Changes in Grocery Shopping & Related Travel During COVID-19

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OVERVIEW

1. Introduction
2. Available Data
3. Methodology
4. Results & Discussion
5. Conclusions

INTRODUCTION

COVID & SHOPPING

Early on…

Shortly after

This reboot looks scarier than the original

I AM GOING TO COSTCO

Unfortuantely the tests came back positive for COVID-19. You have coronavirus.

That can't be correct. I have over 40 cases of costco water and 200 rolls of toilet paper.

IMAGE SOURCE: https://urbanmatter.com/phoenix/10-hilarious-coronavirus-memes-that-hit-too-close-to-home/

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IMAGE SOURCE: https://www.nbcnews.com/better/lifestyle/coronavirus-fears-have-emptied-supermarket-shelves-are-you-panic-buying-ncna1148536

IMAGE SOURCE: https://www.walmart.com/cp/free-store-pickup/2281929

IMAGE SOURCE: https://www.safetyandhealthmagazine.com/articles/20524-covid-19-pandemic-grocery-store-workers-face-accelerated-risk-of-infection-study-finds

THIS STUDY

How did these COVID-19 changes actually impact:

- Transportation decisions & systems?
- People's access to essential goods (e.g. groceries)?
- Their shopping behaviors?

And, will these changes last long-term?

