The Impact of the Flint Water Crisis on Restaurant Employment

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Abstract: During Flint, Michigan's water crisis, people may have been hesitant to eat at restaurants that utilized Flint City water, resulting in reduced sales and employment. We survey restaurants and find that restaurants that use Flint City water experienced reduced sales, though this is partially offset if the restaurant is part of a chain. We augment this finding by using data collected by the State of Michigan and finding a statistically significant break in the trend of restaurant employment in the Flint MSA that corresponds to the Water Crisis. These results suggest approximately 500 jobs were lost during the Crisis.

Keywords: Flint Water Crisis, Employment, Restaurants

JEL Classification: D12, H41, I18

1. Introduction

The Flint Water Crisis occurred when corrosive water dissolved lead from pipes and service lines into the city's water supply, resulting in widespread contamination and adverse health effects. Much has been written about the effects of the Water Crisis on children (see, for instance, Sanburn 2016). General effects of lead on child health and development outcomes has also been examined in the academic literature (for a recent example, see Sorensen et al., 2019).

Understandably, the effect the Water Crisis had on businesses has received less attention. Businesses, especially restaurants, are likely to have been adversely impacted by the Water Crisis. Rational, risk averse consumers would have been hesitant to go to restaurants that serve and cook with Flint water, resulting in decreased sales and thus reduced employment.

While much attention has been paid to the health effects of the Water Crisis, this paper is the first to uncover the effects of the Flint Water Crisis on businesses, specifically restaurants. We surveyed 650 restaurants located in Genesee County. Eighty returned a survey, for a response rate of 12.3 percent. There was a statistically significant relationship between using Flint city water and experiencing a decline in sales. Using the test of Lee, Strazicich, and Meng (2012) and data collected by the State of Michigan, we find a break in the trend of restaurant employment in Genesee County that coincides with the Water Crisis. This test suggests that approximately 500 jobs were lost during the crisis.

The paper is organized as follows. Section 2 presents some background on the Flint Water Crisis. Section 3 describes the survey and econometric results. Section 4 presents the results of the structural break test, and Section 5 concludes.

2. Background

The Flint Water Crisis began in April 2014 when the City of Flint, Michigan switched from using water provided by the Detroit Water and Sewerage Department (DWSD), sourced from Lake Huron, to water sourced from the Flint River, which was Flint's backup water supply at the time.

In March 2013, following years of DWSD water rate increases, the Flint City Council voted to join the Karegnondi Water Authority (KWA), which was building a pipeline from Flint to Lake Huron in order draw water from the lake while avoiding the DWSD. This vote was symbolic, as the State had placed Flint under emergency manager supervision in 2011 after a state financial review team determined that the city was in a "financial emergency." The emergency manager had complete discretion over city decisions, thus city council votes were non-binding. However, the vote to join KWA was ratified by the Flint emergency manager in April 2013.

The KWA pipeline was estimated to be completed in 2016, and Flint planned to use DWSD water until then. However in April 2013, following the emergency manager's decision, the DWSD informed the city that it was terminating Flint's water contract effective April 2014. The city then made the decision to use Flint River water as its water source between when the DWSD water supply ended and when KWA pipeline was completed. River water is more corrosive than lake water, and water officials did not add the proper corrosion inhibitors to it during the treatment process due to a failure in applying the lead and copper rule (LCR). As discussed by Bummer et al. (2016), the LCR requires tap water testing in a sample of 100 homes at high risk of contamination. The lead and copper levels in the 90th percentile of these tests must not exceed 15 parts per billion (ppb). The homes tested in Flint were not those of the highest risk of lead and copper contamination. Water pipes in these homes were improperly flushed prior to the test, causing the test to incorrectly find a low level of lead and copper. The failure to implement the LCR caused Flint to fail to implement the proper corrosion control technology. This caused the corrosive water to dissolve lead from Flint's lead service lines that run from the cast iron water mains to homes, thus contaminating the water supply. One home tested in Flint found a lead level of 13,000ppb.

As discussed by Dingle (2016), proper corrosion control involves adding phosphate to the water supply during the treatment process, which builds a protective coating inside of the pipe, thus preventing lead from dissolving into the water. Masten et al. (2016) have a detailed discussion of all the failures involving the treatment of the Flint River water. These include the river water being difficult to treat due to seasonal variations in temperature, hardness, and organic content, the failure of the Flint water treatment plant to have the proper equipment and chemicals to treat the river water, and a failure to conduct any treatability studies or pilot testing prior to the switch to Flint River water. As a consequence, workers at the water treatment plant had to resort to trial and error to address the numerous water quality issues and resident complaints about them.

The first publicized indication of a problem was in December 2014, when General Motors stopped using Flint city water at its V6 engine plant, as it was corroding the engines. Flint issued a water quality warning in January 2015, and residents brought brown water samples to town hall meetings at city hall. The brown water indicated that the corrosive water was also dissolving the cast iron

water mains (Matsen et al., 2016). Marc Edwards, a professor of civil and environmental engineering at Virginia Tech, discovered the corrosive nature of Flint's water in September of 2015. The Water Crisis became a national news story in December 2015, most famously perhaps with the extensive coverage of it on the Rachael Maddow Show on MSNBC. Genesee County, the county were Flint is located, declared a state of emergency in January 2016. In October 2015, with financial assistance from the Mott Foundation, Flint switched back to DWSD water. Ruckart et al. (2019) discusses further long-term recovery initiatives, including the Flint Lead Free initiative that has the goal of making Flint a lead-free city by 2022.

