3574)	0.2399 (0.3839)
$Post_{t-4} \times (\text{Louisville})$	-0.5538 (0.4072)	-0.2868 (0.3789)	-0.5538 (0.4072)	-0.2869 (0.3790)
$Post_t$	-0.2169 (0.2591)	-0.1596 (0.2731)	-0.0790 (0.2682)	-0.0003 (0.2803)
$Post_{t-1}$	0.0519 (0.2967)	0.0217 (0.3067)	0.0519 (0.2967)	0.0206 (0.3068)
$Post_{t-2}$	-0.5193* (0.2878)	-0.5838* (0.3074)	-0.5193* (0.2878)	-0.5853* (0.3074)
$Post_{t-3}$	0.0642 (0.2928)	0.0625 (0.3156)	0.0642 (0.2928)	0.0601 (0.3158)
$Post_{t-4}$	0.1713 (0.3356)	-0.0210 (0.3045)	0.1713 (0.3356)	-0.0214 (0.3045)
Lou_i	Y	N	Y	N
Day of Week FE	Y	Y	Y	Y
Restaurant FE	N	Y	N	Y
(Last Pre Inspection) $\times (\text{Lexington})$	N	N	Y	Y
R-squared	0.0168	0.4167	0.0173	0.4174
N	9,246	9,246	9,246	9,246

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Observations are inspections independent Louisville restaurants and independent Lexington restaurants. Standard errors, clustered by restaurant, are reported in parentheses.

Table 10: Effect of the LYP of Food Poisoning

	Monthly Emergency Dept.	Food-Poisoning Diagnoses
	(1)	(2)
(Post 2013:H2) × (Louisville)	—	-11.667** (3.8897)
Post 2013:H2	—	10.417** (3.7399)
(Post) × (Louisville)	-6.1111** (2.8526)	1.6667 (3.0230)
Post	7.9778** (2.7692)	1.0333 (2.8647)
Louisville	-37.000** (1.5300)	-37.000** (1.5469)
Intercept	42.133*** (1.4659)	42.133*** (1.4821)
R-squared	0.9083	0.9188
N	96	96

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Results are OLS estimates. The dependent variable is the number of food-poisoning diagnoses made in hospital emergency departments. Observations are measured at the monthly level among two groups: emergency departments in Louisville-Jefferson County, and emergency departments elsewhere in Kentucky. The variable (Post 2013:H2) is an indicator equal to 1 on or after January 1, 2014, and equal to 0 otherwise. Robust standard errors are reported in parentheses.

Table 11: The LYP's Effect on Deducted Points with Separate Trends

Variable	(1) Deducted Points	(2) Deducted Points	(3) Deducted Points
$Post_t \times (\text{Independent})$	-0.6065* (0.3195)	-0.7124** (0.3139)	-0.6793** (0.3145)
$Post_{t-1} \times (\text{Independent})$	0.2474 (0.2920)	0.2012 (0.2892)	0.2132 (0.2900)
$Post_{t-2} \times (\text{Independent})$	0.1636 (0.2729)	0.1197 (0.2744)	0.1308 (0.2736)
$Post_{t-3} \times (\text{Independent})$	0.1139 (0.3063)	0.0778 (0.3038)	0.1017 (0.3064)
$Post_{t-4} \times (\text{Independent})$	-0.4920 (0.3397)	-0.5512 (0.3398)	-0.5472 (0.3369)
$Post_t$	0.1808 (0.2324)	0.1531 (0.2255)	0.1177 (0.2270)
$Post_{t-1}$	-0.0048 (0.2148)	-0.0393 (0.2140)	-0.0429 (0.2148)
$Post_{t-2}$	0.0259 (0.1968)	0.0182 (0.1977)	-0.0040 (0.1975)
$Post_{t-3}$	0.3365 (0.2066)	0.3267 (0.2069)	0.3207 (0.2073)
$Post_{t-4}$	0.4155* (0.2448)	0.3825 (0.2447)	0.3548 (0.2435)
$(\text{Trend}) \times (\text{Independent})$	-0.0600 (0.0841)	-0.0057 (0.0392)	-0.0237 (0.0789)
Trend	-0.1775*** (0.0548)	-0.0812*** (0.0263)	-0.1507*** (0.0535)
Trend Variable	t	Q	$Half$
R-squared	0.4233	0.4227	0.4226
N	10,903	10,903	10,903

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Observations are inspections of Louisville restaurants. All three columns report estimates with the inclusion of logged age, and fixed effects for the restaurant being inspected, the day of the week in which the inspection occurred, and the inspector conducting the inspection. Standard errors, clustered by restaurant, are reported in parentheses.