RESEARCH QUESTION

How were grocery shopping & grocery-related mobility impacted by COVID-19 at the aggregate & disaggregate levels?
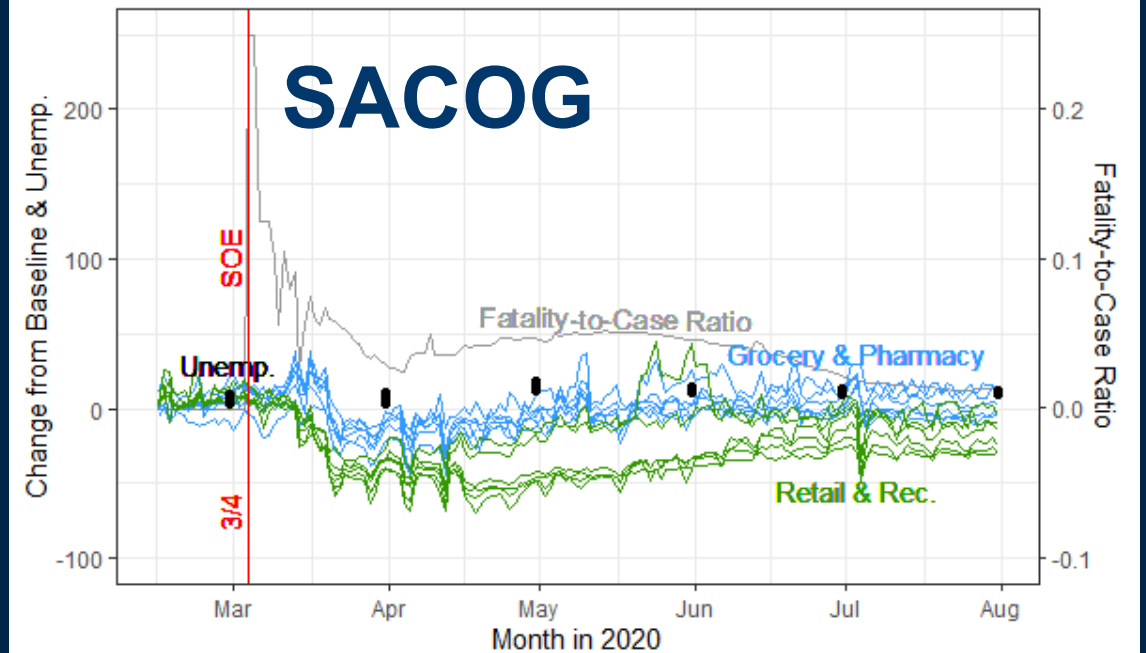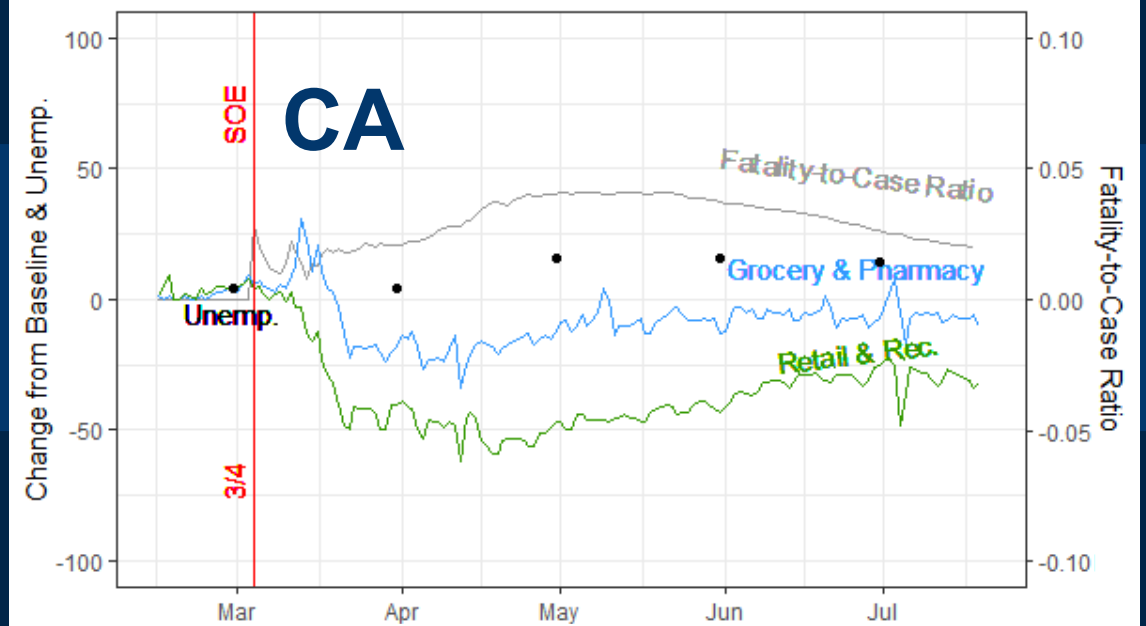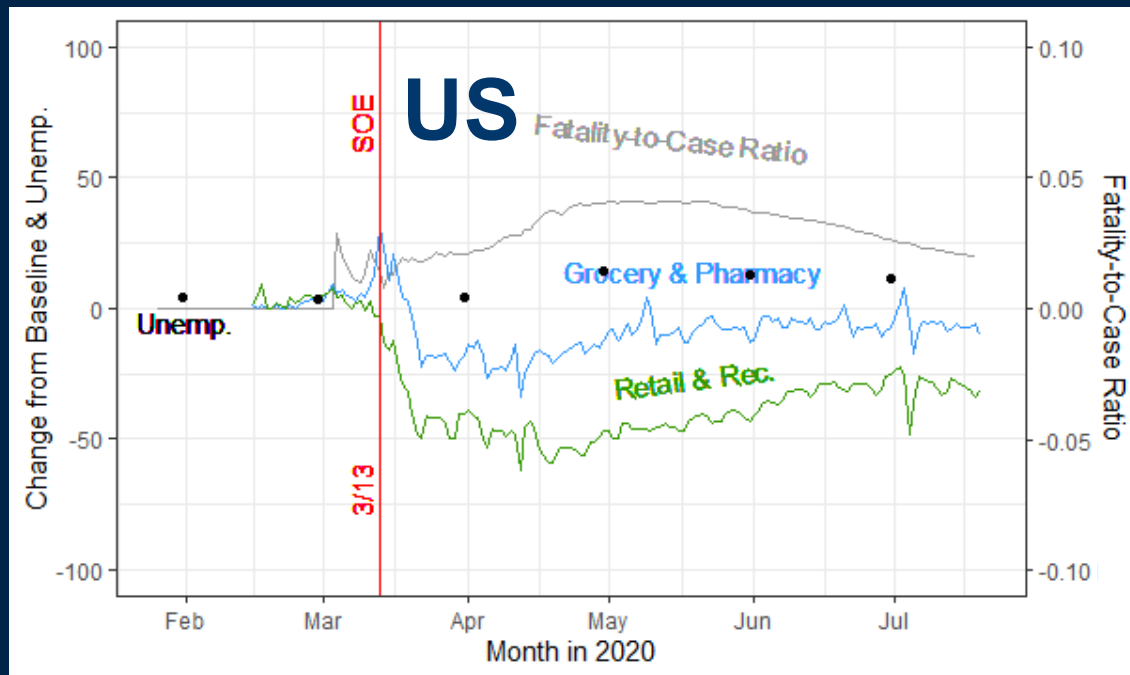
AVAILABLE DATA

