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1. Introduction

In March of 2020, many U.S. cities and states implemented a variety of measures to slow the spread of COVID-19. These include encouraging people to practice social distancing, prohibiting large groups, and the shutdown of nonessential businesses. By the time that businesses closed, many Americans had already adjusted their behavior in response to COVID-19. For example, consumer spending fell by 16 percent in New York between January and March 22, 2020, when the state issued its "Stay-at-Home" order and nonessential businesses closed. Florida's "Stay-at-Home" order on April 3 was preceded, one week earlier, by a 26-percent decrease in overall consumer spending and a 70-percent reduction in spending on entertainment and recreation on March 27, 2020 (Chetty et al. 2020).

Businesses such as restaurants, movie theatres, live sporting events and theme parks were particularly impacted by COVID-19 restrictions because they often have large numbers of people in confined spaces. For example, the number of reservations at U.S. restaurants was 14-percent lower on March 9 (compared with the previous year), 28-percent lower on March 12, and 56-percent lower on March 16. The year-over-year decrease in reservations fell to 99-percent on March 20, where it remained until early May of 2020.[1]

This paper examines the attendance at U.S. theme parks in the period immediately before they closed due to COVID-19. Specifically, we focus on attraction wait times—a proxy for the number of people in a theme park—at Walt Disney World's Magic Kingdom in the days leading up to its shutdown on March 15, 2020. With 21.0 million guests in 2019, the Magic Kingdom (at Walt Disney World in Orlando, Florida) is the world's most visited theme park (Themed Entertainment Association 2020). The number of daily visitors varies across the year, with higher attendance around holidays and school vacations. Magic Kingdom attendance also varies by time of day and day of week, and there are differences in the numbers of people who ride the various attractions; e.g., Space Mountain (roller coaster) is more popular than Prince Charming Regal Carrousel.

Our exploratory analysis provides evidence on the initial economic effects of COVID-19 (Baker et al. 2020; Bartik et al. 2020), with a focus on U.S. theme parks—a sector that experienced a total shutdown due to the pandemic.[2] In addition, the paper contributes to the literature on theme parks (Braun and Soskin 2010; Braun, Soskin and Cernicky 1992; Oi 1971; Song, Yang and Huang 2009) and, more specifically, presents new results related to queue lengths and theme park congestion (Brown, Kappes and Marks 2013; Daniels et al. 2017; Larson 1987; Zhang, Li and Su 2017). The amount of time waiting in lines affects a person's experience when attending a theme park or dining in a restaurant (Hwang and Lambert 2006; Sulek and Hensley 2004), and queue lengths are vitally important when visiting a hospital emergency room (Moloney et al. 2005; Ng et al. 2010) or waiting for a medical treatment (Bilimoria et al. 2011; Kulkarni et al. 2009).

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[1] These figures are from the OpenTable online restaurant reservation website.

[2] For example, Baker et al. (2020) found that U.S. household spending (e.g., groceries) increased sharply between February 26 and March 16, followed by large reductions in spending (e.g. restaurants) from the middle to late March of 2020.

The analysis of attraction wait times, which are posted at the entrances to the rides and on a theme park app, is used as a proxy to represent theme park attendance. This is important because, although estimates of annual theme park attendance figures are available (Themed Entertainment Association 2020), daily attendance figures are not released to the public. A companion piece to this study uses Magic Kingdom attraction wait times to estimate the impacts of various reduced-capacity scenarios on attendance in the period after reopening from the COVID-19 closure (Gabe 2021). For example, operating at 50 percent of the Magic Kingdom's capacity would lower annual attendance by an estimated 10.6 percent. The analysis presented in this paper differs from the previous study in that it focuses on Magic Kingdom wait times in the period immediately before it closed due to COVID-19 (instead of the impacts of reduced capacity). Future research can use attraction wait times from after the park's reopening to examine aspects of the Magic Kingdom's recovery.

