

# Telemobility UTC



## FINAL REPORT

Did the pandemic change shopping habits at retail stores?

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# Did the pandemic change shopping habits at retail stores?

**Abstract:** We use retail store foot traffic data from SafeGraph, to provide model free evidence on changes in customer preferences during the COVID-19 pandemic for (i) distance traveled from home to store, (ii) shopping duration, and (iii) day and time of visit to stores. We find that all outcomes changed substantially at the start of the pandemic, with customers traveling shorter distances, making shorter visits, and shopping more during weekdays and working hours. These changes, however, did not persist across most retail categories and customer behavior reverted to pre-pandemic patterns by 2021. The most persistent changes occurred at fast-food restaurants where the proportion of short visits under 20 minutes increased significantly and proportion of working hour visits decreased significantly.

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## 1. Introduction

### Motivation

Popular media has carried many reports of changes in customer behavior as a result of COVID-19, along with speculation about which changes may persist beyond the pandemic. For example, in an editor's pick article for Forbes in December 2020, Blake Morgan, a customer experience futurist and an adjunct faculty at Rutgers University, noted that "Over the last six months, consumers have decreased the amount of time they spend in stores." Blake identifies this new preference of consumers to get in and out of stores quickly instead of browsing through the aisles selecting groceries as one of the changes that would stick. A New York Times article from Oct, 2020 discusses how a customer preference for curbside pickups offered by Target and Walmart will outlast the pandemic. In agreement, a Wall Street Journal article from March 2021 reported that retail executives and shoppers believed this increase in preference for curbside pickup would become a habit for many customers post-pandemic.<sup>1</sup> Another New York Times article from June 2021 noted that "a Tuesday morning (commute) was not so different from a Saturday afternoon" during the pandemic. It argued that government mandates for closure of non-essential stores and stay-at-home orders in early 2020 decreased overall travel, flattened rush hour peaks during the day, and smoothed the travel traffic through days of the week. It further remarked that "planners, transit agencies, and researchers are now considering the remarkable possibility that in many places it won't revert to its old shape amid newfound work flexibility."<sup>2</sup>

Several academics joined journalists in making predictions. In a December 2021 podcast, McGill University's Mehmet Gumus argued that omnichannel adoption has increased among consumers and retailers due to the pandemic. He remarked, "Would they (customers) visit the store? Or if they're visiting once every week, are they going to visit in the same frequency? In the short-term or long-term, we'll be perhaps going through this re-adaptation and re-normalization process, and we will see whether this shift is going to be permanent or not." Johan Anselmsson, Professor in Marketing Lund University School of Economics and Management, speculates that while their maybe slight changes in consumer spending in the immediate short run, things would go back to normalcy in the long run. Specifically, he believes that there would be less preference for do-it-yourself activities and more for social activities, shopping for apparels in stores for instance and that the city centre constituting of restaurants and major retail stores might change only slightly. Gaurav Sabnis, Associate Professor of Marketing at the School of Business at Stevens Institute of Technology, tweeted "Retail, as we knew it before March 2020, is dead. First line of my first paper draft post covid. Dark?" on 31 May, 2020. In an early article on COVID-19, [Sheth 2020](#) argued that most consumer behaviors apart from a select few like grocery shopping and delivery would

return to normalcy. We discuss various methodologies, data sets, and questions studied around COVID-induced shifts in consumer habits in section 4 on related literature and contributions.<sup>3</sup>

While there has been plenty of speculation, there is little rigorous analysis using ground data. The consensus echoes Stefan Larsson, CEO of Calvin Klein, who stated in a Wall Street Journal article that “Consumers found some of the experiences forced by COVID to be convenient. Anything that they perceive as making their life easier will be here to stay.”<sup>4</sup> In this study, we focus on some customer shopping habits that impact retail operations. We use data from SafeGraph to understand which habits changed early in the pandemic and which show signs of persistence. In particular, we study changes in the distance customers traveled to shop, the time they spent at the store, and their preference for shopping during weekdays or working hours. Along all dimensions, we find significant changes in customer behavior early in the pandemic. Whereas some behaviors reverted to pre-pandemic levels by 2021, other changes persisted, with outcomes varying to some extent by retail category.

## Overview

We analyze data from SafeGraph, a popular source (see section 4) for cellphone mobility data, to provide model-free evidence for the impact of COVID-19 on customer shopping habits. For a representative population of the US, data from SafeGraph shows the number of visits to each store, every hour, for a period of four years from 2018 to 2021 that includes the pandemic. We use this data to track certain customer behavior outcomes impacting retail operations. The outcomes we study include the distance traveled by customers, the percentage of customers making short visits under 20 minutes (a surrogate for curbside pickup), the ratio of weekday to weekend shopping visits, and the ratio of working hour to after working hour visits. These outcomes impact sourcing, staffing, and inventory management decisions by retailers.

We focus on popular firms in some major retail categories such as apparel, pharmacy, multi-purpose retail, and food services to validate our findings. For April 2020, the month after the pandemic started in the US, consistent with press reports, our analysis shows a significant change in customer behavior. We observe a noticeable reduction in distance traveled to shop, time spent shopping, flattening of the weekend shopping peak, and an increase in working hour visits for most retail categories. A noticeable exception is supermarkets, where we observe an increase in the time spent shopping early in the pandemic. Whereas most initial changes in shopping behavior do not seem to persist, some changes persist in specific retail categories. For example, short visits to fast-food restaurants increased early in the pandemic, and the change persisted until 2021.

Our data show significant changes in customer behavior early in the pandemic. In April 2020, the average distance traveled by a customer from home to store for fashion retailers in our set dropped from a pre-COVID average of 16km to 12km. For most retail categories, the ratio of the number of visits shorter than 20 min to those lasting more than 20 min shows a sharp increase in April/May 2020, increasing by almost 50 percent relative to pre-COVID years in some categories. For stores like Best Buy, which were closed for in-person shopping during this period, short visits clearly correspond to an increase in curbside pickups. In all categories but supermarkets, the data suggests that customers traveled less to shop and shopped faster early in the pandemic. The ratio of the number of visits during the weekdays to the number of visits during the weekends almost doubled early in the pandemic, indicating a possible impact of work-from-home. Such a prominent increase early in the pandemic is also observable in the ratio of the number of visits during working hours of the day to the number of visits after working hours.

We find that changes in customer behavior early in the pandemic in terms of distance traveled, short visits, and weekday/weekend visits largely normalized for most retail categories to pre-pandemic levels by September 2020. However, there are several interesting exceptions where changes in customer behavior seem to persist. For example, the fraction of short visits increased significantly for fast-food restaurants, and the change persisted until the end of 2021. We discuss our findings in detail in the Results section.

### **Related literature and contributions**

Several studies have examined COVID-19 induced changes in consumer shopping habits. [Kirk and Rifkin \(2020\)](#) document some early changes in customer behavior and use behavioral theory to explain and predict these changes and associated outcomes. Following [Kirk and Rifkin \(2020\)](#), we organize related studies into three phases: “immediate reaction,” “an attempt at coping,” and “adapting to a new reality.” We restrict attention to peer-reviewed articles that have implications for retail operations. Finally, we present our contribution and highlight the popularity and usefulness of the SafeGraph data set by discussing some previous papers that have used it.

**Immediate reaction.** Following conjectures at the outset of the pandemic, initial studies attempted to find empirical evidence and then explain using theory the phenomena of fear-induced panic buying, stockpiling, and hoarding. [Hall et al. \(2020\)](#) used dates of government lockdown and other mandates from the Canterbury region of New Zealand between January and March 2020 and compared the temporal and spatial variation of consumer spending data to that of the previous year, to explain the sudden increase in spending in certain categories of retail as stockpiling. [Islam et al. \(2021\)](#) showed that impulsive buying resulted from stimuli like quantity scarcity and time

scarcity during the pandemic that increased perceived arousal affecting emotions and subsequent behavior. Their study used confirmatory factor analysis on popular theoretical models, like the Stimuli Organism Response and Competitive Arousal models. Their study used online survey data from the US, China, India, and Pakistan. [Laato et al. \(2020\)](#) used the Stimuli Organism Response framework with a structural model to study the effect of exposure to online information on behavioral effects. They found a strong connection between self-isolation and unusual purchases. [Chen et al. \(2020a\)](#) used prior psychological and economic theory to explain how limited, distorted, and exaggerated information during the pandemic led to aberrant behaviors like stockpiling. They further foresaw four potential impacts, namely, inaccuracy in inventory prediction and disruption in the supply chain, a surge in demand for substitutes for products like toilet paper in short supply (with potential side effects like hand towels clogging sewage), unfair hike in prices for essential goods, and shopping inconvenience due to irregular availability of goods.

