COVID Shutdown Regulations on Restaurants Decreases xx% of Average Total Sales in Ontario*

Hong Shi, Hong Pan, Yixin Guan, Babak Mokri

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Abstract

Since 2020, the world-wide COVID-19 pandemic has greatly influenced public health and healthcare, resulting in governments to impose regulations on social gatherings to eliminate further outbreaks. In Ontario, the provincewide stay at home order and shutdown restrictions on businesses and facilities has limited economic activities into a recession. This paper examines the shutdown effect on restaurants by reopening a city in Ontario (Peterborough) and comparing its restaurant operating situation with that of another city (Brantford) after three months reopening. The experiment results show that shutdown regulations on restaurants have decresed xxx%. . . ..

1 Introduction

2 Data

Our data explores shutdown effects on restaurant businesses in Ontario. We analyzed it using R (R Core Team 2020), and packages `tidyverse` (Wickham et al. 2019), `stringr`(Wickham 2019), `here` (Müller 2020). We used R packages `cansim` (Shkolnik 2020) and packagesxxx to decide our intervention and sampling method, and packages `bookdown` (Xie 2016), `kableExtra`(Zhu 2020) to format the document.

2.1 Intervention

Partnered with the Ontario government, we want to examine the shutdown effects on restaurant businesses in Ontario. The plan of the experimental design was to reopen all restaurants (i.e. enable the dine-in option) in particular Ontario regions, while enforcing current provincewide shutdown restrictions (i.e. disable the dine-in option) on restaurants in the rest of Ontario regions. And after the three-month reopening, we compare restaurant operating situations in reopened regions with those in shutdown regions through data collected from online surveys of restaurant owners.

However, due to current COVID pandemic, any loosening of shutdown restrictions increases chances of COVID exposures, resulting in challenges on public health and healthcare of reopened regions. It is highly risky and hasty to reopen a large area of Ontario regions for the sole purpose of our experiment. Therefore, we mindfully chose Peterborough, a relative small size Single-tier[1] city 125 kilometers northeast of Toronto, as the only region to reopen in Ontario and then compared its restaurant operating situations with those in Brantford, another Single-tier city 105 kilometers southwest of Toronto with similar population. Since demographics, land areas and more importantly, restaurant operating situations between these two cities are quite similar with each other[2], we consider these two cities as valid comparison cities that could yield an accurate estimate of restaurant businesses shutdowns(Gertler et al. 2016). In our experiment, we assigned restaurants in Peterborough as the treatment group and those in Brantford as the control group.

*Code and data are available at: https://github.com/honn-ishinn/restaurants_covid_shutdown

[1]Ontario's Municipal Act, 2001 defines a single-tier municipality as "a municipality, other than an upper-tier municipality, that does not form part of an upper-tier municipality for municipal purposes"

[2]Approach to examine the similarities of these two cities are further introduced in the discussion section

We also ensured restaurants within these two cities to have equal opportunities receiving government support (e.g. subsidies, grants, etc.) to estimate the true impact of shutdown effects on restaurant businesses after three-month reopening in Peterborough.

2.2 Sampling Methods

This experiment considered all Ontario restaurants as its target population. The frame population was decided by randomly selecting 100 restaurants from Brantford and 100 from Peterborough. To ensure the external validity of the experiment, we used the following steps to find these restaurants:

1. Scrape the postal codes of all restaurants located within the circle of the Brantford City Centre to a 40 km radius on Yelp. And then use the same method for Peterborough.
2. Acquire a list of postal codes in Brantford CMA and Peterborough CMA from the Postal Code Conversion File (PCCF) retrieved from the University of Toronto Library(Toronto Library, n.d.).
3. Compare the two lists and eliminate the restaurants with postal codes outside of Peterborough CMA and the Brantford CMA.
4. Randomly select 100 restaurants from Brantford and 100 restaurants from Peterborough to form the frame population.