2. Analysis and Results

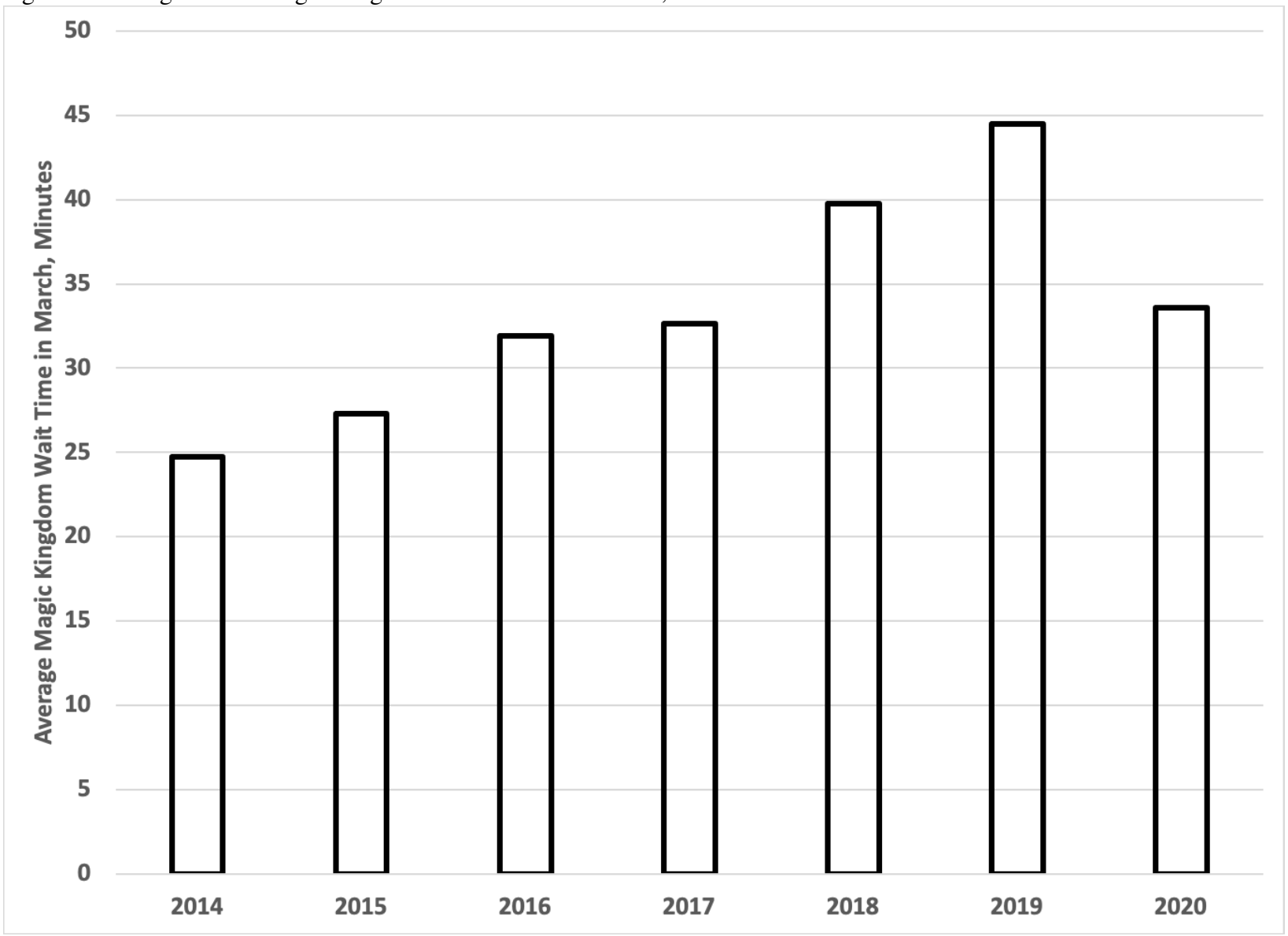
To investigate the main research question of whether people stopped visiting theme parks in advance of their closures due to COVID-19, we examine patterns in Magic Kingdom attraction wait times in the period leading up to and including March 15, 2020, which was its last day of operation. Attraction wait times are good indicators of the numbers of people standing in queues, which in turn are good proxies for the numbers of visitors. Our research question is important to policymakers and business managers because it examines how people respond to public health concerns even before the government and/or businesses take action (i.e., the closure).

The analysis uses data on 329,737 attraction wait times, collected from the My Disney Experience app between January 1, 2014, and March 15, 2020. The dataset includes observations from all 365 days of the year (although not every day in all seven years) and wait times collected across all times of the day for 24 different attractions. Wait times range from zero minutes (i.e., no wait) to over three hours. The average wait time across the entire sample is 29.5 minutes, with a standard deviation of 29.1 minutes.

