# Reopening After Covid: A Replication of Chetty et al. (2020): "The Economic Impacts of COVID-19."

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## Motivation

## 2 Related Literature

## 3 Data

## 4 Methods



## 6 Conclusion

## Preliminary Extension

- Covid created a sharp economic downturn.
- Policymakers faced with tough decisions about economic and public health.
- Chetty et al. (2020) create a high-frequency database of indicators; investigate the effectiveness of state-ordered reopenings.
- As pandemics become more likely, how should we respond?

- Chetty et al. (2020): Reopenings have a modest impact on economic health.
- Bartik et al. (2020): Layoffs took place before mandates.

• Goolsbee and Syverson (2020): Mobility declined before lockdowns.

- Chetty et al. (2020) builds database from private companies.
- Consumer Spending: Affinity Solutions
- Employment: Paychex and Intuit
- Small Business Activity: Womply
- Time Away From Home: Google Mobility Report

• We contacted Opportunity Insights about missing values in the public employment series.

• They sent us a more complete dataset with fewer gaps.

• We use these data for our analysis but do not include the file in replication materials due to privacy concerns.

- Observations are state-by-day; ZIP-by-day level is also available.
- Percentage Change from 4–31 January 2020
- Anonymized
- Seven-day moving average
- Seasonally adjusted

- Chetty et al. (2020) do not provide replication materials.
- We attempt to reconstruct their method from the paper.
- Several ambiguities:
  - Weekly to daily transformation.
  - Stacking issues.
  - Etc. ... We discuss as we proceed.

• Pool and stack states according to reopening date.

- 20 April 2020: South Carolina
- 24 April 2020: Alaska and Georgia
- 27 April 2020: Minnesota and Mississippi
- Controls given by Chetty et al. (2020).

- Estimate Effect on Consumer Spending, Employment, Small Businesses Open, and Mobility.
- Diff-in-Diff Event Study Model:

 $Y_{it} = \beta_0 + \beta_1 A fterEvent_{it} + \beta_2 DoesOpen_{it} \\ + \beta_3 (A fterEvent_{it} \times DoesOpen_{it}) + \epsilon_{it}.$ 

- Y is indicator, i is state, t is event-relative time.
- Restrict to two weeks before and after; robust to three.
- Code: github.com/samueleross/HERC-covid/

## Results

Dep. Var.:	Spending (%)		Employment (%)		Small Businesses Open (%)		Time Outside Home (%)	
Panel A: Chetty et al. (2020)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DiD Estimate of Effect	$1.43^{***}$ (0.51)	$1.37^{**}$ (0.53)	0.65 (0.51)	1.04 (0.97)	-0.30 (0.85)	1.26 (0.88)	$3.27^{**}$ (1.26)	$4.44^{**}$ (1.85)
Ν	200	312	208	258	248	248	244	324
Analysis Window (Weeks)	2	3	2	3	2	3	2	3
Panel B: Replication	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DiD Estimate of Effect	0.33 (0.56)	$0.95^{*}$ (0.50)	$1.02^{*}$ (0.55)	$1.57^{**}$ (0.70)	$2.91^{**}$ (1.14)	$3.91^{**}$ (1.57)	0.73 (0.44)	$1.32^{**}$ (0.57)
Ν	200	300	208	312	244	366	112	168
Analysis Window (Weeks)	2	3	2	3	2	3	2	3

Table 1: OLS Regression results for state-level reopenings.

Standard errors clustered by state in parentheses.

Data source: Opportunity Insights Economic Tracker.

\* p < 0.10,\*\* p < 0.05,\*\*\* p < 0.01

## Chetty et al. (2020):

#### B. Re-Opened States vs. Control States: Consumer Spending







### Chetty et al. (2020):

#### C. Re-Opened States vs. Control States: Employment







## Chetty et al. (2020):

#### D. Re-Opened States vs. Control States: Small Businesses Open







## Results: Time Spent Away From Home





- Results similar but many discrepancies exist
- Why?
  - Weekly vs. daily transformation
  - Stacking issues
  - Analysis window unclear

- Similar results to Chetty et al. (2020) but imperfect replication.
- Reopenings have little impact on economic health.
- Health risk perception may have greater impact.

• Policymakers may question necessity of mandates.

• What about different types of reopenings?

• Chetty et al. (2020) define reopening as the first reopening action.

• What if we could perform this methodology sector-by-sector?

- The *New York Times* tracked the reopening status of US states.
- These pages were crawled and archived every day by archive.org.

• We scrape these archived pages for data on sector-by-state reopening dates.