Table 12: The LYP's Effect on Deducted Points with Leads of Post-announcement Indicator

Variable	(1) Deducted Points	(2) Deducted Points	(3) Deducted Points	(4) Deducted Points
$Post_t \times (\text{Independent})$	-0.5425** (0.2411)	-0.5381** (0.2411)	-0.5332** (0.2411)	-0.5277** (0.2411)
$Post_t$	0.0247 (0.1910)	-0.0292 (0.1947)	-0.1010 (0.1969)	-0.1696 (0.1990)
$Post_{t+1} \times (\text{Independent})$	-0.1750 (0.2439)	-0.2761 (0.3004)	-0.2761 (0.3005)	-0.2768 (0.3005)
$Post_{t+2} \times (\text{Independent})$	— —	0.1487 (0.2748)	0.3045 (0.3201)	0.3076 (0.3200)
$Post_{t+3} \times (\text{Independent})$	— —	— —	-0.2869 (0.3241)	-0.0409 (0.3412)
$Post_{t+4} \times (\text{Independent})$	— —	— —	— —	-0.7281 (0.4541)
$Post_{t+1}$	-0.1817 (0.1758)	-0.0401 (0.1990)	-0.0691 (0.1989)	-0.0889 (0.1989)
$Post_{t+2}$	—	-0.2695 (0.1994)	-0.2029 (0.2284)	-0.2293 (0.2280)
$Post_{t+3}$	— —	— —	-0.1977 (0.2355)	-0.1132 (0.2417)
$Post_{t+4}$	— —	— —	— —	-0.2919 (0.2902)
R-squared	0.4224	0.4225	0.4229	0.4238
N	10,903	10,903	10,903	10,903

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Observations are inspections of Louisville restaurants. All four columns report estimates with the inclusion of $t_{i,t}$, and fixed effects for the restaurant being inspected, the day of the week in which the inspection occurred, and the inspector conducting the inspection. Standard errors, clustered by restaurant, are reported in parentheses.

Table 13: Assignment of a Different Inspector: Linear Probability Estimates

Variable	(1) <i>DiffInspector</i>	(2) <i>DiffInspector</i>	(3) <i>DiffInspector</i>
(Post)×(Independent)	0.1068*** (0.0225)	0.0479*** (0.0177)	0.0422** (0.0193)
Post	0.0393** (0.0167)	0.0347** (0.0164)	0.0512*** (0.0181)
Independent	-0.0734*** (0.0201)	-0.0594*** (0.0148)	— —
<i>ln</i> (Seats)	N	Y	Y
Zip Code FE	N	Y	Y
Opening Year FE	N	Y	Y
<i>t</i>	N	Y	Y
<i>ln</i> (Age)	N	Y	Y
Day of Week FE	N	Y	Y
Inspector FE	N	Y	Y
<i>ln</i> (Days Elapsed)	N	Y	Y
Restaurant FE	N	N	Y
R-squared	0.01242	0.3682	0.4859
N	9,699	9,699	9,699

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Observations are inspections of Louisville restaurants. Standard errors, clustered by restaurant, are reported in parentheses.

A1 Appendix

Table A1: Critical Violations of the Louisville DHW Health Code

Critical Violation
Food from an unapproved source
Spoiled food
Food at unsafe temperatures
Improper re-serving of food
Personnel with infections not restricted from work
Improper hand washing
Bare hand contact with ready-to-eat food
Employees eating, drinking or smoking while preparing food
Person in charge without knowledge of safe food practices or not present
Food contact surfaces not designed or installed properly, not clean, or in disrepair
Improper dish and equipment washing; without proper temperature or sanitizer
Safe hot and cold running water not present
Improper disposal of sewage and waste, sewage pipe leaking or back-up
Hand washing sinks are not designed, installed, accessible, or working properly
Insects, rodents, birds, turtles or other animals present
Toxic items not labeled, stored next to food or improperly used
Consumer advisory for undercooked food not posted
Lack of a convenient hand sink

This list was collected online at <https://louisvilleky.gov/government/health-wellness/about-restaurant-establishment-scores>.

