The Economic Impacts of COVID -19: Evidence from a New Public Database Built Using Private Sector Data

Raj Chetty, Harvard
John N. Friedman, Brown
Nathaniel Hendren, Harvard
Michael Stepner, Univ. of Toronto
and the Opportunity Insights Team

November 16, 2020

OPPORTUNITY INSIGHTS

Motivation: Measuring the Impacts of COVID-19

- How has COVID-19 affected the American economy and what policies can best mitigate its adverse impacts going forward?

- Since Kuznets (1941), macroeconomic policy decisions have been based on data from surveys of households and businesses

- These data provide vital aggregate information (GDP, unemployment rates), but have two key limitations

    1. Available only at low frequencies, often with significant lags

    2. Cannot be disaggregated to examine variation across areas or subgroups

This Project

- We build a publicly available economic tracker using transaction data from several private companies to measure daily economic activity by ZIP code, income group, and industry

- Use these new data to analyze economic impacts of COVID-19 pandemic:

  1. [Mechanisms] Why did COVID-19 lead to unprecedented job losses?

  2. [Policy Responses] Causal effects of fiscal stabilization policies enacted to date

Outline

1. Data
2. Impacts of COVID-19
3. Impacts of Stabilization Policies
4. Policy Implications

Data

A New Public Database Built From Private Sector Data

- Many papers have used transaction data to analyze economic impacts of COVID crisis
  [e.g., Alexander & Karger 2020, Baker et al. 2020, Bartik et al. 2020, Cajner et al. 2020, Chen et al. 2020, Chiou & Tucker 2020, Cox et al. 2020, Kurman et al. 2020, Kahn et al. 2020, Autor et al. 2020, Granja et al. 2020, Mongey et al. 2020]

- Here, we construct and analyze ***public*** statistics based on private sector data rather than directly analyzing confidential sources of microdata

  - Challenge: constructing public statistics that are sufficiently granular for research yet sufficiently aggregated and masked to protect privacy

- Combining data on spending, employment, and other outcomes offers a more complete picture of chain of macroeconomic events than studies that focus on one set of outcomes

Data Partners

Consumer Spending

affinity solutions

COINOUT

Small Business Revenues

WOMPLY

Employment

PAYCHEX

intuit

earnin

KRONOS

Job Postings

burningglass TECHNOLOGIES

Education

2EARN

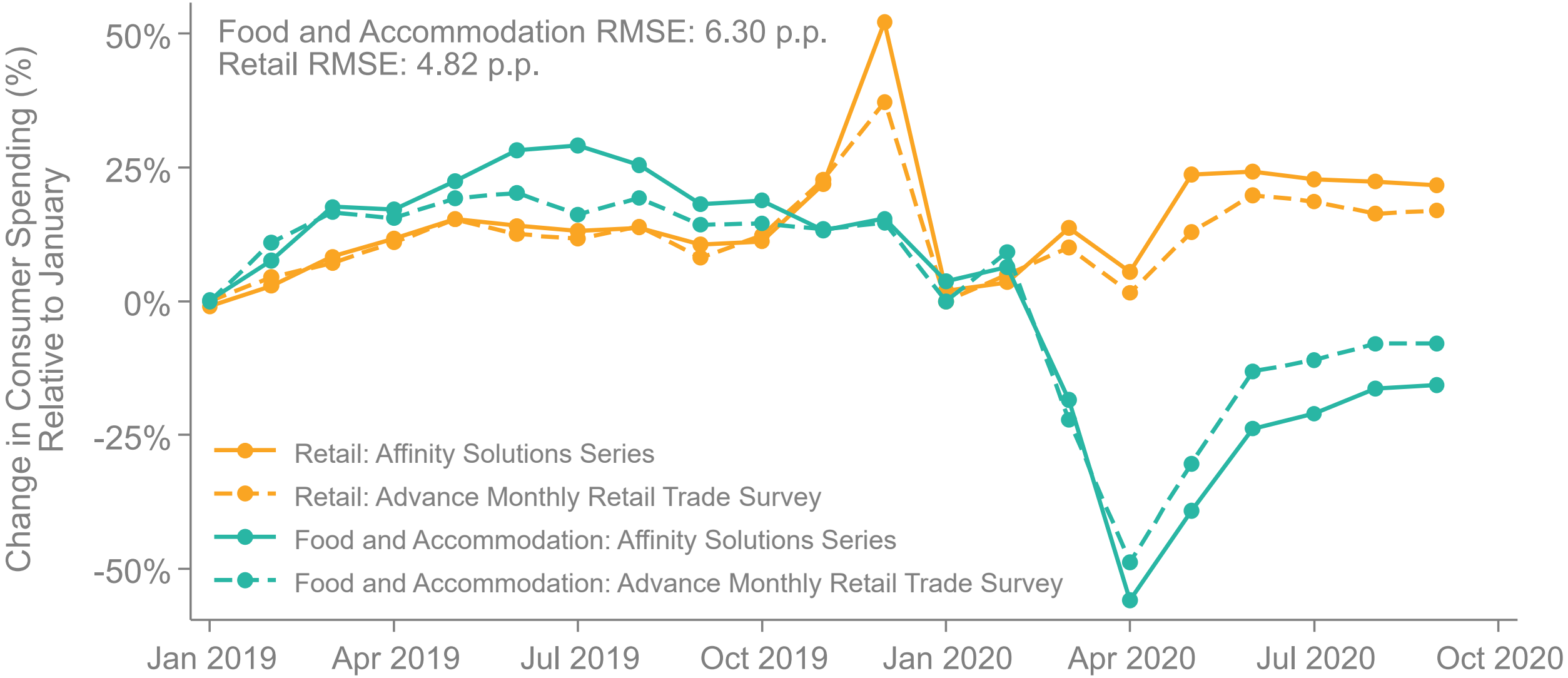
Constructing Publicly Available Economic Indices Based on Private-Sector Data

- Starting from raw data, construct series suitable for economic analysis as follows:

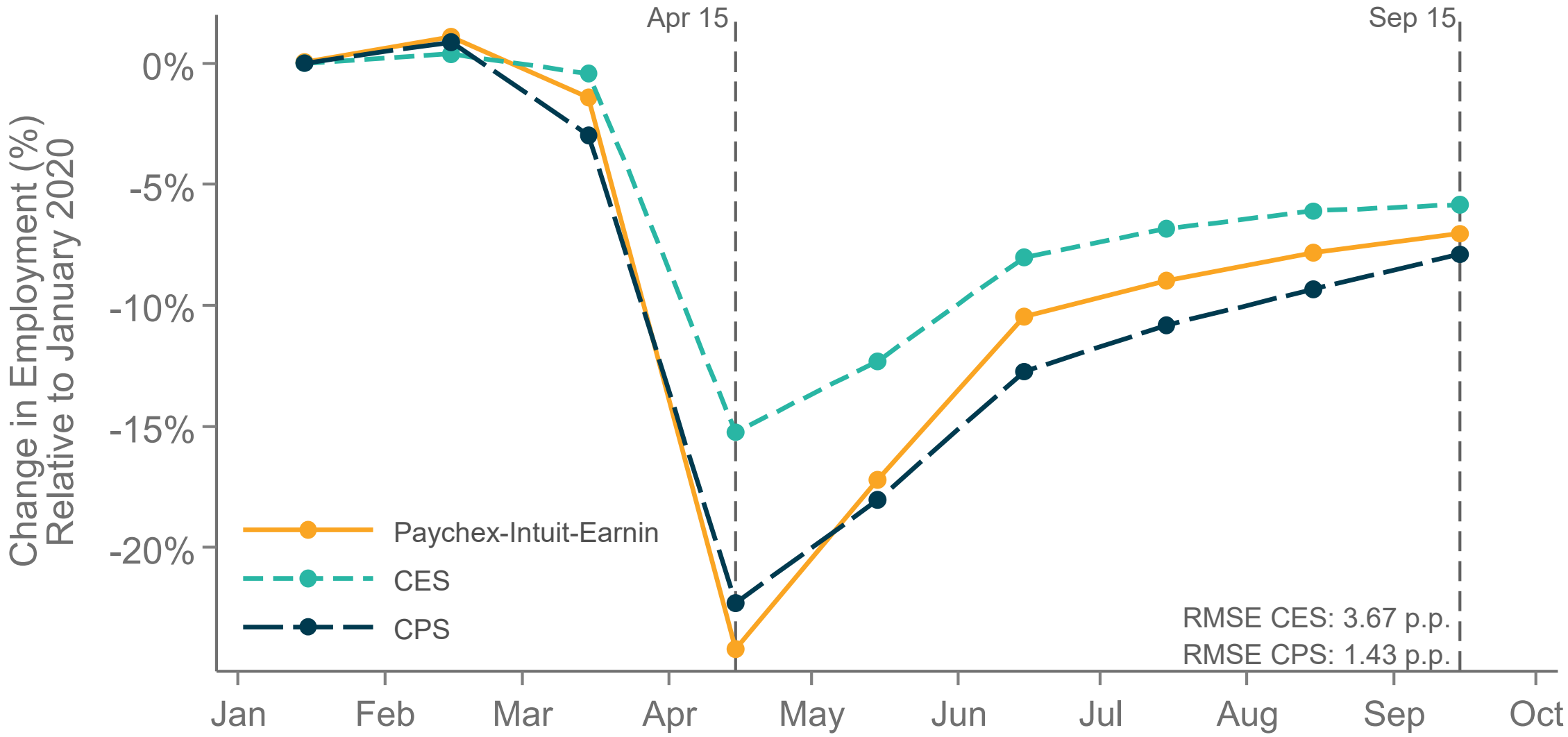
1. **Clean** series to remove artifacts that arise in transaction data
2. **Smooth** seasonal fluctuations using data from 2019
3. **Protect privacy**: index to January 2020 values, exclude small cells, combine data from multiple companies
4. **Benchmark** to national statistics to characterize group each dataset represents to mitigate bias from non-representative selection

Consumer Spending: National Accounts vs. Credit/Debit Card Data

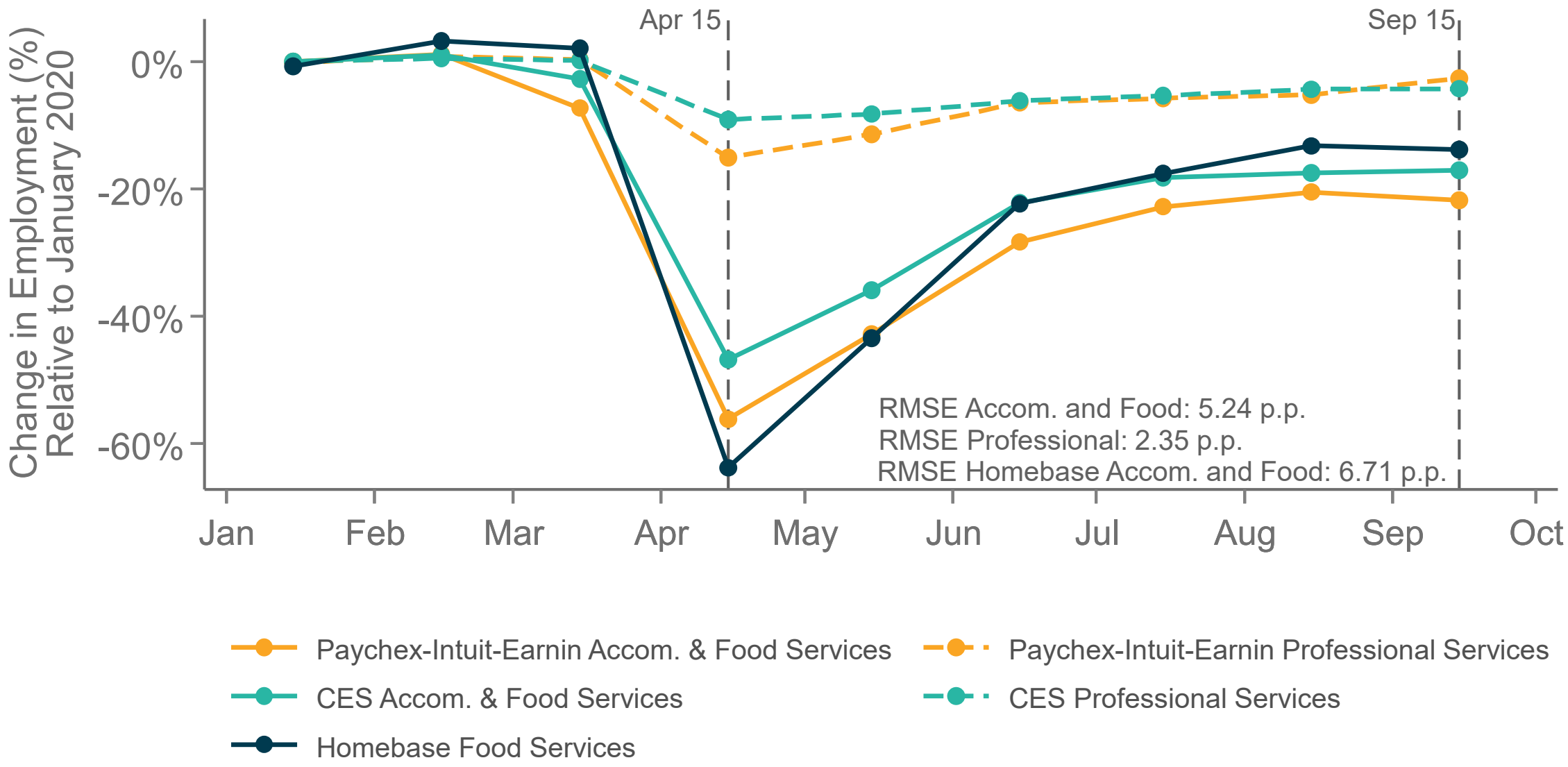
Retail and Food Services in Affinity Solutions Data vs. Monthly Retail Trade Survey