**Attempts at coping.** When coping with the pandemic, researchers observed a change in consumer preference for products that varied with age. Using data from a questionnaire in Italy between June and July 2020 and a series of hypotheses linking the effect of age to the preference for buying sustainable products, [Peluso et al. \(2021\)](#) established that age-related effects increased the propensity to spend on sustainable products during the pandemic. In line with generational cohort theory, [Eger et al. \(2021\)](#) used an online questionnaire in the Czech Republic to demonstrate similarities and differences between generations in their preference for products during the pandemic driven by fear. Other studies evaluated the impact of government mandates during the pandemic and provided insights for improvement. [Jacobsen and Jacobsen \(2020\)](#) employed Google and Apple Mobility reports with government mandate dates to observe that consumers reduced their store visits as a result of stay-at-home orders below levels expected from a voluntary change in mobility behavior. Using the national survey on small and medium enterprises (SMEs) in China, [Chen et al. \(2020b\)](#) found that lockdowns delayed the reopening of these SMEs, and stabilization policies like payment deferrals and exemptions significantly improved their cash flows. Using simulations for service calls, pickups, and delivery based on data from a leading meal delivery platform, [Fotouhi et al. \(2021\)](#) provide insights on designing restrictions to reduce curbside crowding during COVID-19. Several studies also looked at the drivers behind the significant increase in online sales. Using a field study in China involving online coupons redeemed offline, [Zhuang et al. \(2020\)](#) showed that the local severity of the pandemic had positively impacted online sales and negatively impacted offline redemptions. Using a proprietary retail data set, [Hwang et al. \(2020\)](#) showed that online retailers witnessed higher sales and omnichannel retailers experienced a channel shift towards online sales because of temporary store closures due to government mandates. Using an



online questionnaire survey in Jordan, Hashem (2020) showed that consumers depended more on online shopping and e-payment methods during COVID. They end with an unanswered question, “will society’s behavior change after the pandemic’s demise, and will this behavior turn into an economic mind that measures things in numbers?”

**Adapting to a new reality.** Larcom et al. (2021) estimate that while food retailers and online retailers benefited from COVID-19, food and beverage services and non-food stores faced losses. They also talk about the persistence of change in sales from pre-pandemic levels in restaurant and food retail. Although sales in isolation can inform several marketing decisions like promotions/discounts of certain goods and product displays, it is insufficient to instruct operational decisions like staffing and inventory management.

**Our contribution.** We focus on outcomes that impact operational decisions like store location, staffing, and inventory management. In particular, we focus on distance traveled by customers to shop, the fraction of short visits, weekday visits, and working hour visits. In each case, we provide evidence that COVID initially resulted in a significant change in customer behavior. Most changes did not persist for long, with customer behavior returning to pre-COVID levels in most retail categories. There are several interesting exceptions, however. For example, customers decreased their working hour visits to fast food restaurants in 2021 compared to pre-COVID times (see Figure 3). An important next step is to understand whether these changes in outcome resulted from customers reverting to pre-COVID behavior or actions taken by retailers to adapt to the changes. For example, the initial increase in short retail visits was most likely driven because retail stores were shut and curbside pickup was the only option. Once stores opened, customers started spending more time at stores either because they stopped using the pickup channel or because they also spent time browsing/shopping at the store when they went for a pickup. The precise cause has important implications for store operations.

**Safegraph data set.** This data set has time-stamped cellphone-based foot traffic data for most major retailers, restaurants, and other branded business locations in the United States. This data set has been used by each of the following studies. Goolsbee and Syverson (2021) and Cronin and Evans (2020) use this data set to determine the extent to which government mandates were effective in containing virus transmission and if these mandates were drivers of economic slowdown. Goldfarb and Tucker (2020) try to identify retailers with the most physical interaction in an attempt to contain the spread of the virus. Yan et al. (2021) determine the extent to which social distancing is driven by imposed government mandates or voluntary efforts. Weill et al. (2020) show that the effectiveness of social distancing varies by income levels.

## 2. Empirical strategy

### Data

We use data from SafeGraph Inc., a San Francisco-based data company that offers organized data linking several important business points of interest (POIs) and their customers. Through trusted third-party data partners, it collects time-stamped spatial location data from the cellphone carriers of the customers who opt-in<sup>5</sup>. These data partners include mobile application developers and companies that aggregate these data from mobile applications. The data is categorized as (a) Core places, which contain about 8.4 million entries of location, category, and brand association data on POIs; (b) Geometry, which contains 7.8 million entries of spatial and hierarchical data on the POIs; and (c) Patterns, which contains about 4.5 million entries of data linking these POIs with their corresponding customer traffic. SafeGraph’s POI database contains data on 6,581,755 business buildings in the US as of August, 2021. 20.8% of these POIs have a familiar brand name like Walmart or Macy’s associated with them, and these POIs cover a total of 6,257 distinct brands. The POIs include restaurants, major retail chains, shopping malls, convenience stores, and airports. This database is updated every month.

SafeGraph shows that their data on about 10 million cellphones (about 10% of all cellphones in the US) is representative of the US population geographically (state, county, and CBGs) and demographically (education level, race, and income). For example, SafeGraph shows that the difference between the proportion of cellphones in Texas tracked by them to the number tracked across the United States and the proportion of people in Texas to the US population is close to 0. They also show that the number of tracked cellphones in each state has a high positive linear correlation with the population of the state. The data section of [Chiou and Tucker \(2020\)](#) addresses any selection bias concerns for the SafeGraph dataset.

### Design

The patterns dataset of SafeGraph is a panel that links customer visits to various POIs. We select a subset of this panel by retail category as described in [Sample \(5\)](#) and track certain outcomes [\(5\)](#) over a time window that includes two years before and two years during the pandemic. For each month in the selected time window, we test if there is a significant change in these outcomes compared to pre-COVID times. This allows us to determine the extent to which any changes occur and persist. Next, we describe the data and the inference procedure used in our study.

### Sample.

From the monthly Patterns data spanning the years 2018-2021, we filter the following panel of data:

- March - September is chosen as the study window for each year as these months in 2020 included the period of the first wave of COVID in the United States.
- We select branded retail firms that have stores across the US in the following five retail categories:
  - Apparel: H&M (171), Nordstrom (40), Gap (379), Saks 5<sup>th</sup> Avenue (24), Bloomingdale’s (31), Kohl’s (1,098), Macy’s (196)
  - Pharmacy: CVS (8,266), Walgreens (7,925)
  - Multipurpose: Walmart (4,680), Target (1,890), Kmart (201)
  - Supermarket: Trader Joes (488), Whole Foods Market (477)
  - Fast-food: McDonald’s (12,680), Burger King (7,062), Taco Bells (7,049)

The number in parentheses indicates the number of stores for the retailer included in our sample. There were a total of 328,208 brick and mortar retail stores in the US in 2020 of which 96,000 were apparel establishments. As of 2020, H&M had 582 stores, Nordstrom had 100 full-line stores, Gap had 2338 stores, Saks 5<sup>th</sup> Avenue had 102 stores, Bloomingdale’s had 56 stores, Kohl’s had 1162 stores and Macy’s had 733 stores across the US.<sup>6</sup> Our data clearly captures visits to a large fraction of retail stores for each firm.

- We further drop all fields (see Appendix A for a complete list of all fields available and their descriptions) other than the following:
  - *bucketed\_dwelling\_times* (bucketed distribution of the time spent at a POI),
  - *popularity\_by\_hour* (visit time distribution across hours in a day),
  - *popularity\_by\_day* (visit day distribution across days in a week) and
  - *distance\_from\_home* (distance of visit from home to store) for a POI.

A sample of the panel of data is as follows.

City	State	Pincode	Brand	Month	raw_visitor _counts
Hurst	Texas	76053	Walmart	March	1868
Springfield	Illinois	62702	Best Buy	June	2773
Springfield	Illinois	62702	Best Buy	July	3089
Orange City	Florida	32763	Walmart	March	4773

**Table 1** Sample Panel

- For each of the four fields across the four years, every observation corresponds to a month - store pair. For the seven apparel firms we study, there are 13,534, 13,539, 13,127 and 12,660 observations for the years 2018, 2019, 2020, and 2021 respectively. These observations constitute data for all the stores visited for each month during the period we study.

- Next, we remove the upper and lower 5 percentile data for each year, month, and firm triple, to eliminate outliers. Table 2 shows the final data size by outcome for the apparel firms.