As a first look at patterns in attraction wait times in the period before the Magic Kingdom's COVID-19 closure, Figure 1 shows average March wait times for the years 2014 to 2020. Average March wait times increased between 2014 and 2019, with a noticeable drop from 2019 (44-minute average) to 2020 (34-minute average). The average March wait times in 2020, which cover the two weeks prior to the Magic Kingdom's closure on March 15, are roughly similar to average March wait times in 2017 (33 minutes) and 2016 (32 minutes).

Next, to analyze more detailed patterns related to specific days prior to the Magic Kingdom's closure, we estimate a regression model of attraction wait times. The explanatory variables of primary interest are dummy variables that indicate: (1) Final Day prior to closure (i.e., Sunday March 15), (2) Final Weekend (i.e., Friday March 13 to Sunday March 15), (3) Final Week (i.e., Monday March 9 to Sunday March 15), (4) Final Two Weeks, (5) Final Three Weeks, and (6) Final Month.

Figure 1. Average March Magic Kingdom Attraction Wait Times, 2014 to 2020



To isolate impacts associated with the days leading up to March 15, 2020, the regression model controls for the effects on attraction wait times related to the day of week, month, year, time of day, whether the wait time was recorded during the first or last hour of park operations, and the specific attraction. For the months of March and April, the regression model controls for the specific week to capture impacts associated with Spring Break. The regression model also includes variables that indicate U.S. national holidays, and variables that indicate the week around Thanksgiving and the period between (and including) Christmas and New Year's Day.

Regression results presented in Table 1 indicate, other things being equal, 2.9-minute shorter wait times on the day that the Magic Kingdom closed, 9.1-minute shorter wait times on the last weekend of operation, 4.3-minute shorter wait times during the final week, and 8.0-minute shorter wait times associated with the final two weeks. Variables representing the final three weeks and month of operation prior to the Magic Kingdom's closure do not have statistically significant impacts on attraction wait times. Other results presented in Table 1 suggest that Magic Kingdom wait times are associated with, among other things, the day of week, month, time of day, and whether or not the observation was recorded on a holiday.

We can use these regression results to estimate attraction wait times in the days leading up to the Magic Kingdom's closure, compared to the estimated wait without the impacts related to COVID-19. For example, the estimated coefficients from the regression analysis show a 17-minute wait time on a Sunday during the third week of March 2020, which is also indicated as the final day (and included in the weekend, week, two weeks, three weeks and month) before the Magic Kingdom closed.[3] By comparison, the regression results show a 42-minute wait on the same day (i.e., Sunday during the third week of March 2020) without incorporating the effects of the six dummy variables indicating the period leading up to the Magic Kingdom's closure. These estimated wait times on May 15, 2020, shown in the far-left columns of Figure 2, suggest that the wait times on the final day of operation are 60-percent shorter than what they would have been without the COVID-related impacts.

Other results shown in Figure 2 indicate that on the final weekend, but not the final day, before closing (i.e., Friday March 13 and Saturday March 14), the Magic Kingdom had an estimated wait time of 25 minutes.[4] This is 47-percent shorter than the estimated wait time, if not for the impacts related to COVID-19, over the same two days. The periods of Monday March 9 to Thursday March 12, and Monday March 2 to Sunday March 8 have estimated Magic Kingdom wait times that are 28-percent and 21-percent shorter, respectively, than what would be predicted if not for the impacts of COVID-19.

[3] This estimated wait time, and the results shown in Figure 2, are averages across all times of the day and attractions.
[4] This estimate also accounts for the impacts associated with the final week, two weeks, three weeks and month before the COVID-19 closure.