AVAILABLE DATA

For the "Aggregate Analysis"

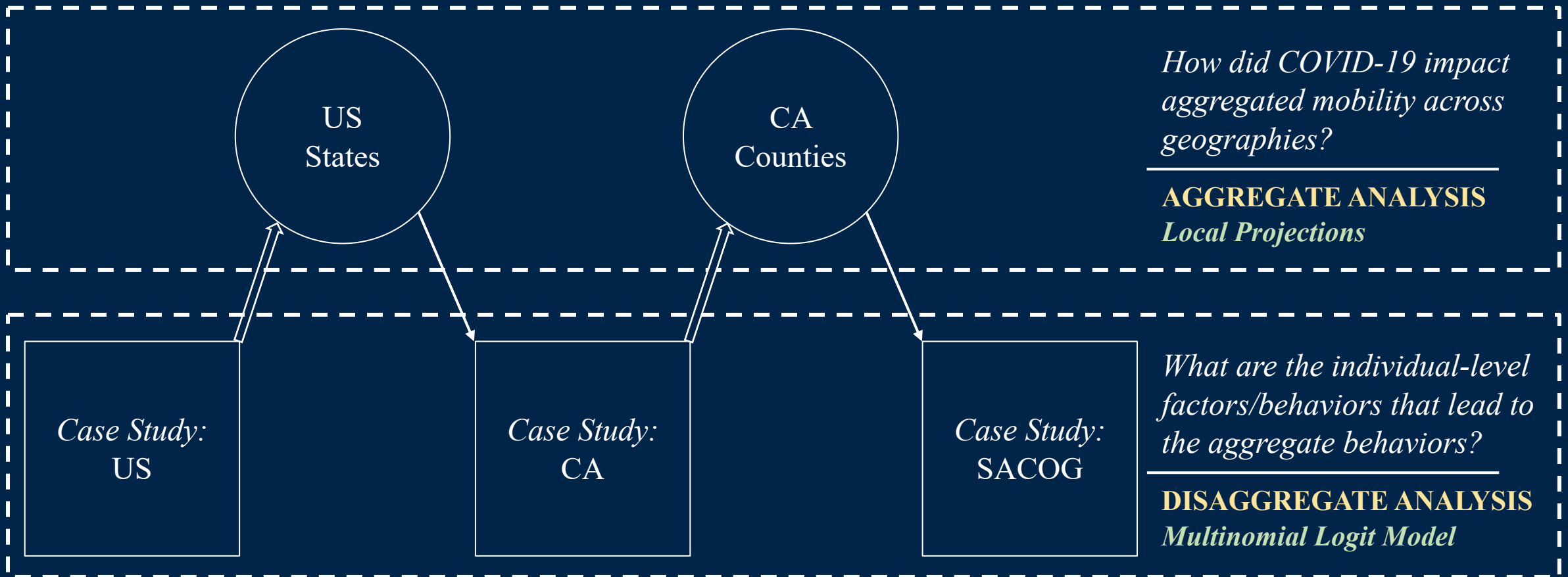| Measure	Data Description	Scope
JHU COVID-19 Health Impact *fatality-to-case ratio*	Daily measure of COVID health markers	Starting Jan. 23, 2020 US, states, counties
Google Mobility Data *grocery & pharmacy, retail & recreation, work, residence, transit, parks*	Daily measure of time spent at location categories as a % comparison to pre-COVID (1/3 – 2/6/2020)	Starting Feb. 15, 2020 US, states, counties
Unemployment rate	Monthly measure of the unemployment rate (%)	Any date US, states, counties
Mask Mandate & SOE Dates	Date that each geography imposed a mask mandate & state of emergency	Any date range States, counties