	2018	2019	2020	2021
<i>distance_from_home</i>	12,603	12,645	12,002	11,647
<i>bucketed_dwell_times</i>	13,398	13,407	12,816	12,518
<i>popularity_by_day</i>	11,610	11,111	10,929	10,929
<i>popularity_by_hour</i>	12,950	13,043	12,193	12,053

**Table 2** Final sample sizes for apparel firms

### Outcomes.

Using the panel data, we construct the following outcomes for each firm, month, and year triple. Each outcome represents the average for all stores belonging to a firm.

**Home-Store distance.** For each triple, the home-store distance is the median distance in kilometers from a customer’s home to a visited store of the firm averaged over all the stores of the firm. Our goal is to understand if COVID changed customers’ willingness to cover distance in order to shop.

**Short visit ratio.** For each triple, the short visit ratio is the ratio of the number of visits to a store that spend less than 20 minutes to the number of visits that spend more than 20 minutes at the store, averaged over all the stores of a firm. A high value for this outcome implies that shorter store visits are more frequent than longer store visits. For stores that were shut early in the pandemic, visits under 20 minutes coincided with curbside pickup. For essential stores like pharmacies and supermarkets that remained open, we use 20 minutes as a threshold for a short visit. Our goal is to understand if COVID changed the customer willingness to spend time at a store.

**Weekday ratio.** For each triple, the weekday ratio is the ratio of the average number of visits during a weekday to the average number of visits during a weekend day, averaged over all the stores of the firm. The weekday average is across Monday to Friday and the weekend average is over Saturday and Sunday. Our goal is to understand if COVID changed customer preference for shopping on weekdays or weekends.

**Workinghour ratio.** For each triple, the working-hour ratio is the ratio of the average number of customers during a working hour (8 am to 5 pm) to the average number of customers during an after-working hour (5 pm to 9 pm) averaged over all stores of the firm. Visits between 9 pm to 8 am are ignored because many stores closed by 9 pm during the pandemic. For this outcome, if a customer stays for multiple hours, the number of customers in each hour is incremented accordingly. Our goal is to understand if COVID changed customer preference for shopping during working hours relative to after-working hours.

## Identification and inference

For each outcome, our goal is to examine if the customer behavior changed as the pandemic set in and if such a change shows signs of persistence. The years 2020 and 2021 correspond to the pandemic and the years 2018 and 2019 represent pre-pandemic times.

We first test the null hypothesis that there was no perceivable change in the outcomes as an “immediate reaction” to the pandemic in April and May 2020. To test this, we construct a 95% bootstrap confidence interval around the mean value of each outcome for every firm, month, year triple. For every triple and outcome, we randomly resample 1,000 stores for each firm with replacement, and then compute the outcomes for each bootstrap sample. This results in a bootstrap sample of size 1,000, which is then used to construct the 95% confidence intervals. For every firm-month pair, if the confidence interval of an outcome for a pandemic year doesn’t intersect with either of the confidence intervals for the pre-pandemic years, we reject the null hypothesis of there being no change in the outcome. For example, in Figure 1, the home store distance decreased significantly in April 2020 for H&M but did not do so for Nordstrom.

For the outcomes that changed immediately after the pandemic struck, we test if the change persisted. We say that a change in an outcome persisted for a period if the null is rejected consistently for the outcome till the end of 2021. For example, in Figure 1, we see that the decrease in home store distance for H&M did not persist even for 2020. In fact, by 2021, the home store distance for H&M seems to have increased relative to pre-pandemic times. In contrast, the working-hour ratio for H&M increased significantly in May 2020 with the change persisting until September 2020. This change, however, does not persist into 2021. Table 3 presents a few descriptive statistics of these outcomes for apparel retailers.

## Results

We consider the four outcomes in terms of initial change in April (or May) 2020 as a response to COVID-19 and persistent change towards the end of 2020 and all of 2021. Whereas we focus on the Apparel sector shown in Figure 1, we also discuss findings for supermarkets, fast-food services, pharmacy, and multi-purpose retail, whose results are shown in Figure 3 and Figure 5. For the SafeGraph data set, we see that the total number of visits to all the stores during the period of study (March - September) in the apparel space (see Figure 2) was about 11.5 million in 2018 and 15 million in 2019, but it fell to 8 million in 2020 before bouncing back to 12 million in 2021. It is clear that despite the increase in 2021, overall visits to apparel retailers witnessed a significant decline relative to 2019. Overall visits to fast food restaurants, however, exceeded pre-pandemic times by 2021 (see Figure 4).

Year	Brands	Home-Store distance (km)				Short visit ratio				Weekday ratio				Workinghour ratio			
		mean	std	min	max	mean	std	min	max	mean	std	min	max	mean	std	min	max
2018	Bloomingdale's	15.44	8.25	3.45	38.87	0.77	0.44	0.23	3.09	0.87	0.38	0.50	2.84	2.39	1.49	0.81	11.28
	Gap	14.41	9.56	0.94	39.86	1.01	0.66	0.14	5.83	0.87	0.49	0.50	6.93	2.24	1.18	0.81	14.33
	HM	13.90	7.43	1.68	39.79	1.21	0.85	0.13	5.69	0.90	0.56	0.50	5.33	1.96	1.23	0.80	10.67
	Kohl's	10.31	5.32	2.12	39.72	0.62	0.24	0.12	5.50	0.69	0.14	0.50	3.70	1.73	0.42	0.81	8.07
	Macy's	11.25	4.72	0.52	36.44	0.76	0.47	0.14	5.87	0.84	0.38	0.50	3.87	2.01	1.03	0.82	10.75
	Nordstrom	14.28	4.27	6.43	28.48	0.82	0.40	0.27	2.42	0.80	0.25	0.50	2.12	2.39	1.07	0.84	7.38
	Saks Fifth Avenue	15.37	5.89	5.43	37.42	0.63	0.25	0.22	1.46	1.03	0.47	0.53	3.36	3.13	2.59	0.81	14.75
2019	Bloomingdale's	15.65	7.78	6.28	39.09	0.77	0.44	0.23	4.00	0.89	0.46	0.50	3.51	2.63	2.36	0.84	18.47
	Gap	14.70	9.66	0.60	39.91	1.07	0.66	0.11	5.83	0.88	0.47	0.50	6.34	2.39	1.32	0.80	19.89
	HM	14.53	7.64	1.61	39.88	1.24	0.82	0.15	5.96	0.90	0.52	0.50	6.40	2.04	1.27	0.80	12.96
	Kohl's	10.41	5.49	2.51	39.95	0.67	0.22	0.15	5.50	0.71	0.18	0.50	4.67	1.80	0.60	0.81	16.64
	Macy's	11.45	5.08	0.37	37.75	0.78	0.43	0.18	5.82	0.84	0.41	0.50	3.77	2.11	1.12	0.82	9.33
	Nordstrom	14.64	4.41	5.00	28.77	0.97	0.60	0.11	5.67	0.78	0.25	0.50	2.24	2.49	1.04	0.83	5.88
	Saks Fifth Avenue	16.26	6.20	7.29	39.12	0.65	0.26	0.19	1.48	1.02	0.48	0.50	3.98	3.07	2.44	0.84	14.00
2020	Bloomingdale's	16.15	7.93	1.18	36.55	0.92	0.56	0.17	4.44	0.96	0.41	0.50	2.90	3.26	1.96	0.86	17.16
	Gap	14.97	9.70	0.47	39.94	1.16	0.80	0.11	5.80	0.94	0.51	0.50	6.55	3.10	2.03	0.81	19.11
	HM	15.26	8.37	0.53	40.00	1.29	0.93	0.13	5.71	0.96	0.52	0.50	5.68	2.80	1.71	0.81	12.00
	Kohl's	10.05	5.38	0.26	39.95	1.02	0.75	0.10	5.87	0.88	0.38	0.50	6.33	2.73	1.30	0.80	24.22
	Macy's	11.51	5.86	0.59	39.79	0.98	0.72	0.13	5.88	0.97	0.61	0.50	6.40	3.18	2.02	0.81	25.89
	Nordstrom	15.78	5.93	0.67	37.39	1.08	0.75	0.11	4.75	0.93	0.45	0.50	2.87	3.90	3.36	0.89	25.00
	Saks Fifth Avenue	16.88	6.92	1.90	37.95	0.87	0.65	0.13	5.44	1.06	0.53	0.53	4.22	3.72	2.53	0.81	13.55
2021	Bloomingdale's	17.15	7.86	5.39	38.24	0.91	0.47	0.17	4.71	0.80	0.28	0.51	2.80	2.71	1.18	0.82	6.59
	Gap	15.71	10.13	0.92	39.81	1.16	0.71	0.11	5.80	0.82	0.46	0.50	6.62	2.73	1.64	0.81	17.72
	HM	16.34	8.82	0.85	39.93	1.19	0.81	0.17	5.67	0.82	0.38	0.50	3.75	2.37	1.43	0.80	16.94
	Kohl's	10.39	5.58	2.78	39.57	0.88	0.31	0.11	5.79	0.75	0.16	0.50	4.39	1.98	0.72	0.81	19.30
	Macy's	12.54	6.02	1.62	38.65	0.87	0.40	0.14	4.29	0.81	0.35	0.50	5.37	2.30	1.24	0.80	12.34
	Nordstrom	17.10	5.92	4.62	39.06	1.08	0.67	0.25	5.00	0.75	0.44	0.51	6.40	2.71	1.30	0.81	9.33
	Saks Fifth Avenue	20.01	6.53	7.86	38.35	0.75	0.36	0.16	2.69	0.92	0.54	0.50	5.30	3.49	2.24	0.94	10.01