Changes in Employment: Current Employment Statistics vs. Payroll Data



Changes in Employment: Current Employment Statistics vs. Payroll Data

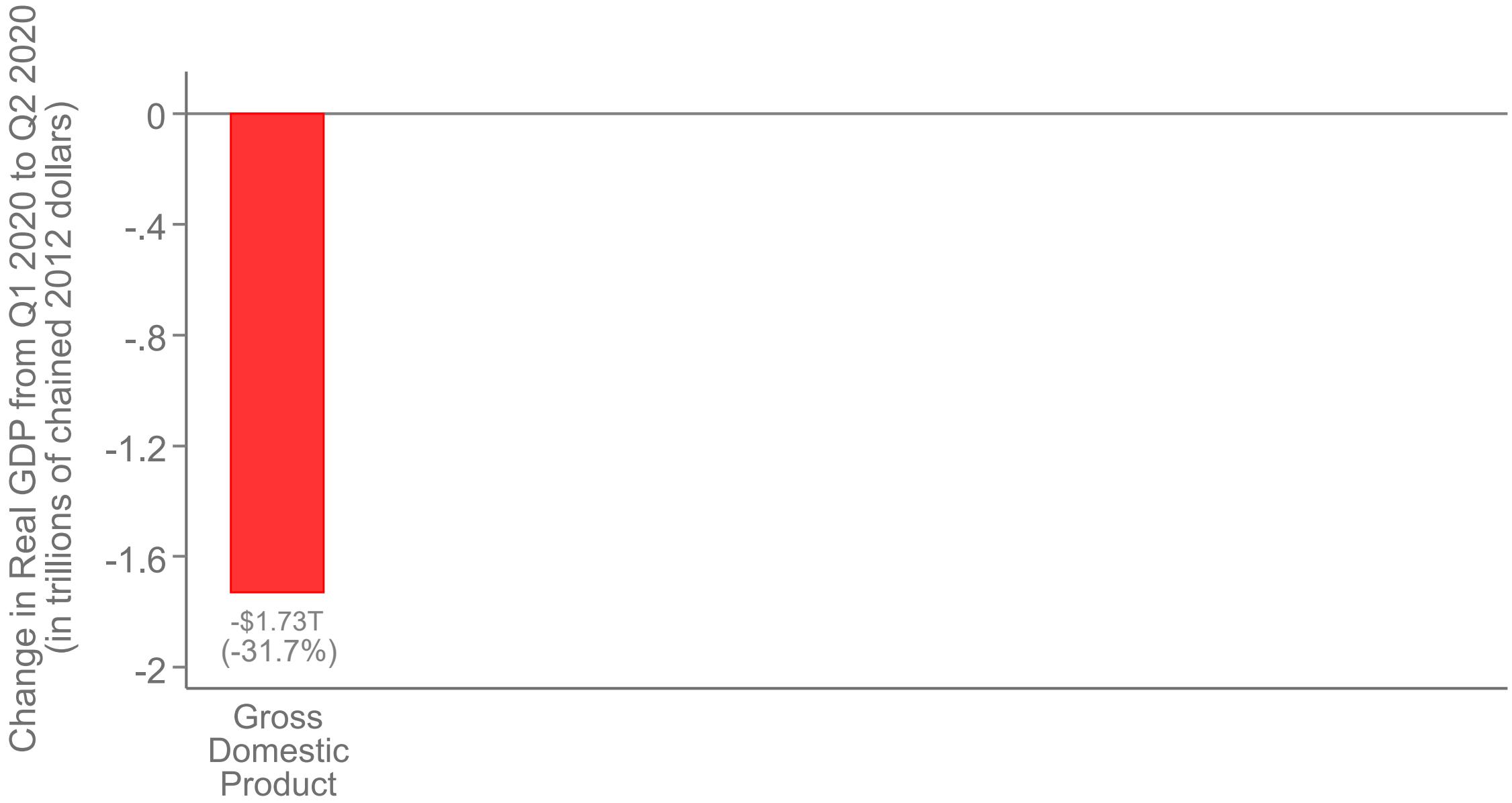


Constructing Publicly Available Economic Indices Based on Private-Sector Data

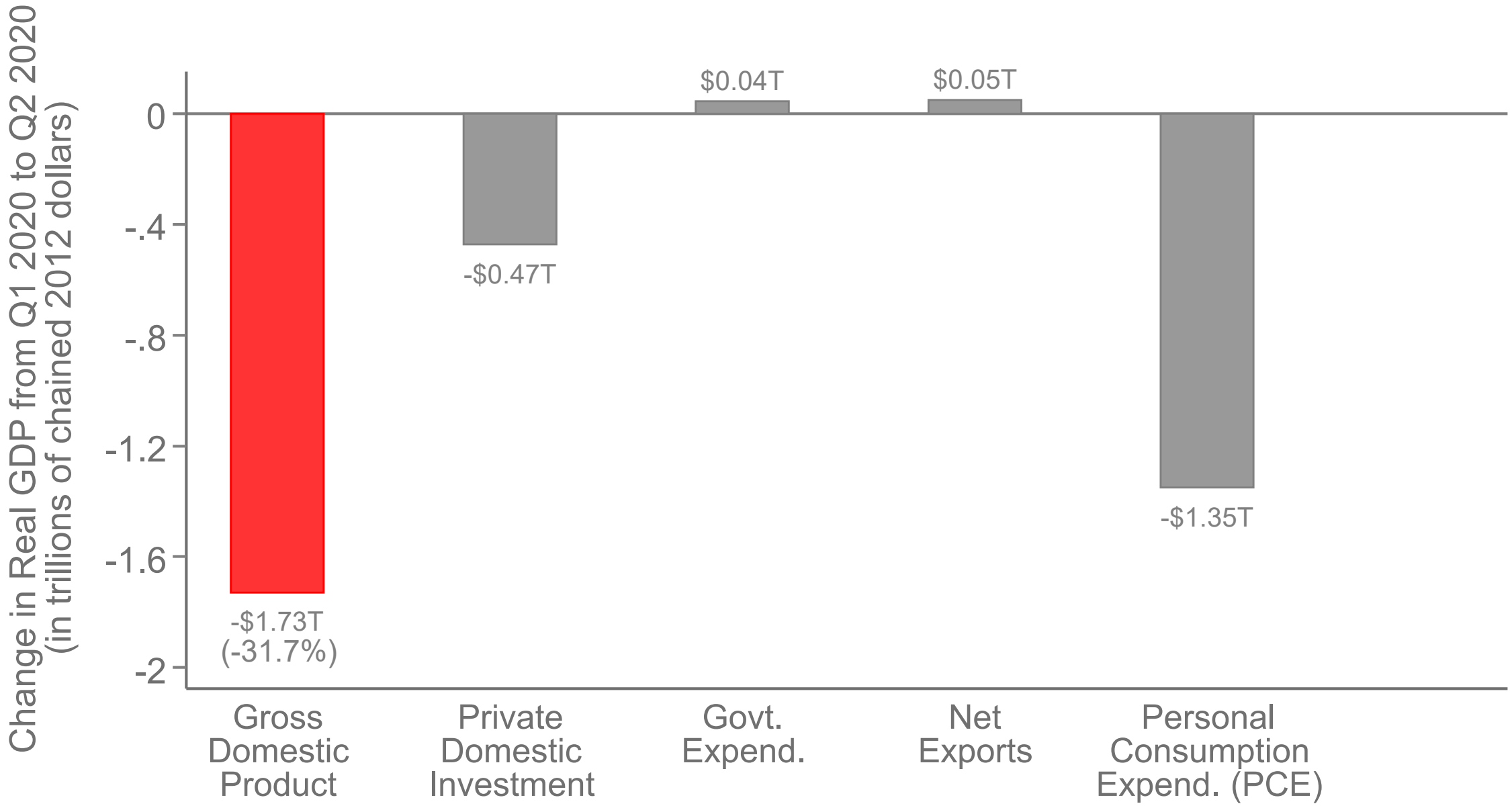
- Produce daily/weekly series by industry (two-digit NAICS), geography (county/ZIP code), and income quartile
  - Automated pipeline that ingests data from companies and reports statistics typically within one week of relevant transactions
- All series are freely downloadable (eliminating need for further contracts) and can be visualized at www.tracktherecovery.org
  - All results that follow are constructed from these publicly available statistics