Table A2: Tests of Parallel Trends by Quarter-year

Variable	(1) Deducted Points	(2) Deducted Points	(3) Deducted Points	(4) Deducted Points
$Q \times (\text{Independent})$	-0.0671 (0.0411)	-0.0420 (0.0412)	-0.0184 (0.0439)	0.0206 (0.0737)
Q	-0.0707** (0.0278)	-0.1305*** (0.0308)	-0.1112*** (0.0338)	-0.1490** (0.0588)
Independent	1.6679*** (0.3255)	1.7273*** (0.3251)	— —	— —
$\ln(\text{Seats})$	N	Y	N	N
Zip Code FE	N	Y	N	N
Opening Year FE	N	Y	N	N
$\ln(\text{Age})$	N	Y	Y	Y
Restaurant FE	N	N	Y	Y
Day of Week FE	N	Y	Y	Y
Inspector FE	N	Y	Y	Y
DiffInspector	N	N	N	Y
$\ln(\text{Days Elapsed})$	N	N	N	Y
R-squared	0.0231	0.1268	0.5074	0.5591
N	5,146	5,146	5,146	3,942

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Observations are pre-announcement inspections of Louisville restaurants and begin in January 2011. Standard errors, clustered by restaurant, are reported in parentheses.

Table A3: Tests of Parallel Trends by Half-year

Variable	(1) Deducted Points	(2) Deducted Points	(3) Deducted Points	(4) Deducted Points
$Half \times (\text{Independent})$	-0.0974 (0.0826)	-0.0570 (0.0834)	-0.0347 (0.0900)	0.0486 (0.1463)
$Half$	-0.1471*** (0.0568)	-0.2455*** (0.0627)	-0.2226*** (0.0695)	-0.2737** (0.1187)
Independent	1.5805*** (0.3399)	1.6599*** (0.3406)	— —	— —
$\ln(\text{Seats})$	N	Y	N	N
Zip Code FE	N	Y	N	N
Opening Year FE	N	Y	N	N
$\ln(\text{Age})$	N	Y	Y	Y
Restaurant FE	N	N	Y	Y
Day of Week FE	N	Y	Y	Y
Inspector FE	N	Y	Y	Y
$DiffInspector$	N	N	N	Y
$\ln(\text{Days Elapsed})$	N	N	N	Y
R-squared	0.0223	0.1258	0.5073	0.5587
N	5,146	5,146	5,146	3,942

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Observations are pre-announcement inspections of Louisville restaurants and begin in January 2011. Standard errors, clustered by restaurant, are reported in parentheses.

Table A4: The LYP's Effect on Deducted Points: Poisson Model

Variable	(1) Deducted Points	(2) Deducted Points	(3) Deducted Points
(Post) × (Independent)	-0.1228*** (0.0351)	-0.1197*** (0.0327)	-0.1031*** (0.0344)
Post	-0.0442 (0.0386)	-0.0035 (0.0355)	-0.0407 (0.0377)
Independent	0.2910*** (0.0263)		
<i>DiffInspector</i>	—	—	0.1127*** (0.0221)
<i>ln</i> (Seats)	Y	N	N
Zip Code FE	Y	N	N
Opening Year FE	Y	N	N
<i>t</i>	Y	Y	Y
<i>ln</i> (Age)	Y	Y	Y
Restaurant FE	N	Y	Y
Day of Week FE	Y	Y	Y
Inspector FE	Y	Y	Y
<i>ln</i> (Days Elapsed)	N	N	Y
N	10,903	10,805	9,588

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Results are Poisson estimates from inspections of Louisville restaurants. Standard errors are robust to violation of the equidispersion assumption, and given in parentheses.

Table A5: The LYP's on Deducted Points: Louisville-Chain Comparison Group with Controls for Pre-Announcement Hygiene Quality

Variable	(1) Deducted Points	(2) Deducted Points
(Post) × (Independent)	-0.6148*** (0.1493)	-0.6837*** (0.1525)
Post	-0.3262*** (0.1040)	-0.0197 (0.1570)
Pre-Average FE	Y	Y
Independent	Y	Y
$\ln(\text{Seats})$	N	Y
Zip Code FE	N	Y
Opening Year FE	N	Y
t	N	Y
$\ln(\text{Age})$	N	Y
Restaurant FE	N	N
Day of Week FE	N	Y
Inspector FE	N	Y
$\ln(\text{Days Elapsed})$	N	N
R-squared	0.3292	0.3509
N	10,903	10,903

Results are OLS estimates from inspections of Louisville restaurants. In both columns, fixed effects are included to account for the half-point interval to which a restaurant's pre-announcement average *DeductedPts* belonged. 36 restaurants with pre-announcement averages greater than 12.5, but often more than half a point from each other, were grouped together. Within that group the mean pre-announcement average among independent restaurants was 14.995, mean pre-announcement average among chain-affiliated restaurants 14.471, and post-announcement improvement in that group was greater among chain-affiliated restaurants. Thus, this particular grouping is not driving the coefficients of interest reported above. Standard errors, clustered by restaurant, are reported in parentheses.