**Table 3** Descriptive Statistics for Apparel Retailers

Observe in Figure 1 that for the month of April 2020, the average home-store distance saw a significant decrease (the 95% confidence interval for April 2020 does not overlap with the corresponding confidence interval for either 2018 or 2019) for all apparel retailers other than Macy's and Nordstrom, relative to pre-COVID times. Specifically, in Figure 1, the average distance traveled by customers visiting Gap fell from about 14km in April 2019 to about 11km in April 2020. At the outset of the pandemic in mid March, these firms temporarily closed all their stores across the US.<sup>7</sup> Thus, most visits in April to apparel stores were for curbside pickup. It seems reasonable that customers were unwilling to travel long distances for curbside pickup from apparel stores at the start of a pandemic. From Figure 3 and Figure 5, it is clear that all categories (including supermarkets) experienced a significant drop in home-store distance for April 2020. An interesting exception is Walmart, which did not experience a significant decrease in average home store distance in April 2020 compared to previous years. One possible explanation is that many Walmart stores are located in rural areas and are often the only option that covers most needs for consumers

in that area. Also, Walmart was one of the first firms to roll out a curbside pickup option, which proved popular. As a result, customers continued to travel similar distance as in the past to shop or pickup at Walmart.

The short visit ratio shows a significant increase in April, May 2020 for apparel stores (see Figure 1 where the 95% confidence intervals do not overlap with pre-covid times) compared to previous years. For example, the short visit ratio for Gap was around 1.2 in pre-pandemic years. However, it peaked at 1.53 in April, 2020. The apparel firms closed their stores between mid-March and early May and were open only for delivery and curbside pickups. As a result, most visits to apparel stores in April, May 2020 were for curbside pickup and were thus short. Another sector where short visits increased significantly in April, May 2020 is fast-food (see Figure 3 where the 95% confidence intervals do not overlap with pre-covid times). Customers clearly preferred pickup or drive through visits to fast-food restaurants once the pandemic hit. In contrast, the short visit ratio showed a significant decline for supermarkets and Walmart (see Figures 5, 3 where the 95% confidence intervals do not overlap with pre-covid times). Early in the pandemic, customers increased the amount of time spent to buy food.

For the apparel sector, we observe a significant increase in the weekday ratio in April 2020 (see Figure 1 where the 95% confidence intervals do not overlap with pre-covid times) compared to pre-COVID years. For example, in April 2020, about 1.5 times more customers visited Macy's during a weekday compared to a weekend, a figure that is significantly higher than either April 2018 or April 2019. Similar increases are less evident in other categories.

Around May 2020, the working-hour ratio shows a significant increase (see Figure 1 where the 95% confidence intervals do not overlap with pre-covid times) for the apparel sector. For example, in May 2020, the working hour ratio increased to 3.57 for Gap from a value within 2.5 in the pre-pandemic years. A similar increase is observed across all categories (see Figures 5, 3). Early in the pandemic, customers increased the fraction of shopping trips during working hours. This is consistent with the fact that most people worked from home during this period and could go shopping during any break from work.

Our results clearly indicate that there was significant change in customer behavior at the start of the pandemic in terms of all outcomes of interest. Our next goal is to understand which outcomes persisted across the various categories as all stores reopened and the pandemic progressed.

As apparel stores reopened in early May 2020, the average home store distance rebounded quickly to levels similar to previous years. By May 2020, customers were willing to travel longer distances

for apparel. In fact, as the pandemic progressed, we see an increase in home store distance relative to previous years with the increase more pronounced in 2021. For example, Macy's, Nordstrom, and Saks Fifth Avenue (see Figure 1) have a significant increase (the 95% confidence intervals do not overlap) in home-store distance for 2021 relative to pre-covid times. An increase in home store distance is consistent with increased store closures by apparel firms during the pandemic. A Wall Street Journal article reported that while in 2019, there were about 9,500 retail store closures, by August 2020, 10,000 stores had closed, which included stores locations for Macy's and Gap. USA Today quotes Mickey Chadha, vice president and senior credit officer of Moody's Investor Service, who states, "If you're in a sector like department stores or specialty or off-price or apparel, you suffered the most in 2020" as it lists several popular apparel firms like Macy's shutting down and updating its future plans to shut down stores permanently.<sup>8</sup> We see the home store distance return to pre-pandemic levels by May 2020 across most categories. In general, customer willingness to travel long distances to shop returned to pre-pandemic levels quickly after the start of the pandemic. If anything, in some categories, customers traveled longer distances compared to pre-pandemic levels, probably because of stores closing.

After increasing in April, May 2020, the short visit ratio quickly returned to pre-pandemic levels for most apparel retailers by June 2020. This maybe because customers stopped using curbside pickup. It may also be because customers spent time at the store when going for a pickup. Nordstrom added an option of pickup across all its stores to take advantage of a customer willingness to browse the store once they arrived for a pickup. Thus, a return of short visit ratio to pre-pandemic times should not necessarily be seen as evidence that customers abandoned the pickup option. One apparel retailer that is a clear exception is Kohl's, particularly for 2021. The short visit ratio for Kohl's in 2021 is significantly higher (the 95% confidence intervals do not overlap) than pre-COVID times. By early 2021, Kohl's started offering a variety of in-store pickup options for digital orders in as little as an hour.<sup>9</sup> Our data suggests some success for Kohl's efforts.

The one category where the short visit ratio increased significantly and persisted into 2021 (see Figure 3 where the 95% confidence intervals do not overlap) is fast-food restaurants. For example, for Burger King, the short visit ratio almost tripled to 4.5 in 2020 from about 1.5 in September 2018 and 2019. It is clear that customers took advantage of increased drive through lanes and pickup options and continued to spend less time at fast-food outlets compared to pre-COVID times. A Chicago Tribune reports on how several popular fast-food retails like Taco Bell and McDonald's increased their curbside pickup capacity during the pandemic. These two chains also added an express lane for customers who ordered ahead which was separate from the regular drive-thru where you order at the location. A CNBC news article also reports how the shuttering of inside



dining led to an increased drive-thru demand pushing the fast-food chains to add capacity and make their drive-thru service more efficient.<sup>10</sup>