Table 1. OLS Regression Results: Factors Impacting Magic Kingdom Wait Times, 2014 to 2020 (n=329,737)

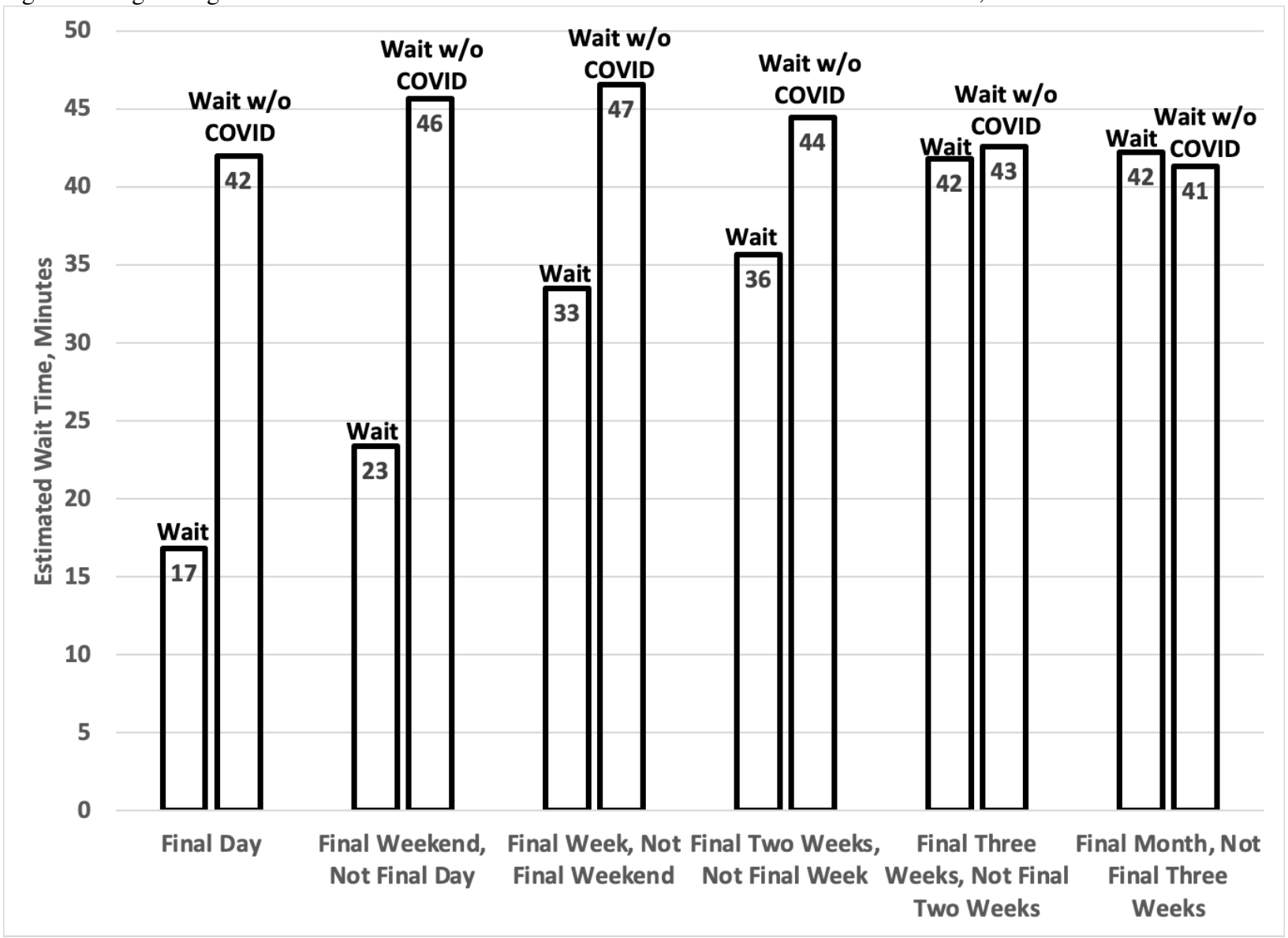
Variable Name		Estimated Coefficient	Standard Error
Constant		-2.51*	0.260
Final Day		-2.92*	0.676
Final Weekend		-9.14*	0.571
Final Week		-4.33*	0.511
Final Two Weeks		-7.96*	0.913
Final Three Weeks		-1.68	1.198
Final Month		0.87	0.918
Tuesday		0.89*	0.136
Wednesday		-0.99*	0.136
Thursday		-2.23*	0.139
Friday		-1.45*	0.138
Saturday		0.67*	0.131
Sunday		-1.75*	0.131
February		0.88*	0.137
March		4.01*	0.180
	March Week 2	5.64*	0.235
	March Week 3	1.49*	0.262
	March Week 4	6.31*	0.229
April		7.56*	0.194
	April Week 2	-0.35	0.326
	April Week 3	-6.69*	0.316
	April Week 4	-4.23*	0.320
May		2.01*	0.183
June		3.81*	0.174
July		3.38*	0.168
August		-0.09	0.159
September		-7.13*	0.162
October		-1.99*	0.197
November		-1.73*	0.223
December		6.19*	0.138
Year 2015		1.88*	0.110
Year 2016		3.83*	0.115
Year 2017		6.66*	0.114
Year 2018		9.37*	0.117