Impacts of COVID-19

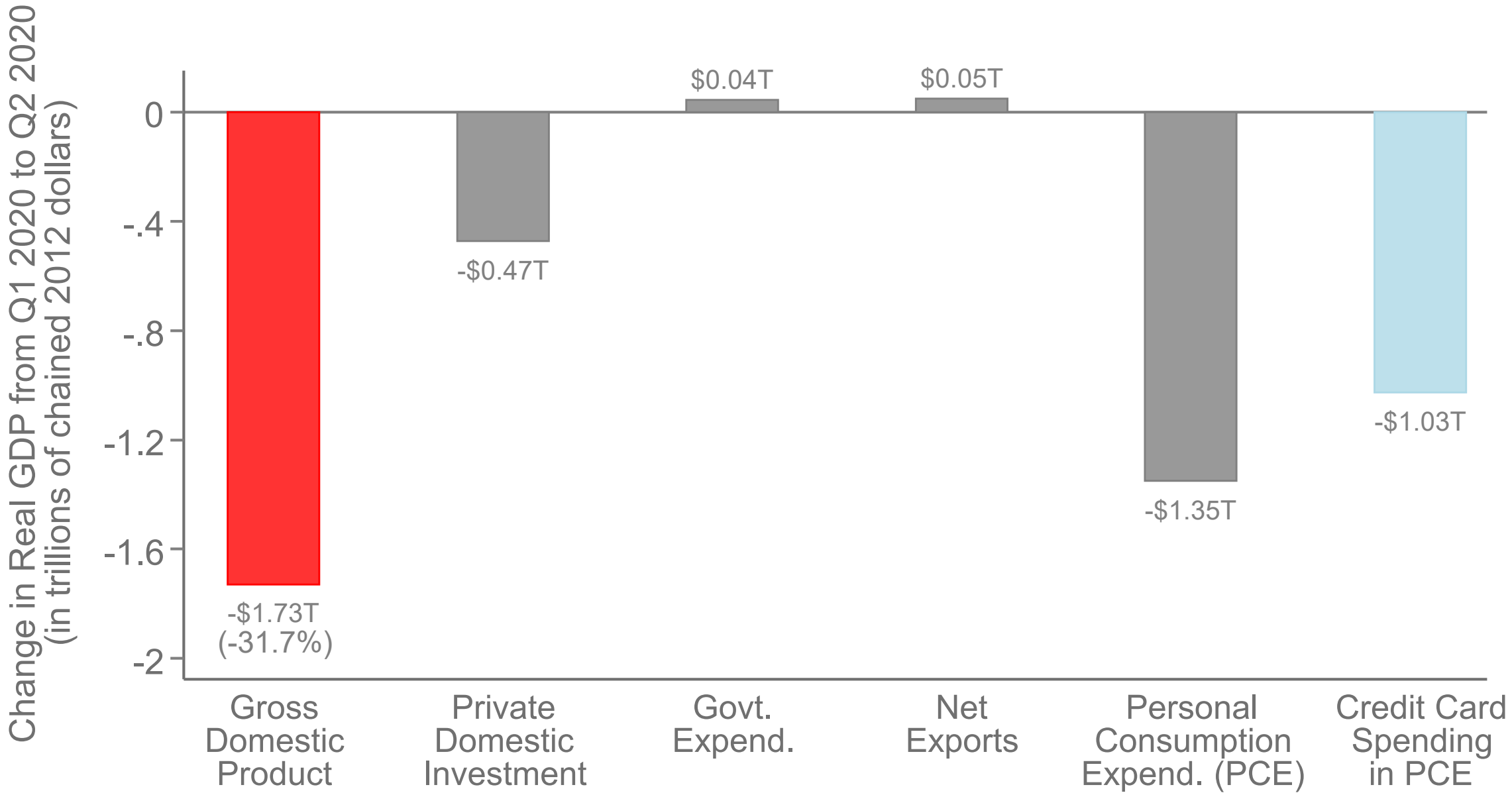
National Accounts Data: Changes in GDP and its Components