Table A6: Treatment Effect Estimates on Logged Deducted Points: Louisville-Chain Comparison Group

Variable	$\ln(Y_{i,t} + 1)$
(Post) \times (Independent)	-0.0818*** (0.0263)
Post	-0.0226 (0.0275)
t	Y
$\ln(\text{Age})$	Y
Restaurant FE	Y
Day of Week FE	Y
Inspector FE	Y
R-squared	0.5370
N	10,903

Observations are inspections of Louisville restaurants. Standard errors, clustered by restaurant, are reported in parentheses.

Table A7: Treatment Effect Estimates on Logged Deducted Points: Lexington-Independent Comparison Group

Variable	$\ln(Y_{i,t} + 1)$
(Post) \times (Louisville)	-0.1040*** (0.0366)
Post	-0.0004 (0.0392)
t	Y
Restaurant FE	Y
Day of Week FE	Y
R-squared	0.5352
N	9,246

Observations are inspections of independent Louisville restaurants, and independent Lexington restaurants. Standard errors, clustered by restaurant, are reported in parentheses.

Table A8: The LYP's Effect on Deducted Points: Linear Model with Alternative Sample

Variable	(1) Deducted Points	(2) Deducted Points	(3) Deducted Points
(Post) × (Independent)	-0.7255*** (0.1588)	-0.7138*** (0.1624)	-0.6180*** (0.1703)
Post	-0.1378 (0.1690)	0.0354 (0.1708)	-0.1566 (0.1794)
Independent	1.4624*** (0.1902)	— —	— —
<i>DiffInspector</i>	— —	— —	0.5367*** (0.1121)
<i>ln</i> (Seats)	Y	N	N
Zip Code FE	Y	N	N
Opening Year FE	Y	N	N
<i>t</i>	Y	Y	Y
<i>ln</i> (Age)	Y	Y	Y
Restaurant FE	N	Y	Y
Day of Week FE	Y	Y	Y
Inspector FE	Y	Y	Y
<i>ln</i> (Days Elapsed)	N	N	Y
R-squared	0.1104	0.4224	0.4355
N	10,670	10,670	9,493

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Results are OLS estimates with the 27 independent restaurants that lack Yelp profiles dropped from the sample. Standard errors, clustered by restaurant, are reported in parentheses.

Table A9: Tests of Parallel Trends in Critical Violations by Inspection

Variable	(1) Crit. Violations	(2) Crit. Violations	(3) Crit. Violations	(4) Crit. Violations
$T \times (\text{Independent})$	-0.0080 (0.0085)	-0.0076 (0.0088)	-0.0077 (0.0100)	0.0038 (0.0143)
T	-0.0111** (0.0054)	-0.0162** (0.0065)	-0.0154** (0.0077)	-0.0155 (0.0115)
Independent	0.0529 (0.0323)	0.0713** (0.0335)	— —	— —
$\ln(\text{Seats})$	N	Y	N	N
Zip Code FE	N	Y	N	N
Opening Year FE	N	Y	N	N
$\ln(\text{Age})$	N	Y	Y	Y
Restaurant FE	N	N	Y	Y
Day of Week FE	N	Y	Y	Y
Inspector FE	N	Y	Y	Y
DiffInspector	N	N	N	Y
$\ln(\text{Days Elapsed})$	N	N	N	Y
R-squared	0.0039	0.0361	0.2835	0.3404
N	5,064	5,064	5,064	3,939

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Observations are pre-announcement inspections of Louisville restaurants. T equals: 1 in a restaurant's 5th, 2 in their 4th, 3 in their 3rd, 4 in their 2nd, and 5 in their last, inspections before the announcement. Standard errors, clustered by restaurant, are reported in parentheses.

Table A10: Tests of Parallel Trends in Critical Violations by Quarter-year

Variable	(1) Crit. Violations	(2) Crit. Violations	(3) Crit. Violations	(4) Crit. Violations
$Q \times (\text{Independent})$	-0.0003 (0.0040)	0.0010 (0.0041)	0.0005 (0.0046)	0.0073 (0.0074)
Q	-0.0068** (0.0026)	-0.0097*** (0.0032)	-0.0068* (0.0036)	-0.0114* (0.0060)
Independent	0.0263 (0.0284)	0.0381 (0.0296)	— —	— —
$\ln(\text{Seats})$	N	Y	N	N
Zip Code FE	N	Y	N	N
Opening Year FE	N	Y	N	N
$\ln(\text{Age})$	N	Y	Y	Y
Restaurant FE	N	N	Y	Y
Day of Week FE	N	Y	Y	Y
Inspector FE	N	Y	Y	Y
DiffInspector	N	N	N	Y
$\ln(\text{Days Elapsed})$	N	N	N	Y
R-squared	0.0034	0.0360	0.2799	0.3406
N	5,146	5,146	5,146	3,942

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Observations are pre-announcement inspections of Louisville restaurants and begin in January 2011. Standard errors, clustered by restaurant, are reported in parentheses.