In November 2017, the Flint City Council voted to sign a 30-year contract with KWA. Flint water is currently safe to drink,[1] though trust in the state and local government has been severely eroded and replacement of the lead service lines will not be completed until at least 2019.[2] It is important to note that only people within the Flint city limits experienced contaminated water. Communities that surround Flint in Genesee County, including Flint Township, are on different water supplies, though there was substantial confusion about this during the crisis.

Butler et al. (2016) point out that failing to properly enforce and implement drinking water regulations, which has led to drinking water contamination, has occurred in other cities that are similar to Flint. This study, as well Campbell et al. (2016), show that Flint Water Crisis was a failure involving all levels of government, and argue these failures are more likely in post-industrialized cities with substantial minority populations such as Flint.

3. Survey and Econometric Results

Table 1 presents the questions and summary statistics from the survey sent to Genesee County restaurants, some of which used Flint City water while others used different water source. The survey format and initial database of bars and restaurants came from Biehl and Douglas (2011), with the database cross-checked with Yellow Page listings to ensure it remained accurate.

Out of the 80 restaurants that responded, 34 percent were fast food restaurants, 33 percent were family restaurants, 11 percent were adult restaurants, 24 percent were part of a national chain, 39 percent also have a bar, 33 percent use Flint city water, and 36 percent experienced a decrease in sales during the Water Crisis. Restaurants hooked to Flint City water were highly likely to report a reduction in sales during the crisis, with a correlation coefficient of 0.64.

To investigate this relationship, we estimate the following linear probability model:

$$decreased_i = \beta_0 + \beta_1 fastfood_i + \beta_2 \times family_i + \beta_3 \times flintwater_i + \beta_4 \times chain \times flintwater_i + \beta_5 bar \times flintwater_i + u_i \qquad (1)$$

The dependent variable equals unity if restaurant *i* reported that its sales decreased during the Water Crisis. The independent variables are dummy variables from the survey, as described in Table 1, with the latter two terms being interaction terms.

Table 2 presents the results. Restaurants on Flint city water have a 77 percent greater chance of reporting that sales decreased, though being part of a national chain reduces this by 46 percentage points. A chain may offer assurance to consumers in that they believe a national chain has the reputation and resources to mitigate the contaminated water through an expensive filtration system. Consumers might be less confident that a small, independent restaurant has the resources to do so. Franchises exist in part to signal quality and impose minimum quality standards (Mathewson and Winter, 1985).

4. Structural Break Test

We test for a structural break in total restaurant employment (NAICS code 722) in the Flint Metropolitan Statistical Area using data collected by the State of Michigan to see if reduced restaurant sales coincide with a reduction in employment. The monthly data spans from January, 2013 to March, 2017.[3] Because there is a clear difference in employment trends before December, 2012 due to the Great Recession, we use observations from 2013 through 2017, resulting in 51 monthly observations.

The structural break test of Lee, Strazicich, and Meng (2012) allows the testing for two structural breaks at unknown dates. The first and last 10 percent of the observations are trimmed and a grid search is conducted over the remaining observations. The maximum F-statistic obtained for two possible beak dummy variables in the grid search is compared to the critical value in Table 1 of Lee, Strazicich, and Meng (2012). If the F-statistic exceeds the critical value, then there are two significant breaks in the trend of the series. This allows us to see if the break dates determined by the test coincide with the Flint Water Crisis.

Table 3 presents the results of this test. The test finds two statistically significant breaks, one in March 2015 and one in December 2015. Recall from section 2 that these dates roughly coincide with the water quality warning issued by Flint in January 2015 and the switch back to DWSD water in October 2015.

Figure 1 plots the restaurant employment time series for the Flint MSA, along with the two break points, which clearly shows the trend in employment decreasing. Before the first break, 12,900 people worked in restaurants compared to 12,473 after. As of March, 2017, fewer people work in restaurants in Flint than before the crisis. In contrast, restaurant employment statewide in Michigan had recovered to pre-Great Recession level by then, consistent with the idea that restaurants in the Flint MSA struggled more than those in MSAs that did not have a water crisis.

5. Conclusion

Both the survey evidence and the State of Michigan employment data suggest that restaurants in Flint suffered a loss of sales and employment during the Water Crisis. Unlike for the entire state, in Flint, restaurant employment has not yet returned to its pre-Great Recession level. This is another adverse effect of the Water Crisis that is likely to linger for years to come.

Endnotes

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1. It is safe to drink, unless it is coming through a lead pipe that is so corroded that some lead breaks loose and flows into the water.
2. For a detailed history of the Flint Water Crisis, see "Disaster Day by Day: A Detailed Flint Crisis Timeline" in *Bridge Magazine*.
3. The State of Michigan appears to have stopped collecting three-digit NAICS employment data for the Flint MSA after this date. See the Michigan Bureau of Labor Market Information and Strategic Initiatives at milmi.org

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Table 1: Survey Questions and Summary Statistics

Variable	Mean
fast food restaurant	0.34
family restaurant	0.33
adult restaurant	0.11
chain restaurant	0.24
restaurant has a bar	0.39
restaurant uses Flint city water	0.33
restaurant's sales decreased	0.36

Table 2: Linear Probability Model Results

Variable	Coefficient	Standard Error
$fastfood_i$	-0.113	0.118
$family_i$	0.0367	0.113
$water_i$	0.773**	0.132
chain x water	-0.461*	0.213
bar x water	0.0413	0.180
constant	0.139	0.0889
N=80		F-stat: 13.15

Notes: ** means significant at 1% level, * means significant at 5% level.
P-value on F-statistic is 0.0000

Table 3: Structural Break Test Results

First Break	Second Break	F-Statistic	5% Critical Value
March, 2015	December, 2015	12.634	10.801

Figure 1: Restaurant Employment in Flint MSA With Break Points