National Accounts Data: Changes in GDP and its Components



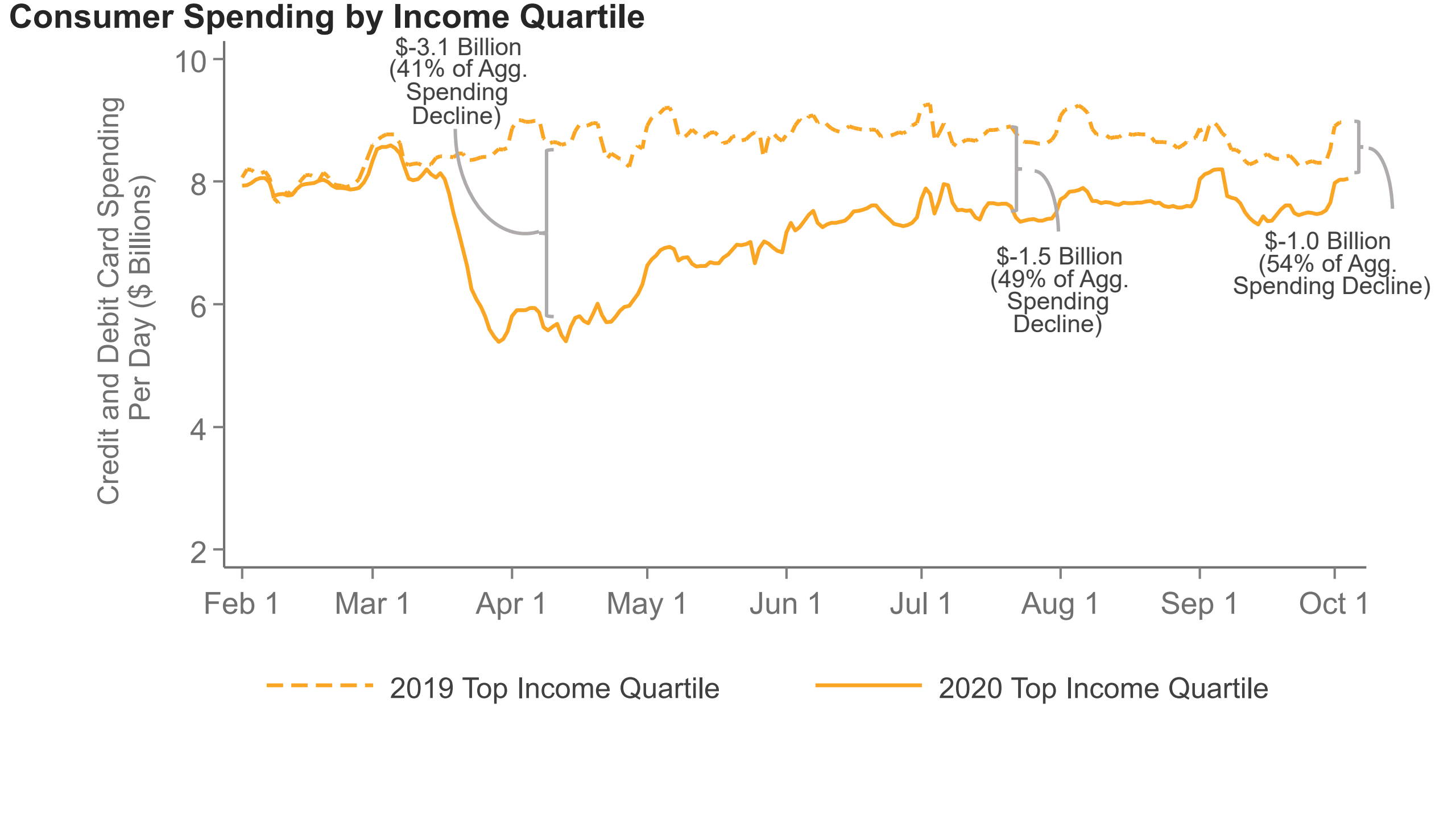
National Accounts Data: Changes in GDP and its Components



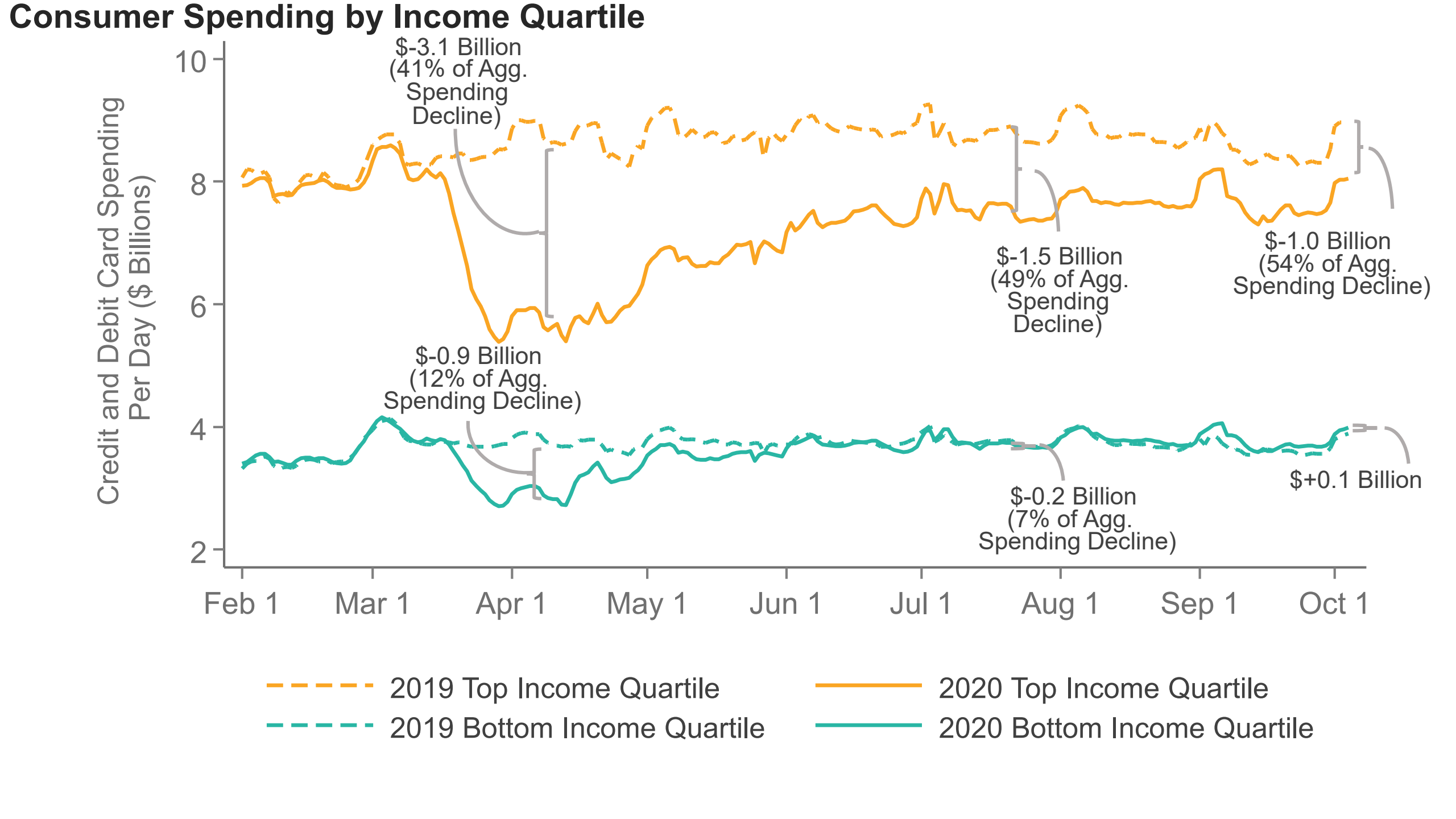
Impacts of COVID-19 on Consumer Spending