AVAILABLE DATA

AVAILABLE DATA

For the "Disaggregate Analysis"

Measure	Data Description	Scope
COVID-19 Future Survey (CFS)	Longitudinal survey of participant travel behaviors & attitudes before, during & after COVID	June 19 – Oct. 14, 2020 US, California
Sacramento Area Council of Governments Household Travel Survey (SACOG HTS)	Follow-up survey to 2018 SACOG HTS which surveys shopping & non-shopping trips, grocery, shopping opinions, attitudes, & COVID	May 25 – June 1, 2020 SACOG Counties
American Community Survey (ACS)	Yearly population data (US Census Bureau)	2018 California, SACOG

ANALYSIS & METHODOLOGY OVERVIEW

ANALYSIS OVERVIEW

US States → **Case Study: US**

CA Counties → **Case Study: CA**

Case Study: SACOG

How did COVID-19 impact aggregated mobility across geographies?

AGGREGATE ANALYSIS
Local Projections

What are the individual-level factors/behaviors that lead to the aggregate behaviors?

DISAGGREGATE ANALYSIS
Multinomial Logit Model

METHODS

Local Projections (Aggr.)

- Method to estimate the dynamic behavior of multivariate time series systems
- Key statistic: Impulse Response Function (IRF)
- Local projections use ordinary least squares regression to obtain IRFs (from an estimated parameter)

Multinomial Logit (Disaggr.)

- Estimate how different characteristics/behaviors relate to shopping behaviors

BEHAVIORAL MNL MODEL (Disaggr.)

Dependent Variable

No shopping (neither)
Both channels
In-store only
Online only

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ShoppingChannel

(%)	SACOG HTS	CFS - CA	CFS - US
n =	306	717	7,572
Neither	6.2	7.1	8.7
Both	15.0	23.8	17.9
In-store	72.5	55.4	62.3
Online	6.2	13.7	11.1