- The sectors we analyze are:
  - Entertainment
  - Food & Drink
  - Worship
  - Industry
  - Recreation
  - Retail

- We use the same indicators of economic health as the replication above:
  - Consumer Spending
  - Employment
  - Open Small Businesses
  - Time Spent Away from Home
- Sourced from Opportunity Insights website.

- Similar to replication.
- For each sector, stack and analyze the first three reopening dates.
- A difference: Controls are every state that has not yet reopened that sector, rather than being handpicked.
- Could erode parallel trends assumption.

- Estimate effect on consumer spending, employment, small businesses open, and mobility by sector.
- Diff-in-Diff Event Study Model:

$$Y_{its} = \beta_0 + \beta_1 A fter Event_{its} + \beta_2 DoesOpen_{its} + \beta_3 (A fter Event_{its} \times DoesOpen_{its}) + \epsilon_{its}.$$

• Y is indicator, *i* is state, *t* is event-relative time, *s* is sector.

## Results

Dep. Var.:	Spending (%)		Employment (%)		Small Businesses Open (%)		Time Outside Home (%)	
Panel A: Entertainment	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DD Estimate of Effect of Reopening	-0.31 (0.77)	0.12 (0.71)	0.38 (0.43)	0.67 (0.64)	$2.43^{*}$ (1.23)	3.09*** (1.02)	0.44 (0.36)	0.68 (0.46)
State-Week Observations	592	888	592	888	592	888	592	888
Analysis Window	2	3	2	3	2	3	2	3
Panel B: Food & Drink	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DD Estimate of Effect of Reopening	-0.37 (1.14)	0.09 (0.49)	0.44 (0.39)	$0.87^{*}$ (0.48)	2.03** (0.77)	3.32*** (0.99)	$0.83^{***}$ (0.28)	1.21*** (0.36)
State-Week Observations	596	894	596	894	596	894	596	894
Analysis Window	2	3	2	3	2	3	2	3
Panel C: Worship	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DD Estimate of Effect of Reopening	0.23 (2.03)	0.06 (1.89)	0.91 (0.67)	0.95 (0.57)	2.83 (2.02)	3.14** (1.44)	0.08 (1.03)	0.48 (0.78)
State-Week Observations	647	945	647	945	647	945	647	945
Analysis Window	2	3	2	3	2	3	2	3

Table 1: OLS Regression results for sector-disaggregated reopenings.

Standard errors clustered by state in parentheses.

Data source: Opportunity Insights Economic Tracker; Archived New York Times COVID-19 Reopening Information.

\* p < 0.10,\*\* p < 0.05,\*\*\* p < 0.01

## Results

Dep. Var.:	Spending (%)		Employment (%)		Small Businesses Open (%)		Time Outside Home (%)	
Panel D: Industry	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DD Estimate of Effect of Reopening	-0.40 (0.44)	-0.41 (0.73)	0.04 (0.84)	-0.17 (1.20)	$-1.26^{*}$ (0.69)	$-1.86^{***}$ (0.54)	-0.55 (0.53)	-0.19 (0.26)
State-Week Observations	600	900	600	900	600	900	600	900
Analysis Window	2	3	2	3	2	3	2	3
Panel E: Recreation	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DD Estimate of Effect of Reopening	0.70 (0.93)	$1.67^{*}$ (0.99)	0.36 (0.29)	0.53** (0.49)	1.29*** (0.37)	$1.95^{***}$ (0.62)	0.60** (0.24)	0.75** (0.33)
State-Week Observations	600	900	600	900	600	900	600	900
Analysis Window	2	3	2	3	2	3	2	3
Panel F: Retail	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DD Estimate of Effect of Reopening	2.35*** (0.58)	1.81** (0.78)	0.68 (0.53)	1.03 (0.80)	3.44*** (0.60)	3.95*** (0.82)	1.14*** (0.29)	1.44*** (0.36)
State-Week Observations	588	882	588	882	588	882	588	882
Analysis Window	2	3	2	3	2	3	2	3

Table 2: OLS Regression results for sector-disaggregated reopenings. (Cont.)

Standard errors clustered by state in parentheses.

Data source: Opportunity Insights Economic Tracker; Archived New York Times COVID-19 Reopening Information.

\* p < 0.10,\*\* p < 0.05,\*\*\*<br/>\*p < 0.01

## Results: Entertainment



Gangolf, Goyal, Ross (Haverford)

# Results: Food & Drink



# Results: Worship



# Results: Industry



## Results: Recreation





- Retail openings have greatest impact all-around.
- Food and drink openings drive employment, open businesses, and mobility, but not spending.
- Worship, industrial, and recreational openings have relatively minor impacts.
- Further work is needed to assess assumptions and strength of results.