- Begin by disaggregating spending changes by household income
  - Who cut spending more – the rich or the poor?
- Impute income based on median household income in cardholder ZIP code
  - Matches estimates in JPMorgan Chase individual-level income data
    [Farrell, Greig, Cox, Ganong, Noel 2020]

Consumer Spending by Income Quartile



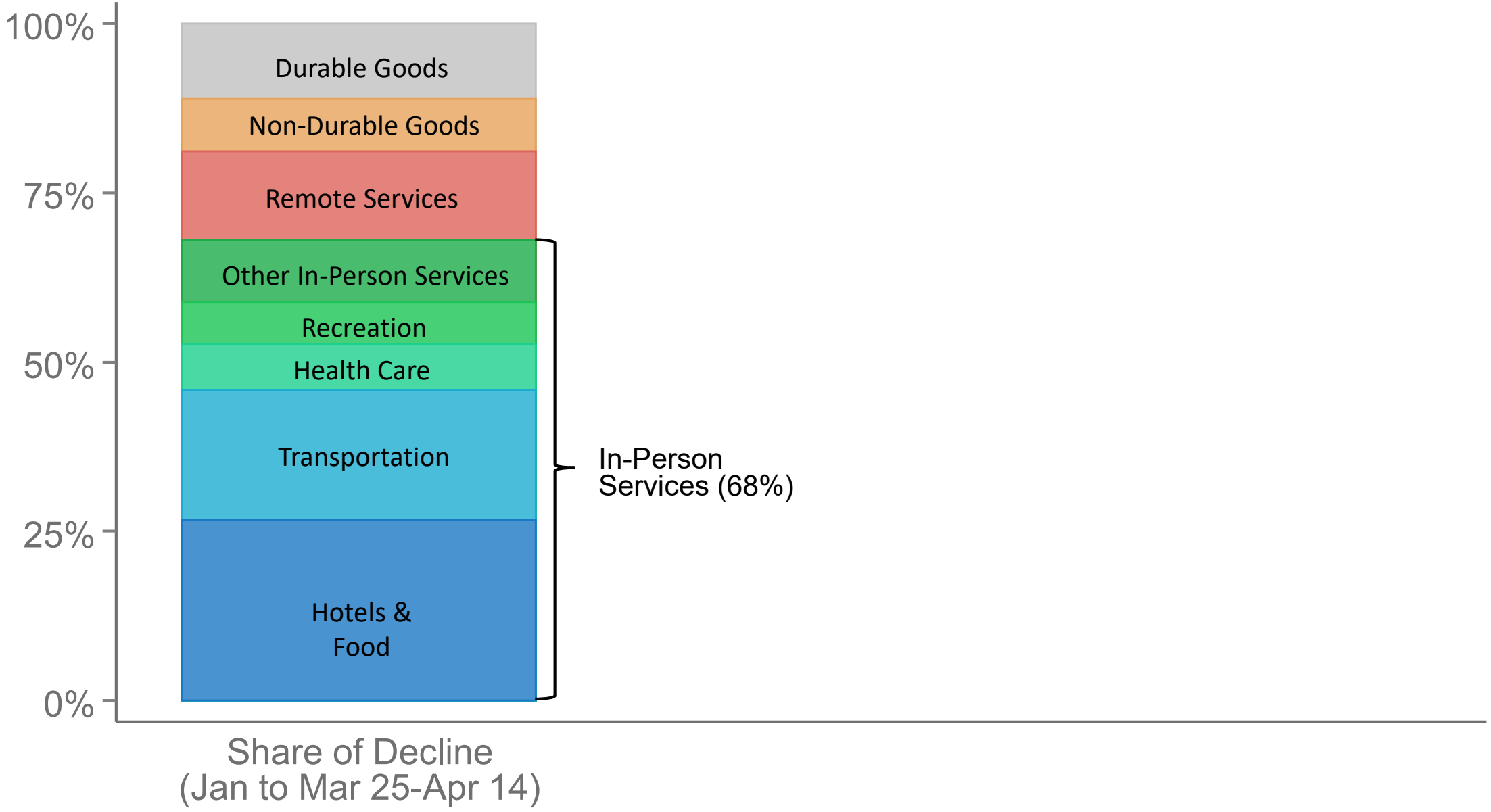
Consumer Spending by Income Quartile



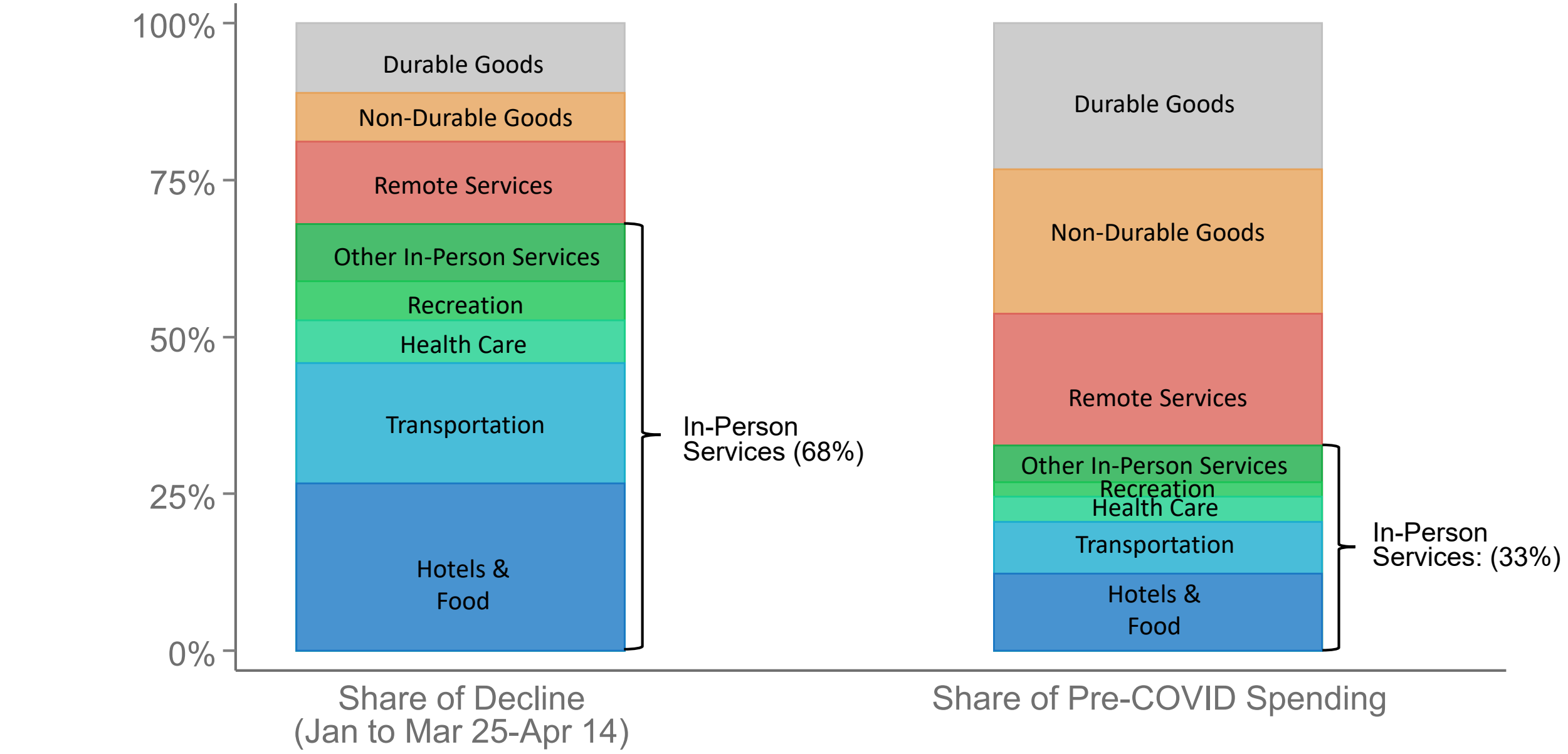
Impacts of COVID-19 on Consumer Spending