Table A11: Tests of Parallel Trends in Critical Violations by Half-year

Variable	(1) Crit. Violations	(2) Crit. Violations	(3) Crit. Violations	(4) Crit. Violations
$Half \times (\text{Independent})$	0.0009 (0.0080)	0.0032 (0.0083)	0.0004 (0.0095)	0.0145 (0.0148)
$Half$	-0.0131** (0.0054)	-0.0177*** (0.0066)	-0.0137* (0.0075)	-0.0191 (0.0121)
Independent	0.0219 (0.0299)	0.0337 (0.0313)	— —	— —
$\ln(\text{Seats})$	N	Y	N	N
Zip Code FE	N	Y	N	N
Opening Year FE	N	Y	N	N
$\ln(\text{Age})$	N	Y	Y	Y
Restaurant FE	N	N	Y	Y
Day of Week FE	N	Y	Y	Y
Inspector FE	N	Y	Y	Y
$DiffInspector$	N	N	N	Y
$\ln(\text{Days Elapsed})$	N	N	N	Y
R-squared	0.0029	0.0354	0.2799	0.3402
N	5,146	5,146	5,146	3,942

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Observations are pre-announcement inspections of Louisville restaurants and begin in January 2011. Standard errors, clustered by restaurant, are reported in parentheses.

Table A12: The LYP's effect on Critical Violations: Poisson Model

Variable	(1) Critical Violations	(2) Critical Violations	(3) Critical Violations
(Post)×(Independent)	-0.3239** (0.1500)	-0.3734** (0.1525)	-0.2949* (0.1626)
Post	0.0277 (0.1579)	0.1463 (0.1693)	-0.0295 (0.1815)
IND	0.3652*** (0.1058)	— —	— —
<i>DiffInspector</i>	— —	— —	0.1400 (0.1138)
<i>ln</i> (Seats)	Y	N	N
Zip Code FE	Y	N	N
Opening Year FE	Y	N	N
<i>t</i>	Y	Y	Y
<i>ln</i> (Age)	N	Y	Y
Restaurant FE	N	Y	Y
Day of Week FE	N	Y	Y
Inspector FE	Y	Y	Y
<i>ln</i> (Days Elapsed)	N	N	Y
N	10,903	4,488	3,707

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Results are Poisson estimates from inspections of Louisville restaurants. Standard errors are robust to violation of the Poisson model's equidispersion assumption, and reported in parentheses.

Table A13: The LYP's Effect on Deducted Points Over Time: Poisson Model

Variable	(1) Deducted Points	(2) Deducted Points	(3) Deducted Points
$Post_t \times (\text{Independent})$	-0.1527** (0.0598)	-0.1500*** (0.0506)	-0.1319** (0.0515)
$Post_{t-1} \times (\text{Independent})$	0.0404 (0.0761)	0.0443 (0.0621)	0.0376 (0.0619)
$Post_{t-2} \times (\text{Independent})$	0.0336 (0.0742)	0.0381 (0.0592)	0.0381 (0.0590)
$Post_{t-3} \times (\text{Independent})$	0.0074 (0.0769)	-0.0026 (0.0642)	0.0011 (0.0642)
$Post_{t-4} \times (\text{Independent})$	-0.1314 (0.0824)	-0.1381* (0.0710)	-0.1345* (0.0708)
$Post_t$	-0.0150 (0.0521)	0.0460 (0.0463)	0.0264 (0.0486)
$Post_{t-1}$	-0.0201 (0.0610)	-0.0093 (0.0495)	-0.0007 (0.0505)
$Post_{t-2}$	-0.0300 (0.0578)	-0.0038 (0.0473)	-0.0082 (0.0483)
$Post_{t-3}$	0.0570 (0.0583)	0.0813* (0.0490)	0.0871* (0.0494)
$Post_{t-4}$	0.0638 (0.0611)	0.1062* (0.0553)	0.1066* (0.0562)
$\ln(\text{Seats})$	Y	N	N
Zip Code FE	Y	N	N
Opening Year FE	Y	N	N
t	Y	Y	Y
$\ln(\text{Age})$	Y	Y	Y
Restaurant FE	N	Y	Y
Day of Week FE	Y	Y	Y
Inspector FE	Y	Y	Y
$\ln(\text{Days Elapsed})$	N	N	Y
N	10,903	10,805	9,588

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Results are Poisson estimates from inspections of Louisville restaurants. Standard errors are robust to violation of the Poisson model's equidispersion assumption, and reported in parentheses.