Table 1: Sampling Results Summary

City	Survey Administered	Total Sample Collected	Telephone Survey	Online Survey
Brantford	100	45	40	5
Peterborough	100	48	41	7

We used telephone interviews and online questionnaire methods to administer the survey. The telephone interview served as the primary channel and an online survey option was provided when respondents could not or prefer not to be interviewed over the phone. As shown in the above table (Table 1), our sampled population included 45 valid responses in Brantford and 48 collected from Peterborough, among which, 5 were collected via the online survey in Brantford and 7 were collected via the online survey in Peterborough. Surveys that were not answered or have incomplete answers were treated as nonresponses and were not included in the dataset for further analysis. The surveys were administered in the following steps:

1. The phone number of the restaurants was scraped from Yelp while we determined the frame population.
2. Working from 2 pm to 4 pm, half of the survey staff called the Brantford restaurants, and the other half called the Peterborough restaurants simultaneously to avoid sampling bias. Each phone call took around 15 minutes to complete. All restaurants on the pre-determined list were reached within one week.
3. When the call was connected, the survey staff would provide a brief introduction of the survey purpose and indicate that the survey was sponsored by the Ontario government. See Appendix A for details.
4. To ensure the quality and accuracy of the data collection, the survey staff would ask if the respondent at the restaurant worked at a management-level position in the restaurant or was familiar with the restaurant's sales performance. If the respondent answered no, the survey staff would ask the caller to pass the call to the relevant staff in the restaurant. If that staff was not available, the survey staff will schedule another call or provide the online questionnaire based on the preference identified by the respondent. Respondents who were interested in answering the questions via online questionnaires could leave their email addresses and have two weeks to complete the survey questions.
5. Respondents who were not reached by phone for the first time were called again in the following week. Restaurants that did not respond to the second call were documented as "nonresponse".
6. To address privacy concerns and to increase the response rate, the respondents were notified before the survey that all answers were recorded anonymously. The respondents were told at the beginning of the

telephone survey that they could terminate the survey anytime if they want to. The respondents were also notified before the survey that they would have a chance to win a 50-dollar gift card if they fully participated.

The survey incurred a total cost of $20,000 CAD, which was mainly used to hire and train staff to conduct the telephone survey, collect data and administer the online survey if applicable. A small portion of the cost ($500 CAD) was used for online survey technology support and database maintenance.

3 Discussion

3.1 Determine the Treatment Group and Control Group

To obtain an accurate estimate of the shutdown effect on restaurant businesses, average characteristics of restaurants in the reopening city and those in the shutdown city need to be identical in the absence of the reopen intervention under current COVID outbreak. Since businesses in the food service industry are highly labor intensive (Swayne 2016), the `total employment` on food service between selected cities is preferred to be equal as the identical characteristic. Besides, `population density` (`Total Population`/ `Total Land Area in squared kilometers`) also has significant organizational life-cycle effects(Parsa et al. 2011). At different population density levels, competitions for food services varies, leading to different restaurants mortality rates even without the reopen intervention. As a result, total employment on food service and population density serve as primary restaurant operation characteristics for the selection of treatment city and control city.

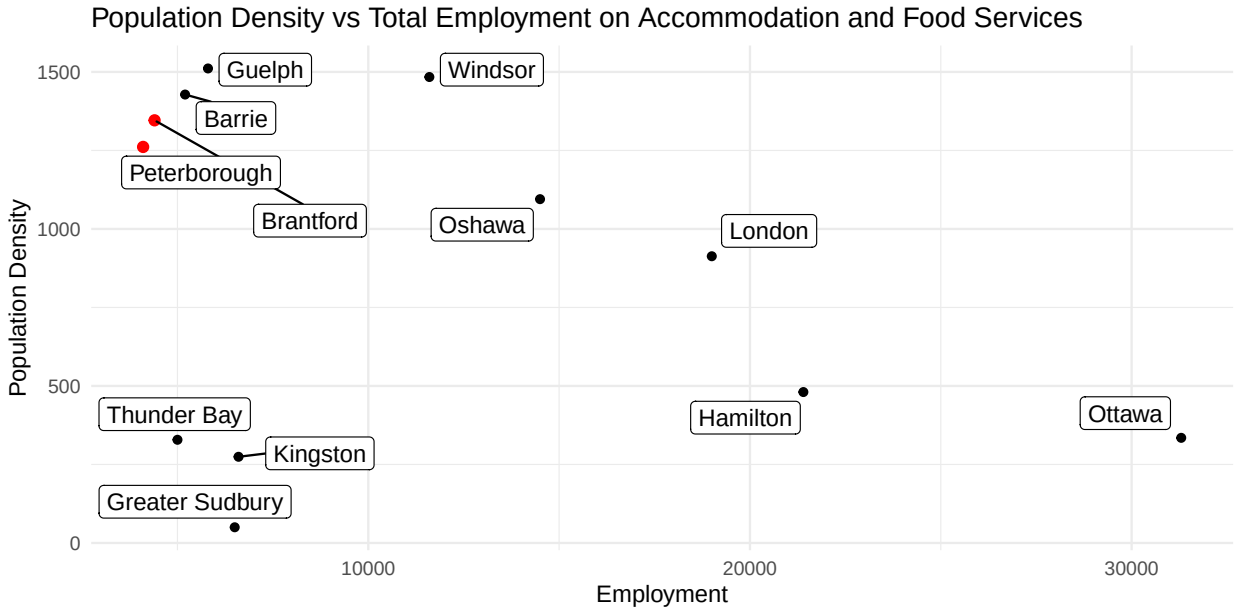

Figure 1: Population Density vs Employment on Accommodation and Food Services in Ontario Cities in 2016