Independent Variables

- *Number of people in HH*
- *HH income*
- *Age*
- *Gender*
- *Ethnicity/race*
- *Education*
- *Travel disability*
- *COVID income reduction*
- *Housing type*
- *Days of telecommuting*
- *COVID related reduction in employment*
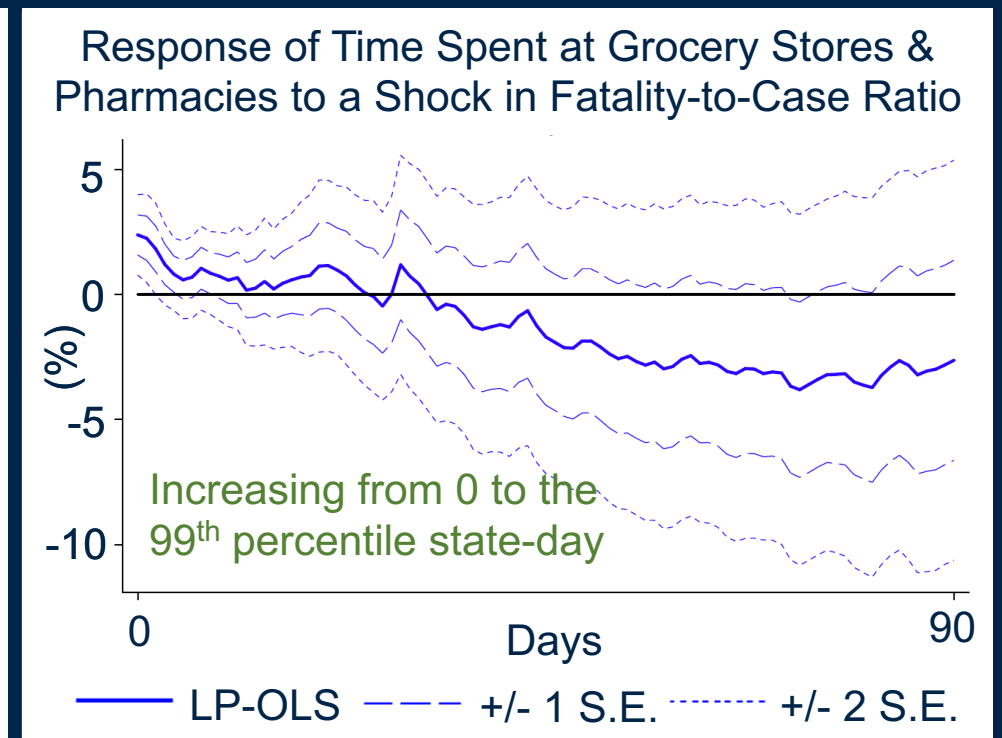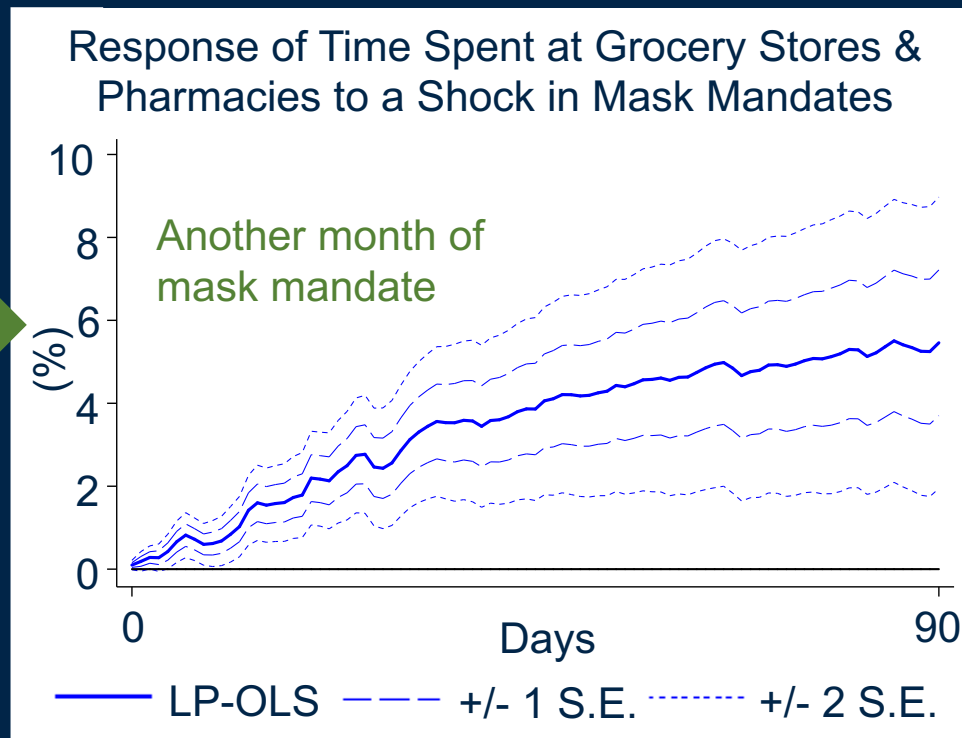- *Pre-COVID shopping behaviors*

RESULTS & DISCUSSION

LOCAL PROJECTIONS (Aggr.)

US States

The response (in %) of time at grocery locations to:

…

Across all states & days

Response of Time Spent at Grocery Stores & Pharmacies to a Shock in Mask Mandates

Another month of mask mandate

Response of Time Spent at Grocery Stores & Pharmacies to a Shock in Fatality-to-Case Ratio

Increasing from 0 to the 99th percentile state-day

LP-OLS — +/- 1 S.E. ⋯ +/- 2 S.E.