Table A14: The LYP's on Critical Violations with Leads of Post-announcement Indicator

Variable	(1)	(2)	(3)	(4)
$Post_t \times (\text{Independent})$	-0.0326 (0.0237)	-0.0323 (0.0237)	-0.0319 (0.0236)	-0.0311 (0.0236)
$Post_t$	0.0181 (0.0189)	0.0141 (0.0193)	0.0072 (0.0191)	-0.0025 (0.0192)
$Post_{t+1} \times (\text{Independent})$	-0.0027 (0.0244)	-0.0170 (0.0298)	-0.0170 (0.0298)	-0.0171 (0.0298)
$Post_{t+2} \times (\text{Independent})$		0.0210 (0.0264)	0.0501 (0.0322)	0.0506 (0.0322)
$Post_{t+3} \times (\text{Independent})$			-0.0525 (0.0340)	-0.0266 (0.0361)
$Post_{t+4} \times (\text{Independent})$				-0.0796 (0.0504)
$Post_{t+1}$	-0.0161 (0.0172)	-0.0020 (0.0192)	-0.0049 (0.0193)	-0.0077 (0.0193)
$Post_{t+2}$		-0.0251 (0.0180)	-0.0261 (0.0224)	-0.0298 (0.0224)
$Post_{t+3}$			-0.0063 (0.0252)	0.0103 (0.0265)
$Post_{t+4}$				-0.0529 (0.0324)
R-squared	0.1681	0.1683	0.1690	0.1716
N	10,903	10,903	10,903	10,903

Observations are from inspections of Louisville restaurants. Standard errors, clustered by restaurant, are reported in parentheses.