We used the employment by industry data and 2016 Census data available at Statistics Canada to identify cities with similar total employment on food service and population density. The above point graph(Figure 1) indicates that Brantford and Peterborough have similar characteristics affecting the restaurant operations. In addition, the coefficient of the graph

$$\frac{Population\ Density}{Total\ Employment} = \frac{Total\ Population/Total\ Land\ Area}{Total\ Employment}$$

, which could be interpreted as the number of people served by a restaurant employee per square kilometers, helps to identify the restaurant operating situation in designated regions. Similar coefficients between

Brantford and Peterborough (0.306 vs 0.308) also suggest close restaurant characteristics. Besides, there is neither significant demographics nor land areas difference between these two cities, so we consider these two cities as a valid comparison group and reopened Peterborough as the treatment group while maintaining Brantford shutdown as the control group.

Extra concerns when determining the treatment group and control group:

- The employment data at Statistics Canada uses the NAICS (North American Industry Classification System) standard and assigns employment services to Accommodation and Food Service category. So there is less employment in food services. We took the convention that the ratio between the accommodation employment and the food service employment between Peterborough and Brantford is the same.
- Since the distance between Brantford and Peterborough is more than 200 kilometers apart, residents in Brantford are unlikely to travel such long distance solely for a dine-in meal. So the treatment of reopening Peterborough would not affect the mealing behavior in Brantford. However, residents in shutdown regions near Peterborough might go for dine-in meals, increasing sales in Peterborough restaurants. The actual shutdown effect on restaurants could be overestimated due to possible increase in sales from nearby shutdown regions' residents.
- The mindful comparison between cities' similarities on employment, population density, etc. ensures the internal validity of our experiment so that we could accurately estimate the true impact of the shutdown restriction on restaurant. However, the shutdown effect evaluation may not be generalized to the entire population of interest, i.e. all restaurants in Ontario such as township regions or cosmopolitan city Toronto.

If my paper were 10 pages, then should be be at least 2.5 pages. The discussion is a chance to show off what you know and what you learnt from all this.

3.2 Sampling Method

The sampling methods of this experiment were accompanied by some inevitable limitations and biases:

- The list of restaurants in Brantford and Peterborough may not be accurately represented on Yelp. Some restaurants may not be registered on Yelp and some may not have updated their information on time. What is more, restaurants would only appear in the Yelp query when it has been reviewed by one of its users, which suggests that certain new restaurants may not be on the list. These limitations may result in the exclusion bias of our sample.
- The sample suffered from survivorship bias as we only surveyed restaurants that are still in operations. Restaurants that lost their businesses during the pandemic could not be captured with the current method. However, these may be the ones that are most severely impacted.
- The sampling methods bore self-selection bias. From a psychological standpoint, respondents may have a stronger desire to respond to the survey if they have a strong opinion to express about their situations. The results showed that restaurant owners in Brantford faced a steeper sales decrease, and we expect that this may contribute to the higher survey response rate in Brantford.
- The accuracy of the responses may be hindered by the difficulties in reaching the management staff of restaurants. The phone numbers scraped from Yelp was usually used for food ordering and the staff who picked up the phone may not know the sales status. However, we do not believe this would significantly skew the result. According to Statistics Canada, 98.5% of restaurants in Canada have 0-99 employees(Canada, n.d.). Since food service businesses are usually small to medium size, there is a high likelihood for the survey to reach management staff in the restaurant. Respondents were also asked to pass the phone to management staff or leave their email to receive the online survey if they would like to do so, therefore mitigating the negative impact caused by the telephone survey method.
- Respondents may react differently in a phone interview compared to an online survey. The two methods may have the potential to produce significantly different results even when the two surveys have the

same questions (Yan Xin 2014). People may be more comfortable answering a certain type of question online rather than by phone call, or vice versa.

3.3 Third discussion point

3.4 Weaknesses and next steps

Weaknesses and next steps should also be included.

Appendix

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