- People might feel protected by their mask or comforted that others are required to mask
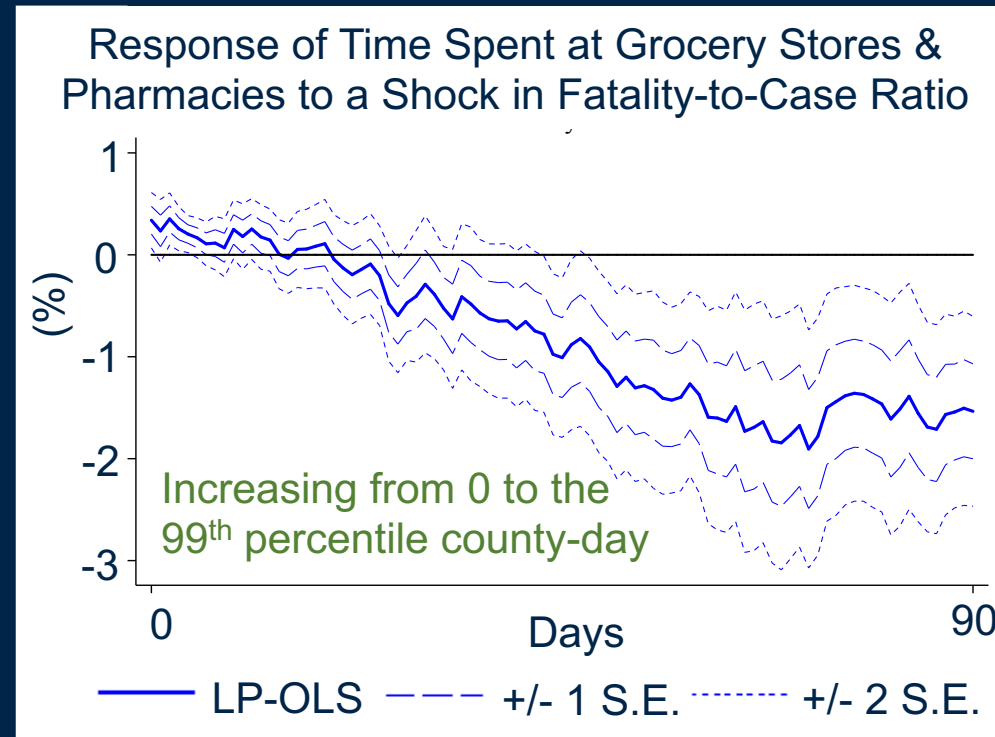- Is this the result of an increase in visitors and/or more time spent at the store?

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LOCAL PROJECTIONS (Aggr.)

CA Counties

The response (in %) of time at grocery locations to:

…

Across all counties & days

Response of Time Spent at Grocery Stores & Pharmacies to a Shock in Fatality-to-Case Ratio

Increasing from 0 to the 99th percentile county-day

LP-OLS — — — +/- 1 S.E. ········ +/- 2 S.E.

(%)

Days

Fewer in-store shoppers?
Supplementary online shopping?

How does this translate to transportation impacts?

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EMPIRICAL RESULTS (Disaggr.)

(%)	US	CA	SACOG
Had shopped online BC, shopped online DC	15	19	17 ←
Had shopped online BC, did not shop online DC	7.5 - 9	9 - 10	34
Had not shopped online BC, shopped online DC	14	15 - 19	4 ←
Had not shopped online BC, did not shop online DC	62 - 64	52 - 54	35