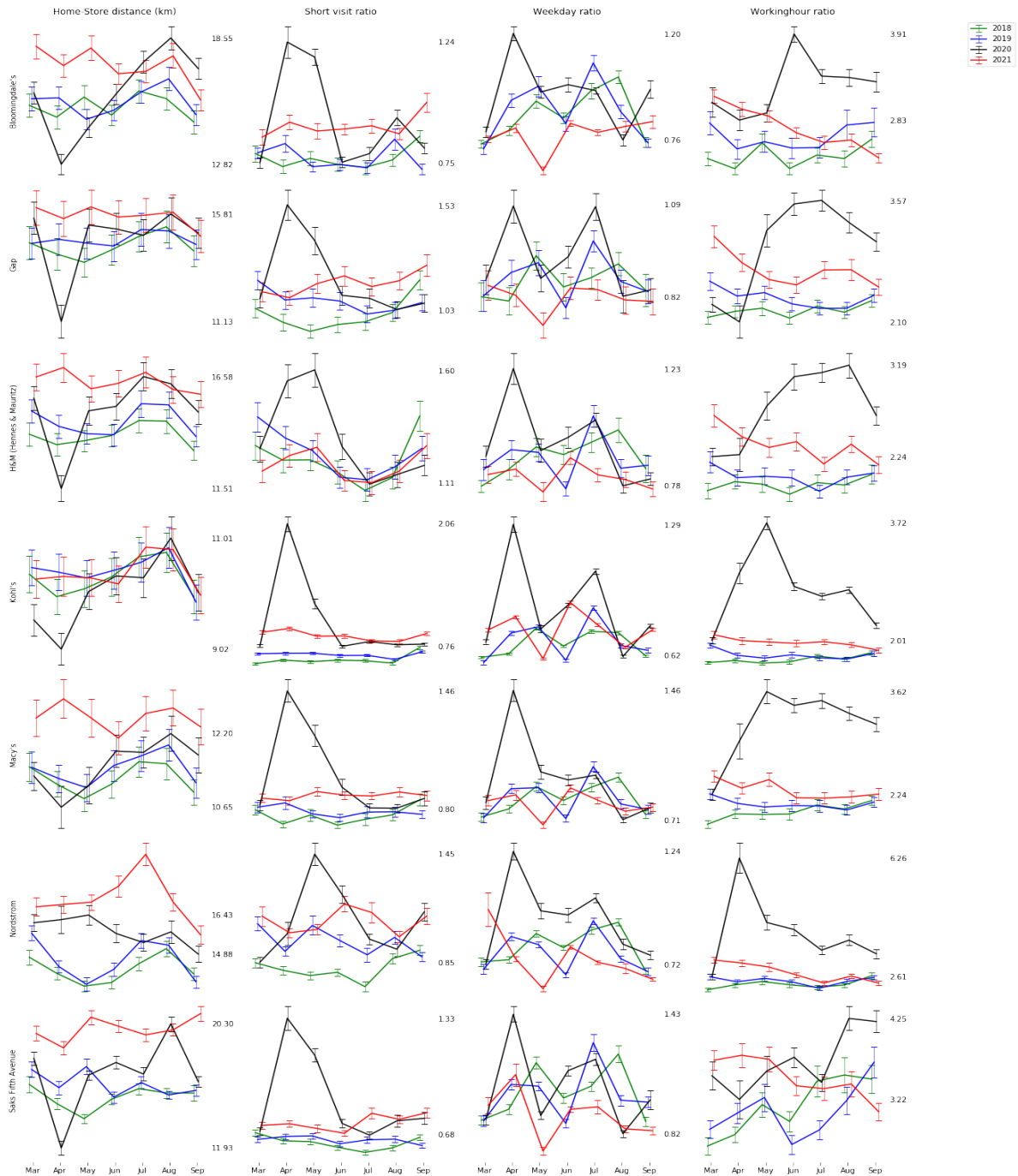
In fast-food chains, we also observe a gradual decrease in working hour ratio post-pandemic. By 2021, the working hour ratio for fast food restaurants is significantly lower (the 95% confidence intervals do not overlap) than pre-pandemic times. For example, for Burger King, the working hour ratio always stayed over 1.49 in the pre-pandemic years, but in 2020, it fell from about 1.6 to 1.49 and then always stayed below this in the year 2021. This maybe the result of greater work from home where customers eat lunch at home when working from home but choose to go out for dinner as the pandemic progressed.

Our analysis suggests that customer preference for weekday and working hour shopping early in the pandemic did not persist into late 2020 and 2021 (the 95% confidence intervals overlap) for sectors other than fast food (see Figure 1 and Figure 5). The increase in the weekday ratio in April 2020 disappears by September 2020 with 2021 returning to pre-pandemic times across all the retail categories. The increase in working-hour ratio for most sectors persisted through much of 2020 but it too reverted to pre-pandemic patterns in 2021.

### **Mechanism**

We speculate that lockdowns and store closures coupled with fear, significantly impacted customer behavior at the start of the COVID pandemic. Whereas our study does not look at drivers of change rigorously, we offer potential mechanisms that can be studied more carefully in future research. For firms that shut their stores during the lockdown (e.g. apparel), customers reduced the distance they were willing to travel for a pickup. For stores that remained open, such as supermarkets, customers reduced the distance traveled by perhaps substituting a closer supermarket instead of the preferred supermarket. As the lockdowns ended and stores reopened, customers quickly returned to driving pre-pandemic distances to shop. The increase in home-store distance in 2021 for firms like Saks Fifth Avenue is most likely explained by store closures in 2021.

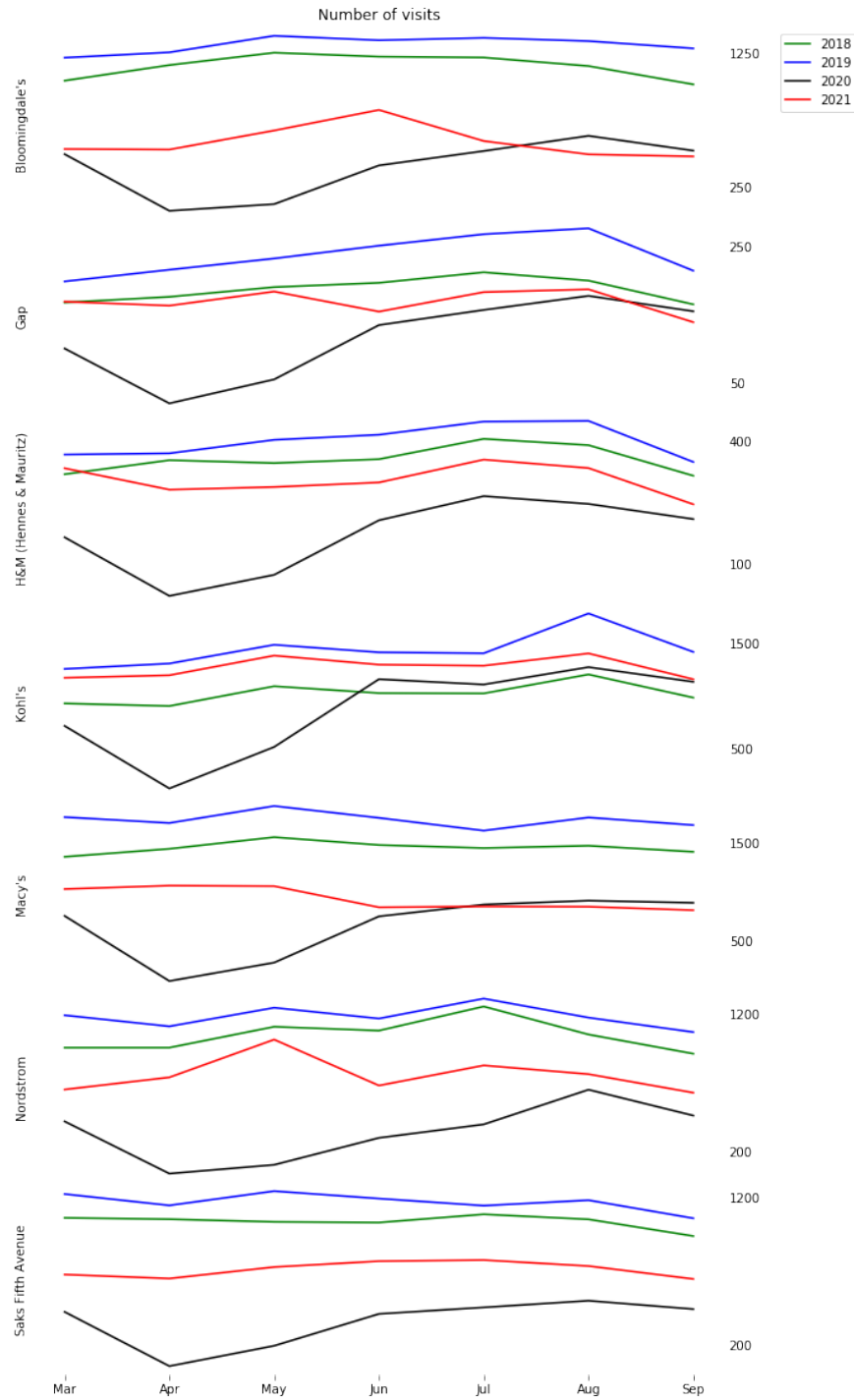
The drop in short time ratio at the start of the pandemic for non-essential retailers is most likely explained by curbside pickup as the only shopping option at most stores. In the case of a firm like BestBuy, the increase in this ratio is clearly explained by curbside pickup because stores were closed and curbside pickup was the only reason for a customer to visit. The initial increase in short time visits to fast-food restaurants is probably driven by fear with customers opting for pickup or drive through lanes rather than sit down dining. As fast-food restaurants increased the number of drive through lanes, customers have persisted with this preference through the end of 2021. Besides increased drive through capacity, a customer preference for a few popular menu items may also



**Figure 1 Outcome evolution for apparel firms**

Note: We track the monthly evolution of the four outcomes of interest (shown at the top) for the seven apparel firms (shown on the left). The trend lines trace the evolution of these outcomes from March through September for pre-COVID years (2018 and 2019) and pandemic years (2020 and 2021). The whiskers denote a 95% confidence interval for each firm, month, year triple.