Table 1. Continued

Variable Name	Estimated Coefficient	Standard Error
Year 2019	4.92*	0.124
Year 2020	17.17*	0.392
10 am to 1 pm	17.91*	0.163
1 pm to 4 pm	24.92*	0.165
4 pm to 7 pm	24.02*	0.171
7 pm to 10 pm	17.31*	0.208
10 pm or later	11.30*	0.173
First Hour Open	-2.77*	0.170
Last Hour Open	-9.15*	0.151
New Year's Day	-11.17*	0.338
Birthday of Martin Luther King, Jr.	1.38*	0.410
Washington's Birthday	6.63*	0.775
Memorial Day	-2.36*	0.568
Independence Day	0.07	0.651
Labor Day	3.91*	0.458
Indigenous Peoples' Day	6.63*	1.729
Veterans Day	8.46*	0.788
Thanksgiving Day	0.28	0.535
Week of Thanksgiving	12.18*	0.324
Christmas Day	3.99*	0.287
Week Between Christmas and New Year's	14.17*	0.200
New Year's Eve	14.30*	0.221
R-squared	0.6361	
Adjusted R-squared	0.6360	

Notes: * indicates statistical significance at the 1-percent level. Regression model also includes 23 dummy variables that control for the specific attraction (e.g., Space Mountain, Pirates of the Caribbean) on which the wait time was recorded. The observations are weighted for equal representation by year.

Figure 2. Magic Kingdom Wait Times in the Period Prior to its COVID-19 Closure on March 15, 2020



3. Conclusions

Measures used to combat the spread of COVID-19—e.g., increase social distancing and prohibit the gathering of large groups—had particularly severe impacts on restaurants, live theaters, hotels and theme parks. These types of businesses halted their operations as a result of the COVID-related shutdowns in many U.S. cities and states. In the days before they closed, however, U.S. consumers had already changed their behavior as a result of COVID-19.

Walt Disney World's Magic Kingdom, the world's most visited theme park, closed its gates due to COVID-19 on March 15, 2020, about two weeks before Florida issued the state's "Stay-at-Home" order on April 3. Prior to its shutdown, the number of guests fell substantially as evidenced by much shorter attraction wait times, compared to the wait without the COVID-related impacts. For example, wait times were 60-percent shorter on the Magic Kingdom's last day of operation on March 15, and wait times were 21-percent shorter from March 2 to March 8—i.e., two weeks before the Magic Kingdom's shutdown.

Our results, which show no impact on wait times associated with COVID-19 from February 24 to March 1 (and February 16 to 23), suggest that the number of Magic Kingdom visitors started its decline in the first week of March 2020. This change happened shortly after the first U.S. death attributed, at the time, to coronavirus on February 29, and as the United States approved widespread testing for coronavirus (on March 3).[5] The Magic Kingdom's shutdown coincided with the U.S. Centers for Disease Control and Prevention's recommendation of "no gatherings of 50 or more people" issued on March 15, 2020.

The main policy and economic implications of these findings are that they provide evidence of people changing their behavior to a public health threat, even before the government and/or businesses took action. Our results are, thus, similar to other studies that show people adjusted their behavior in advance of COVID-19 closures (Gibson and Sun 2020; Goolsbee and Syverson 2021). For example, in a study that focused on U.S. restaurants, Tucker and Yu (2020) found that the number of customers "had already declined substantially" in advance of state-specific restrictions. Future research, focusing on Magic Kingdom wait times after it reopened in July of 2020, will examine the theme park's recovery and if (and how) behavior might have further evolved as people started to adapt to the threat of COVID-19.

[5] These dates are from Taylor (2020).

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