Table A15: Chain-Affiliated Restaurants in Sample: Part 1

A & W ROOT BEER -LONG JOHN SILVERS	DAIRY QUEEN #097	KFC
ARBY'S	DAIRY QUEEN #310	KFC #Y052-034
ARBY'S #1400	DAIRY QUEEN #311	KFC #Y317002
ARBY'S #194	DAIRY QUEEN GRILL & CHILL	KFC - Y052-020
ARBY'S #263	DAIRY QUEEN GRILL AND CHILL	KFC / Y052-042
ARBY'S #325	DENNY'S	KFC Y052 004
ARBY'S #5412	DENNY'S RESTAURANT	KFC Y052-016
ARBY'S #5430	DOMINO'S	KFC Y052-023
ARBY'S #714	DOMINO'S PIZZA #1421	KFC Y052-032
ARBY'S #7204	DOMINO'S PIZZA #1422	KFC/TACO BELL
ARBY'S #7349	DOMINO'S PIZZA #1423	KRISPY KREME
ARBY'S #773	DOMINO'S PIZZA #1424	KRISPY KREME DOUGHNUT
ARBY'S #7810	DOMINO'S PIZZA #1425	LITTLE CAESAR'S
ARBY'S #7879	DOMINO'S PIZZA #1426	LITTLE CAESAR'S PIZZA
AUNTIE ANNE'S	DOMINO'S PIZZA #1427	LITTLE CAESARS
BACKYARD BURGERS	DOMINO'S PIZZA #1428	LOGAN'S ROADHOUSE
BASKIN ROBBINS	DOMINO'S PIZZA #1429	LOGANS ROADHOUSE
BEEF O'BRADY'S	DOMINO'S PIZZA #1431	LONG JOHN SILVERS
BOB EVANS	DOMINO'S PIZZA #1432	LONG JOHN SILVERS #14
BOB EVANS RESTAURANT #51	DOMINO'S PIZZA #1433	LONG JOHN SILVERS #15
BUCA DI BEPPO	DOMINO'S PIZZA #1434	LONG JOHN SILVERS #7253
BUFFALO WILD WINGS	DOMINO'S PIZZA #1435	LONGHORN STEAKHOUSE
BUFFALO WILD WINGS BAR & GRILL #18	DOMINO'S PIZZA #1436	LONGHORN STEAKHOUSE #287
BUFFALO WILD WINGS GRILL & BAR	DOMINO'S PIZZA #1464	MCALISTER'S DELI
BUFFALO WILD WINGS GRILL & BAR #35	DUNKIN DONUTS #349892	MCALISTER'S DELI # 1135
BURGER KING	EINSTEIN'S BAGELS	MCALISTER'S DELI # 1149
BURGER KING #12488	FAZOLI'S	MCALISTER'S DELI # 1258
BURGER KING #541	FIREHOUSE SUBS #486	MCALISTER'S DELI #1078
BURGER KING #542	FIVE GUYS BURGERS & FRIES	MCALISTER'S DELI #1079
BURGER KING #544	FRISCH'S BIG BOY #119	MCALLISTER'S DELI
BURGER KING #546	FRISCH'S BIG BOY #201	MCDONALD'S
BURGER KING #587	FRISCH'S BIG BOY #203	MCDONALD'S #29
BURGER KING #889	FRISCH'S BIG BOY - #153	MCDONALD'S #31
CALIFORNIA PIZZA KITCHEN	FRISCH'S BIG BOY - #154	MCDONALD'S #35
CAPTAIN D'S	FRISCH'S BRECKENRIDGE	MCDONALD'S #38
CAPTAIN D'S #3311	GOLDEN CORRAL	MCDONALD'S #4629
CAPTAIN D'S #3321	GRAETER'S	MCDONALD'S #4924
CAPTAIN D'S #3329	GRAETER'S ICE CREAM	MCDONALD'S #6809
CAPTAIN D'S #3517	GRAETER'S ICE CREAM #5	MCDONALD'S #6859
CAPTAIN D'S #3532	HARD ROCK CAFE	MCDONALD'S #6875
CAPTAIN D'S #3615	HARDEE'S	MCDONALD'S #6891
CARRABBA'S ITALIAN GRILL #6801	HONEY BAKED HAM COMPANY	MCDONALD'S #6895
CHARLEY'S GRILLED SUB	IHOP	MCDONALD'S #6899
CHARLEY'S GRILLED SUBS	JASON'S DELI	MCDONALD'S #7536
CHEDDAR'S	JERSEY MIKE'S SUBS	MCDONALD'S RESTAURANT
CHEESECAKE FACTORY	JERSEY MIKE'S SUBS #2	MCDONALD'S RESTAURANT #1
CHICK-FIL-A	JET'S PIZZA	MCDONALD'S RESTAURANT #15
CHILI'S	JIMMY JOHN'S	MCDONALD'S RESTAURANT #16
CHILI'S BAR & GRILL	JIMMY JOHN'S #1081	MCDONALD'S RESTAURANT #4620
CHILI'S GRILL AND BAR	JIMMY JOHN'S GOURMET SANDWICHE	MCDONALD'S RESTAURANT #6828
CHUCK E CHEESE'S #111	JIMMY JOHNS	MCDONALD'S RESTAURANT #6834
CHUY'S #22	JOE MUGGS	MCDONALD'S RESTAURANT #6835
CULVER'S	JOE'S CRAB SHACK	MCDONALD'S RESTAURANT #6839
CULVERS OF LOUISVILLE	JOHNNY BRUSCO'S PIZZA	MCDONALD'S RESTAURANT #6849
DAIRY QUEEN	KAMILIA LLC DBA COLD STONE CREAMERY	MCDONALD'S RESTAURANT #6877