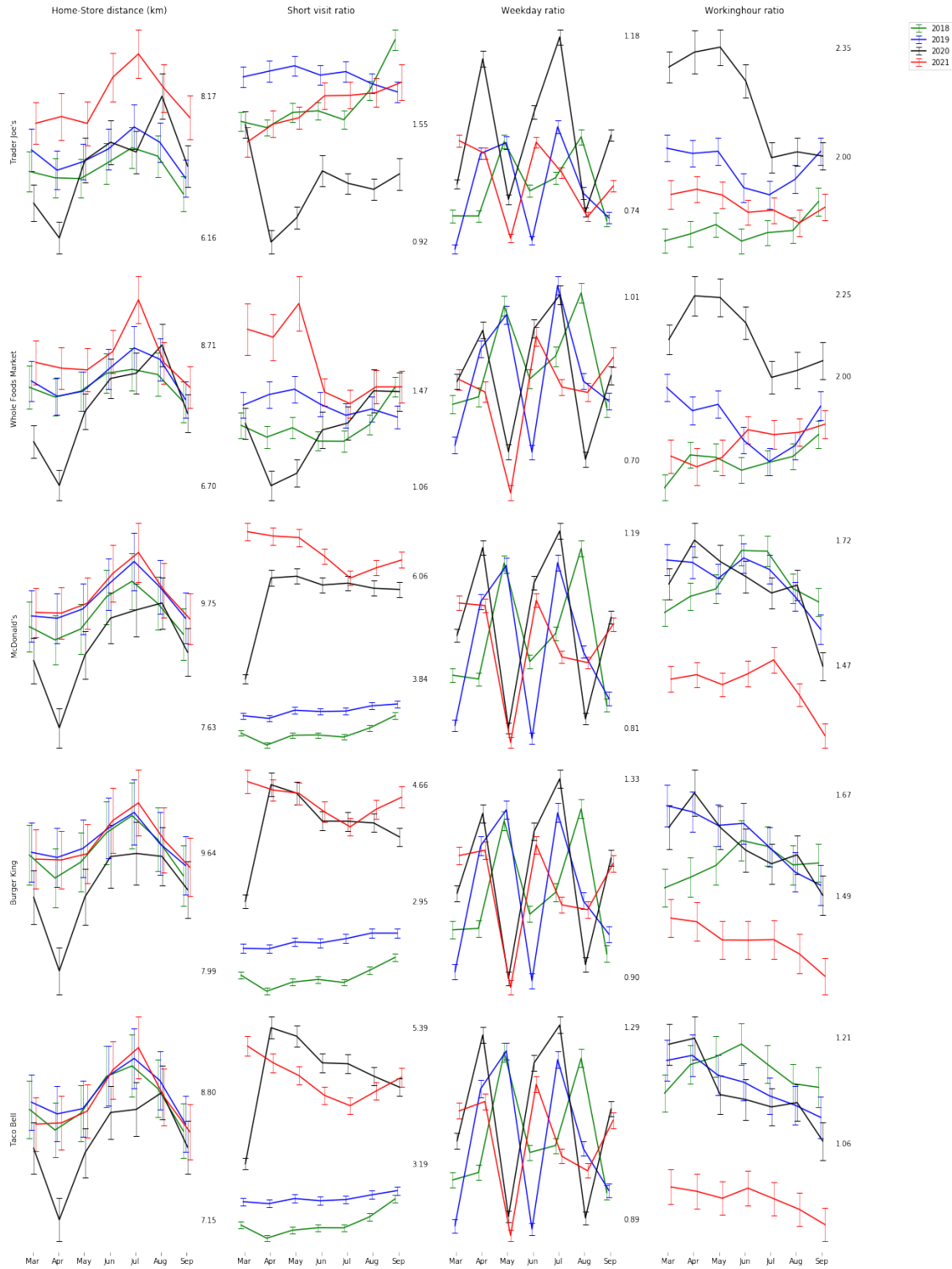
have contributed to short visits. For supermarkets, the initial decrease in short time ratio probably occurred because customers reduced the number of visits to supermarkets by consolidating more



**Figure 2 Monthly visits to apparel firms**

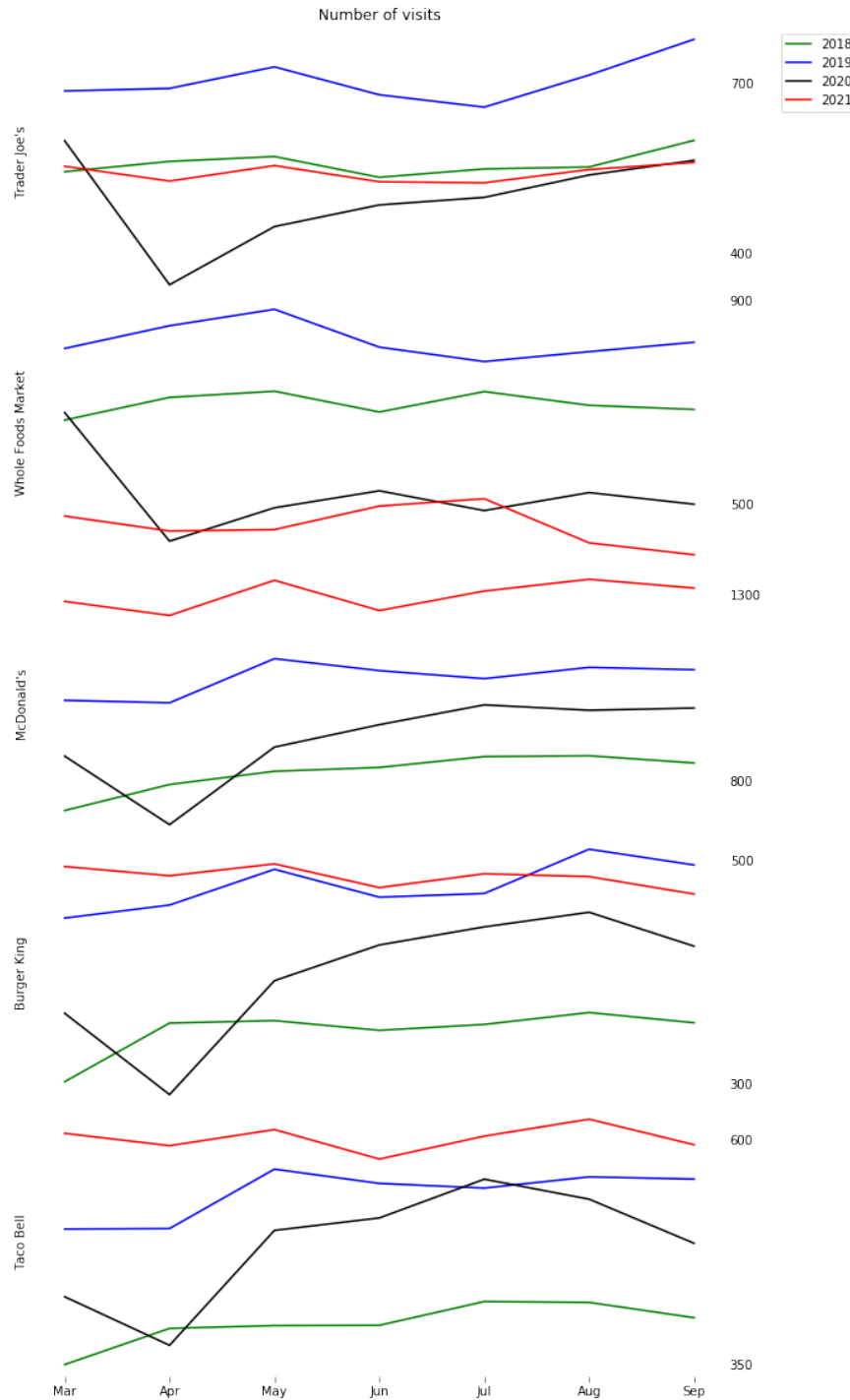
Note: This figure shows the average monthly visits to a firm's (shown on the left) store in the US.

shopping into a single trip. This probably led to larger purchase quantities per visit early in the pandemic.



**Figure 3 Outcome evolution for supermarkets and fast-food firms**

Note: We track the monthly evolution of the four outcomes of interest for supermarkets (first two firms in figure) and fast-food firms. The trend lines trace the evolution of these outcomes from March through September for pre-COVID years (2018 and 2019) and pandemic years (2020 and 2021). The whiskers denote a 95% confidence interval for each firm, month, year triple.