BC = before COVID
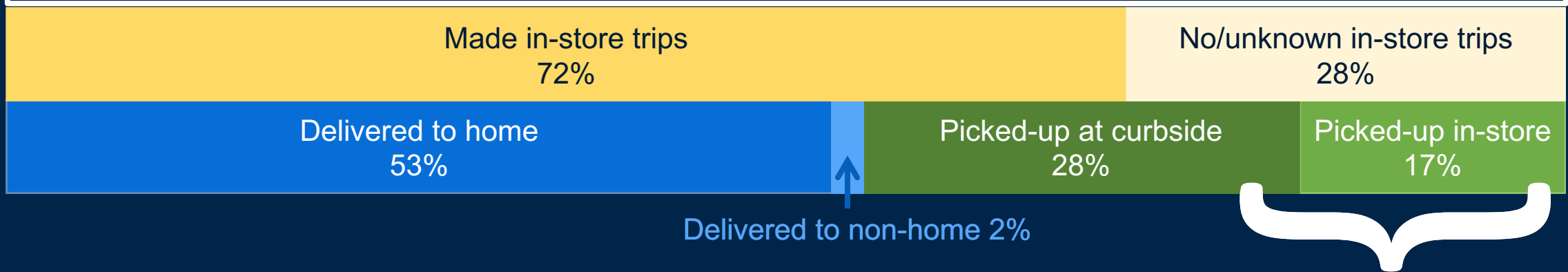*DC = during COVID (i.e., during the study period)*
"shopped online DC" = online only or both
"did not shop online DC" = in-store only or neither

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EMPIRICAL RESULTS (Disaggr.)

SACOG

E-commerce Grocery Purchases (subset = 71 respondents)

Made in-store trips 72%		No/unknown in-store trips 28%
Delivered to home 53%	Picked-up at curbside 28%	Picked-up in-store 17%

Delivered to non-home 2%

45% lead to trip-making

- 20% reported an increase in home deliveries
- 13% an increase in in-store pick up
- 16% an increase in curbside pick-up frequency

BEHAVIORAL MNL MODELS (Disaggr.)

Focus on online/both & demographics

- Males: (- *online*) compared to females (US, CA, SACOG)
- Age: older → (+ *in-store, both*) (US, CA) & (+ *online*) (US)
  - Agrees with previous studies that older groups try/use more options
- Race/Ethnicity:
  - Black participants → (- *in-store, online only*) (US, CA)
  - Hispanic → (+ *both, in-store*) (US, CA) (+ *online*) (US)
  - White participants → (- *both, in-store*) (SACOG)
- HH Size: HH with 2+ members → (+ *online*) (SACOG)

Focus on online/both & demographics

- Income & Education (Interactions):

US • (- *online*) income & high school GED or less (+ above $205,000 income)

CA • (+ *both*, *in-store*) income & high school GED or less (- *both* above $15,700 income)

- Other
  - Other interaction terms consider frequency of in-store & online shopping BC (US, CA, SACOG), WFH (SACOG), & income change *from* COVID (US, CA)
  - When a person frequently shopped online BC, higher likelihood of shopping *online only* (US, SACOG) or through *both* channels DC (US, CA, SACOG)

  Now that more people have shopped online for groceries DC, will this hold true beyond COVID?

DISCUSSION (Disaggr.)

Some commonalities, many differences in how demographics relate to shopping channel between geographies (from MNL)

Substituted online for in-store*
- SACOG: 2.6%
- CA: 11.3% for pickups, 10.3% for deliveries
- US: 8.4% for pickups, 8.3% for deliveries

}

Pickups do not replace a personal trip
Deliveries replace a personal trip but generate some last-mile delivery demand

Complementary online shopping*
- SACOG: 15%
- CA: 23.8%
- US: 17.9%

Generate both

* In the study week

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CONCLUSIONS

- Access to groceries is essential, but was constrained by COVID
- Many businesses expanded their business models to include e-commerce orders
  - Beneficial, especially in the time of a public health crisis
  - HOWEVER, there are some equity concerns
- This study shows meaningful differences in shopping behaviors (including mobility) between geographies and demographics
  - Mobility impacts are expected, but might differ between geographies (especially considering substitution & complementary shopping)
  - To equitably, effectively, and appropriately plan, characteristics of the local population and typical (pre-pandemic) behaviors are critical to consider

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THANK YOU 😊

Questions? Comments?

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