Table A16: Chain-Affiliated Restaurants in Sample: Part 2

MCDONALD'S RESTAURANT #7940	PIZZA HUT #013422	STARBUCKS COFFEE #2561	WENDY'S
MELLOW MUSHROOM	PIZZA HUT #013425	STARBUCKS T0780	WENDY'S #170232
MELTING POT	PIZZA HUT #013426	STEAK & SHAKE #702	WENDY'S #170234
MIMI'S CAFE	PIZZA HUT #013427	STEAK N SHAKE #701	WENDY'S #170283
MOBY DICK	PIZZA HUT #013428	STEAK N SHAKE #703	WENDY'S #21
MOBY DICK INDIAN TRAIL	PIZZA HUT #013429	STEAK N SHAKE #707	WENDY'S #23
MOBY DICK RESTAURANT	PIZZA HUT #013430	STEAK N SHAKE #708	WENDY'S #310
MOBY DICK SEAFOOD RESTAURANT	PIZZA HUT #014321	SUBWAY	WENDY'S RESTAURANT
MOBY DICK WINKLER	PIZZA HUT #013423	SUBWAY #111140	WHITE CASTLE
MOE'S SOUTHWEST GRILL	PIZZA HUT/WING STREET	SUBWAY #11525	WHITE CASTLE #10
O'CHARLEY'S	POPEYE'S	SUBWAY #12335	WHITE CASTLE #11
OLIVE GARDEN	POTBELLY SANDWICH SHOP	SUBWAY #1715	WHITE CASTLE #13
OLIVE GARDEN #1703	QDOBA	SUBWAY #21299	WHITE CASTLE #15
OLIVE GARDEN ITALIAN #1327	QDOBA #2546	SUBWAY #21369	WHITE CASTLE #17
OUTBACK STEAKHOUSE	QDOBA #2632	SUBWAY #24964	WHITE CASTLE #19
OUTBACK STEAKHOUSE #1815	QDOBA MEXICAN GRILL	SUBWAY #2824	WHITE CASTLE #28
P.F. CHANG'S	QDOBA MEXICAN GRILL #2029	SUBWAY #28497	WHITE CASTLE #29
PANERA BREAD	QUIZNO'S	SUBWAY #2945	WHITE CASTLE #30
PANERA BREAD #1669	RALLY'S	SUBWAY #34164	WHITE CASTLE #31
PANERA BREAD #826	RALLY'S #103	SUBWAY #34858	WHITE CASTLE #33
PANERA BREAD #904	RALLY'S #106	SUBWAY #35147	WHITE CASTLE #36
PAPA JOHN'S	RALLY'S #112	SUBWAY #4260	WHITE CASTLE #7
PAPA JOHN'S #008	RALLY'S #114	SUBWAY #43919	ZAXBY'S
PAPA JOHN'S #11	RALLY'S #118	SUBWAY #6322	ZAXBY'S
PAPA JOHN'S #22 / BROADBENT ARENA	RALLY'S #121	SUBWAY #6345	ZOE'S KITCHEN
PAPA JOHN'S PIZZA #12	RALLY'S #123	SUBWAY - 10519	ZOE'S KITCHEN
PAPA JOHN'S PIZZA #16	RALLY'S #126	SUBWAY SANDWICH SHOP	
PAPA JOHN'S PIZZA #17	RED ROBIN	SUBWAY SANDWICHES	
PAPA JOHN'S PIZZA #20	RED ROBIN GOURMET BURGERS	SUBWAY SANDWICHES & SALAD	
PAPA JOHN'S PIZZA #21	ROMANO'S MACARONI GRILL		
PAPA JOHN'S PIZZA #36	RUBY TUESDAY #4520	TACO BELL	
PAPA JOHN'S PIZZA #4	RUTH'S CHRIS STEAK HOUSE	TACO BELL #19726	
PAPA JOHN'S PIZZA #50	RYAN'S FAMILY STEAKHOUSE	TACO BELL #20133	
PAPA JOHN'S PIZZA #7	SCHLOTZSKY'S	TACO BELL #22578	
PAPA JOHN'S PIZZA #81	SHONEY'S #1772	TACO BELL #2412	
PAPA JOHN'S PIZZA #9	SKYLINE CHILI #1	TACO BELL #2477	
PAPA JOHN'S PIZZA 1450	SKYLINE CHILI #2	TACO BELL #3362	
PAPA JOHN'S PIZZA 2000	SKYLINE CHILI #3	TACO BELL #3376	
PAPA JOHN'S PIZZA 25	SKYLINE CHILI #4	TACO BELL #3450	
PAPA JOHN'S PIZZA 44	SMOOTHIE KING	TACO BELL #3677	
PAPA MURPHY'S	SONIC	TACO BELL #3871	
PAPA MURPHY'S PIZZA	SONIC DRIVE IN	TACO BELL/KFC EXPRESS	
PENN STATION	SONIC DRIVE-IN	TACO BELL/PIZZA HUT EXPRESS #2511	
PENN STATION #5	STARBUCKS	TEXAS ROADHOUSE	
PENN STATION #8	STARBUCKS #10454	TGI FRIDAY'S	
PENN STATION EAST COAST SUBS	STARBUCKS #10637	WAFFLE HOUSE	
PITAPIIT	STARBUCKS #2466	WAFFLE HOUSE #1001	
PIZZA HUT	STARBUCKS #2472	WAFFLE HOUSE #1069	
PIZZA HUT #013414	STARBUCKS #2487	WAFFLE HOUSE #1398	
PIZZA HUT #013415	STARBUCKS #2562	WAFFLE HOUSE #1444	
PIZZA HUT #013416	STARBUCKS #2633	WAFFLE HOUSE #1568	
PIZZA HUT #013419	STARBUCKS COFFEE	WAFFLE HOUSE #179	
PIZZA HUT #013420	STARBUCKS COFFEE #10559	WAFFLE HOUSE #221	
	STARBUCKS COFFEE #11798	WAFFLE HOUSE #353	
	STARBUCKS COFFEE #2541	WAFFLE HOUSE #932	
		WAFFLE HOUSE #1111	