**Figure 4 Monthly visits to supermarkets and fast-food firms**

Note: This figure shows the average monthly visits to a firm's (shown on the left) store in the US.

The initial change in weekday and working-hour ratios is most likely explained by an increase in work from home. Firms and employees probably took a while before they became adept at remote work. This likely led to more work breaks early in the pandemic for people working from home.

These breaks in turn gave them opportunities to both shop during weekdays and during working-hours. As the pandemic progressed, firms and employees became more comfortable with remote work likely leading to fewer breaks. This likely reduced opportunities to shop during weekdays and working-hours resulting in customers reverting to pre-COVID behavior.

### 3. Managerial Implications

Our results provide evidence that many conjectures published at the start of COVID about changes in customer behavior are not substantiated by the data. Whereas there was an initial increase in weekday and working-hour visits, customer behavior returned to pre-COVID times by the end of 2021. Similarly, customer willingness to travel longer distances to shop also returned to pre-COVID times.

A clear persistent change is the increased customer preference for short visits to fast-food restaurants. Whereas customers showed an increased preference for short visits in 2019 relative to 2018, the preference increased significantly during the pandemic. McDonald's announced in late 2020 its new strategy to double down on "customers' preference for core menu items and the surge in drive-thru orders." The company has also announced plans to test "automated order taking, drive-thru lanes only for digital orders and a restaurant design without any indoor dining."<sup>11</sup> Many restaurants may consider designing locations specialized for pickup / drive through or delivery orders.

Another persistent change for fast food restaurants is the decrease in the fraction of working hour visits despite an increase in overall visits. Such a change suggests changing staffing accordingly.

The different experience of Kohl's and Nordstrom with regards to short store visits suggests different approaches and outcomes that retailers may try. Whereas Kohl's focused on the speed of its in-store pickup, Nordstrom emphasized the use of all its stores to pickup online orders across several of its online sites. The company allowed orders at Nordstrom.com, NordstromRack.com or HauteLook.com to be picked up at Nordstrom Rack or Nordstrom locations.<sup>12</sup> Nordstrom's objective was to drive foot traffic into the store to encourage other potential purchases. Whereas we have no data to validate whether Nordstrom customers made in-store purchases when they arrived for a pickup, our data certainly suggests that the fraction of customers spending at least 20 minutes at the store returned to pre-COVID times despite the increased offering of in-store pickup for online orders. In contrast, with a focus on speed for its pickup offering, Kohl's observed an increase in the fraction of customers spending less than 20 minutes.

## Endnotes

1. The following cited newspaper articles talk about customers' increased need for speed-shopping: (a) "3 Lasting Changes To Grocery Shopping After Covid-19," *Forbes*, December 14, 2020 ([link](#)), (b) "Curbside pickup is another innovation that is likely to outlast the pandemic," *New York Times*, October 9, 2020 ([link](#)), (c) "Covid-19 Rewrote the Rules of Shopping. What Is Next?" *Wall Street Journal*, March 12, 2021 ([link](#)).
2. "A Little More Remote Work Could Change Rush Hour a Lot," *New York Times*, June 11, 2021 discusses flattened mobility traffic peaks ([link](#)).
3. (i) Professor Mehmet Gumus, professor in the Desautels Faculty of Management at McGill University, made this remark in the second season episode 4 of *Delve* podcast aired on December 16, 2021 titled "New Normal: How the Pandemic Changed Shopping Forever with Mehmet Gumus" ([link](#)).  
(ii) The video with Professor Johan Anselmsson, also a member of Centre for Retail Research at the Lund University School of Economics and Management, is published by the university and can be found here ([link](#)).  
(iii) Gaurav Sabnis' tweet can be found here ([link](#)).
4. This quote appeared in "Covid-19 Rewrote the Rules of Shopping. What Is Next?" *Wall Street Journal*, March 12, 2021 ([link](#)).
5. Data collection and privacy safeguards are discussed in "Privacy Policy" at SafeGraph ([link](#)). It also provides the list of its data partners with whom customers opt to share their information ([link](#)).
6. Statista, a consumer and market data company, in its research report from May 11, 2021 notes that there were 328,208 brick and mortar retail establishments in the US ([link](#)). First Research, a leading provider of market analysis tools, reports that US clothing store industry includes about 96,000 establishments (single-location companies and units of multi-location companies) ([link](#)).
7. These firms closed their stores across the nation as early as March 17-19, 2020 ([link1](#), [link2](#), [link3](#)) with plans to reopen in two weeks, but ended up reopening ([link](#)) the first stores only in the first week of May.
8. Several media articles reported permanent store closures by major retailers including "U.S. Retail Store Closures Hit Record in First Half," *Wall Street Journal*, September 29, 2020 ([link](#)), and "More store closings in 2021? These are the most vulnerable major retailers of 2021 as pandemic continues," *USA Today*, December 30, 2020 ([link](#)).
9. "Kohl's offering fast in-store pickup," by Dan Berthiaume, *Chain Store Age* article accessed on January 29, 2022 ([link](#)).
10. Several media articles report the investment by fast-food chains in increasing drive-thru capacity including "Quadruple drive-thru lanes? Restaurants aim to keep the line moving as to-go sales boom during the pandemic," *Chicago Tribune*, November 17, 2021 ([link](#)) and "Drive-thru ordering surged during the pandemic. Fast-food chains don't think it's a fad," *CNBC News*, March 12, 2021 ([link](#)).
11. "McDonald's looks to chicken, loyalty program and celebrities to drive mid-single digit sales growth in 2021 and 2022" on *CNBC.com* accessed on January 29, 2022 ([link](#)).
12. "Nordstrom expands online order pickup to Rack stores," Tatiana Walk-Morris on *Retaildive.com* accessed on January 29, 2022 ([link](#)).

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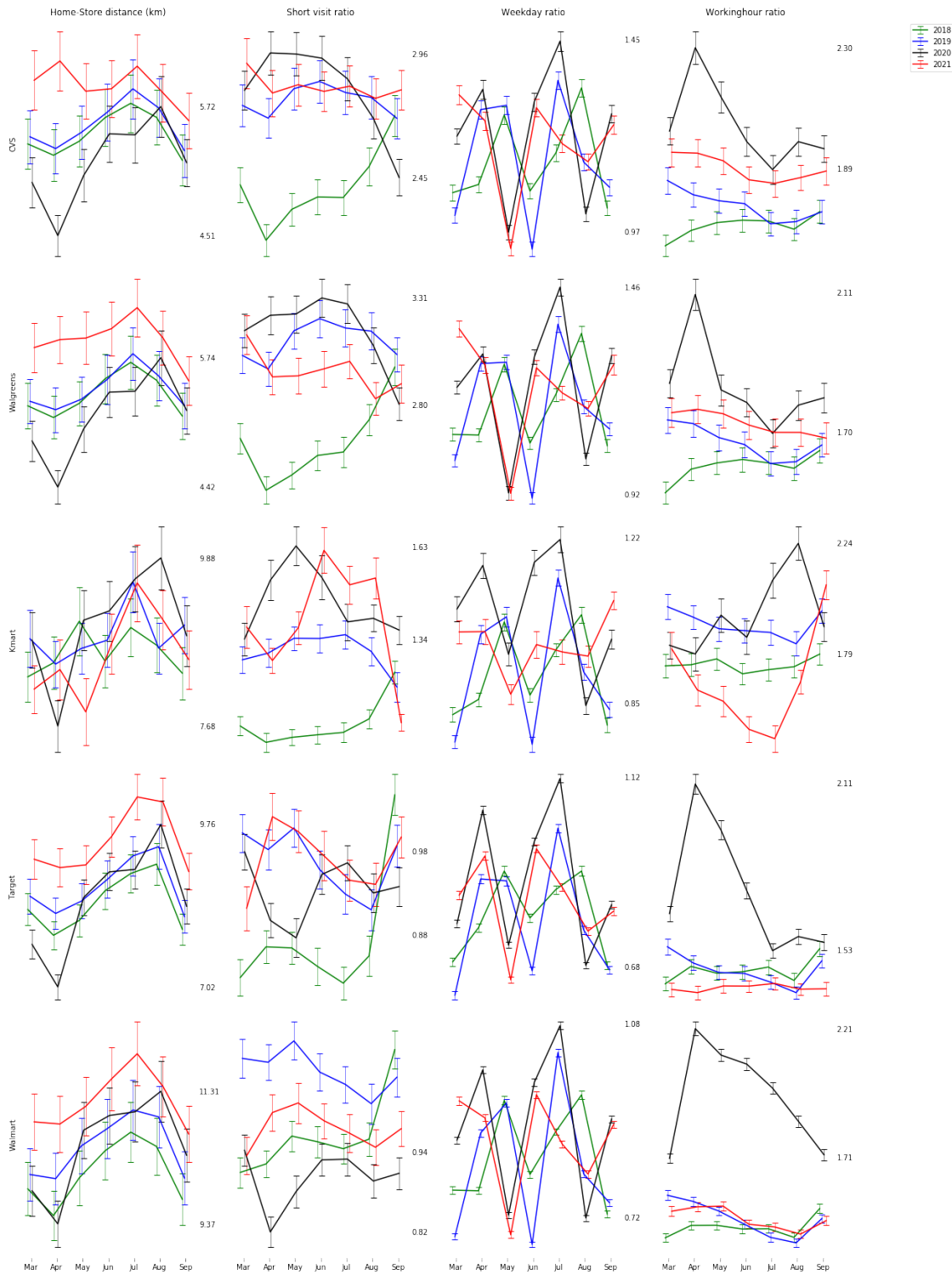
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- Lesley Chiou and Catherine Tucker. Social distancing, internet access and inequality. Technical report, National Bureau of Economic Research, 2020. [6](#)

## A. Appendix

Column Name	Type	Description	Example
location_name	String	The name of the place of interest.	Salinas Valley Ford Lincoln
street_address	String	Street address of the place of interest.	1100 Auto Center Circle
city	String	The city in which this point of interest is located.	Irvine
region	String	This is the USA state or territory.	CA
postal_code	String	This is the USA 5 digit zip code.	92602
brands	List	If this POI is an instance of a larger brand that we have explicitly identified, this column will contain that brand name. This is an easy way to, for example, unambiguously select all Target stores in the USA. A POI may have multiple brands, as in a new car dealership that sells ford and lincoln cars.	ford, lincoln
date_range_start	String	Start time for measurement period in ISO 8601 format of YYYY-MM-DDTHH:mm:SS±hh:mm (local time with offset from GMT).	2020-03-01T00:00:00-06:00
date_range_end	String	End time for measurement period in ISO 8601 format of YYYY-MM-DDTHH:mm:SS±hh:mm (local time with offset from GMT). The end time will be the last day of the month at 12 a.m. local time.	2020-03-31T00:00:00-06:00
raw_visit_counts	Integer	Number of visits in our panel to this POI during the date range.	1542
raw_visitor_counts	Integer	Number of unique visitors from our panel to this POI during the date range.	1221
visitor_country_of_origin	JSON String: Integer	A mapping of country code to the number of visitors to the POI whose home is in that country. Only countries with at least 2 devices are shown and countries with fewer than 5 devices are reported as 4. See more on privacy here: Places Manual	"US": 98,"CA": 12
distance_from_home	Integer	Median distance from home traveled by visitors (of visitors whose home we have identified) in meters. See also, Places Manual	1211
median_dwll	Double	Median minimum dwell time in minutes. See also, Places Manual	5
bucketed_dwll_times	JSON String: Integer	Key is range of minutes and value is number of visits that were within that duration. See also, Places Manual	{ "< 5": 40, "5 - 20": 22, "21 - 60": 45, "61 - 240": 3, "> 240": 5 }
popularity_by_hour	JSON [Integer]	A mapping of hour of day to the number of visits in each hour over the course of the date range in local time. First element in the array corresponds to the hour of midnight to 1 am. See also, Places Manual	[ 0, 0, 0, 0, 0, 0, 0, 222, 546, 444, 333, 232, 432, 564, 456, 345, 678, 434, 545, 222, 0, 0, 0, 0 ]
popularity_by_day	JSON String: Integer	A mapping of day of week to the number of visits on each day (local time) in the course of the date range. See also, Places Manual	"Monday": 3300, "Tuesday": 1200, "Wednesday": 898, "Thursday": 7002, "Friday": 5001, "Saturday": 5987, "Sunday": 0
carrier_name	JSON String: Integer	A mapping of wireless carrier names to the number of visitors to the POI whose device uses that wireless carrier. Only carrier.names with at least 2 devices are shown, and carrier.names with less than 5 devices are reported as 4. See more on privacy here: Places Manual	"Verizon": 342, "T-Mobile": 288, "AT&T": 265

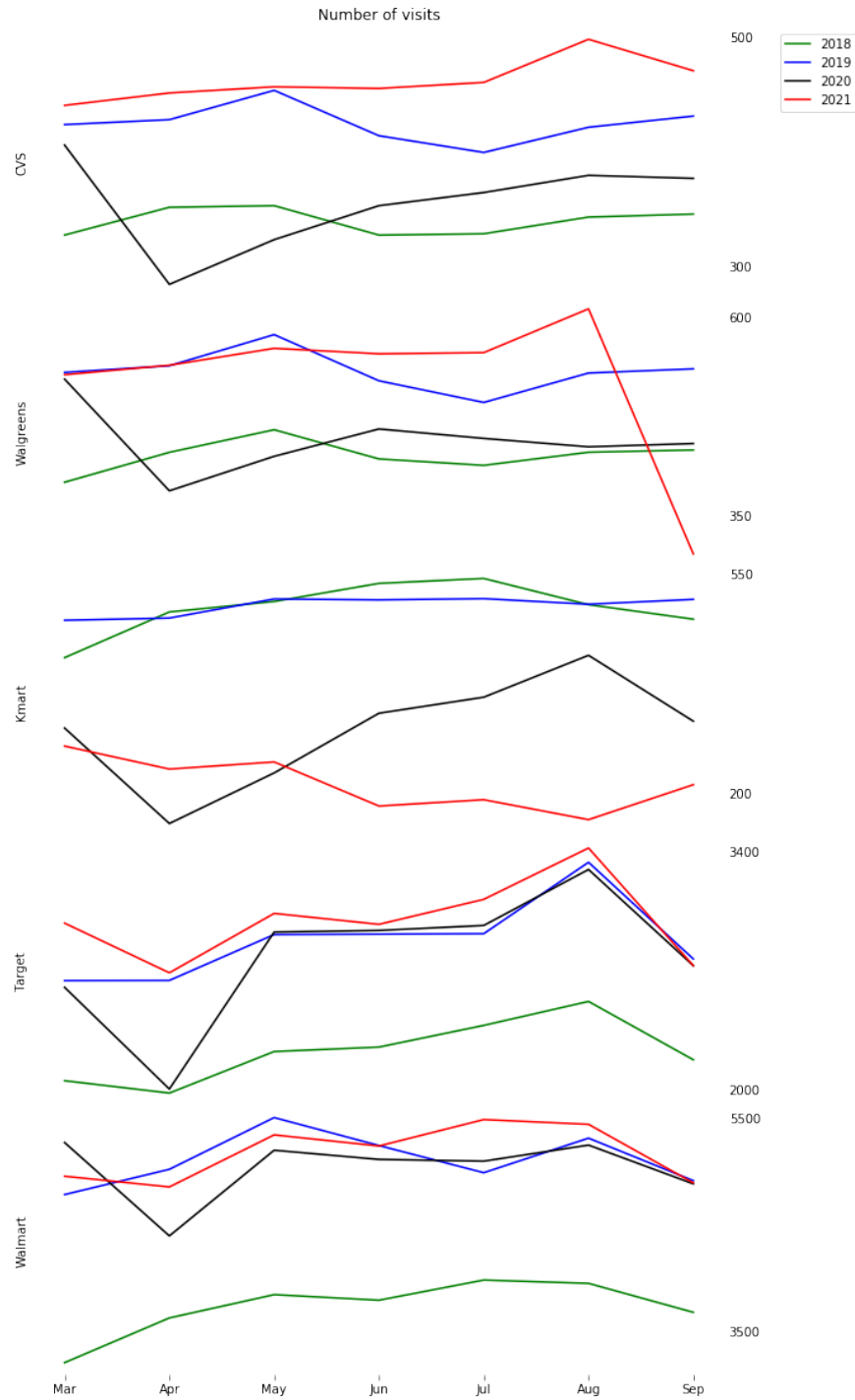
**Table 4** Description of fields in the SafeGraph Monthly Patterns data set

## B. Additional appendix: Results for other retail categories



**Figure 5 Outcome evolution for pharmacies and multipurpose firms**

Note: We track the monthly evolution of the four outcomes of interest for pharmacies (top two firms in figure) and multipurpose firms. The trend lines trace the evolution of these outcomes from March through September for pre-COVID years (2018 and 2019) and pandemic years (2020 and 2021). The whiskers denote a 95% confidence interval for each firm, month, year triple.



**Figure 6 Monthly visits to pharmacies and multipurpose firms**

Note: This figure shows the average monthly visits to a firm's (shown on the left) store in the US.