- Next, disaggregate by sector
  - Why did spending fall? Because of a reduction in purchasing power/expected income or health concerns about COVID-19?

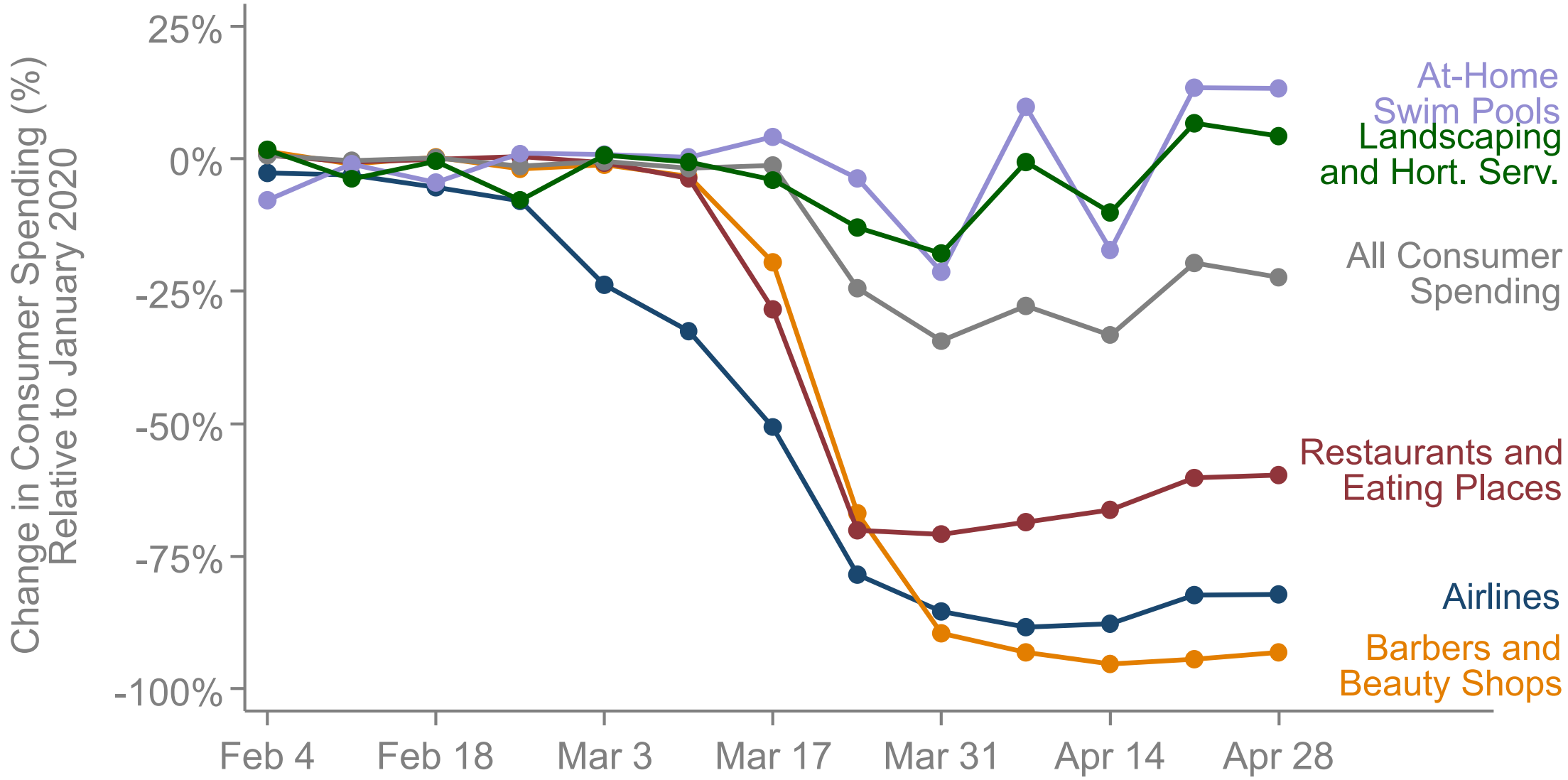
Change in Consumer Spending by Sector



Change in Consumer Spending by Sector

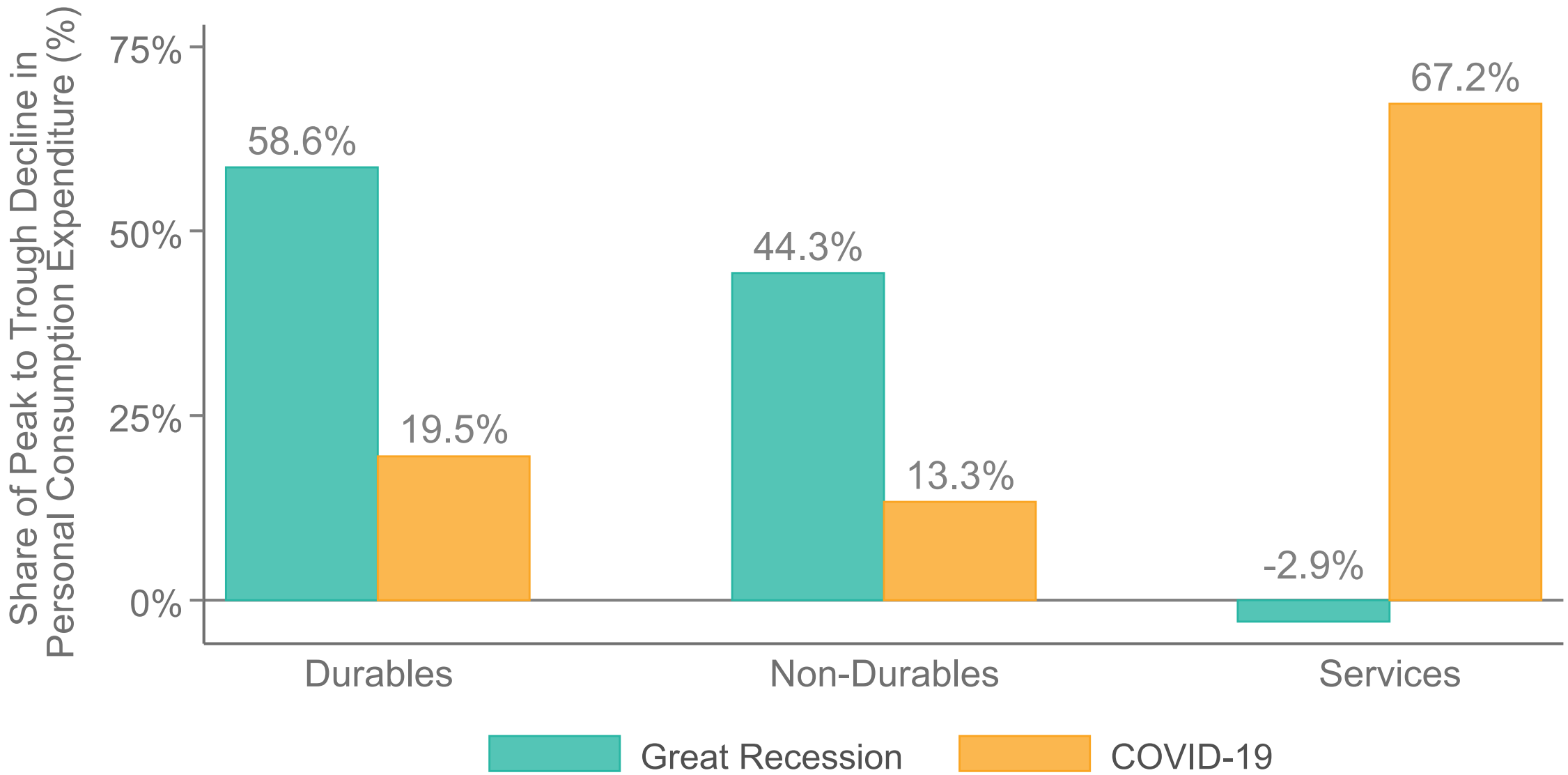


Change in Consumer Spending by Category



Change in Consumer Spending by Sector

COVID vs Great Recession



Business Revenues

Impacts of COVID-19 on Businesses

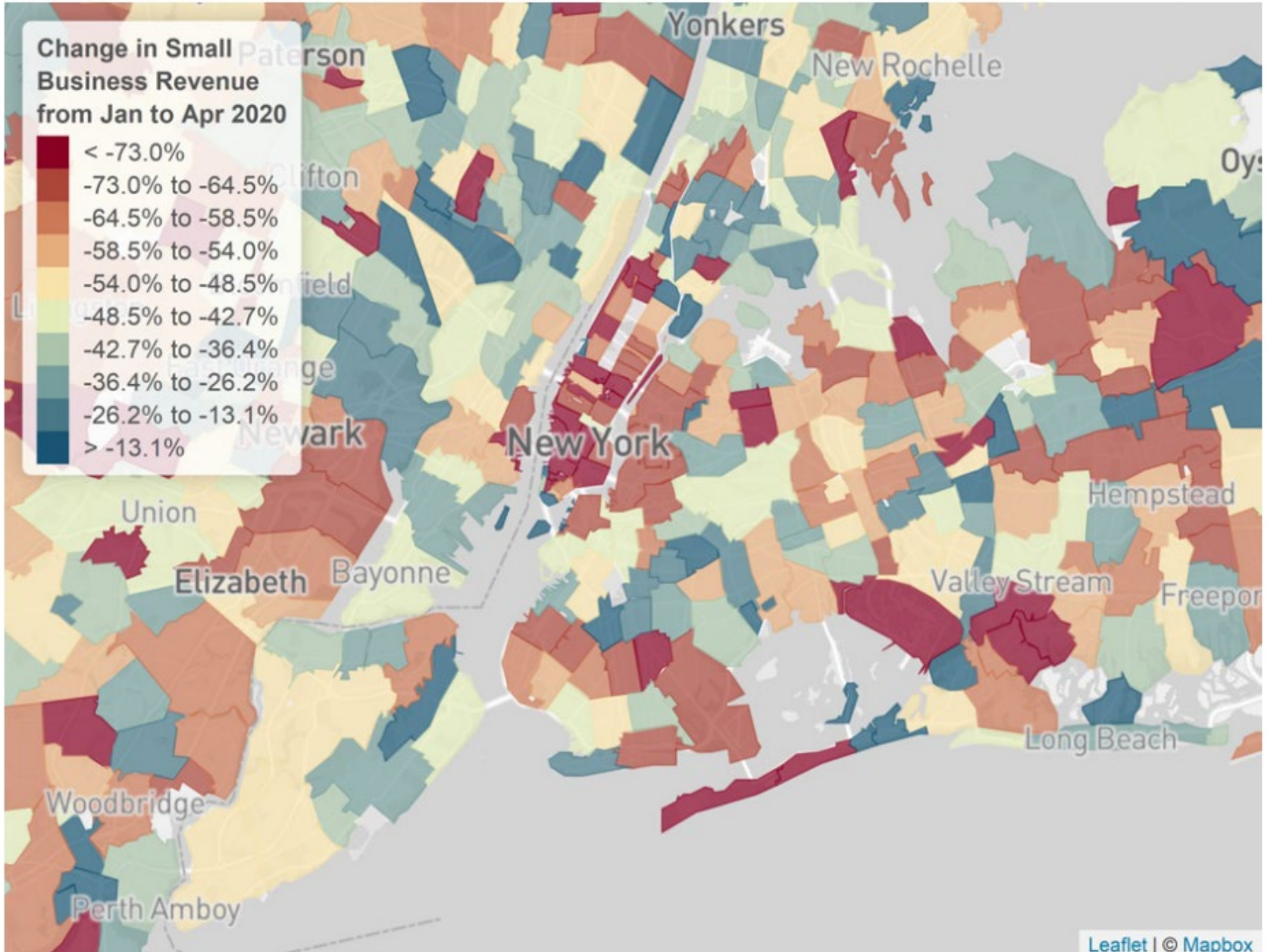
- How did the fall in consumer spending and business revenue affect business decisions: decision to remain open, employment, job postings, etc.?

- To answer this question, use variation in size of spending shocks across ZIP codes
  - Spending fell primarily among high-income households for in-person services such as restaurants
  - Such services are mostly produced by small businesses that serve customers in their local area
  - Differences across ZIP codes in average household income → variation in size of spending shock that local businesses face

- Begin by analyzing impacts on small business revenue

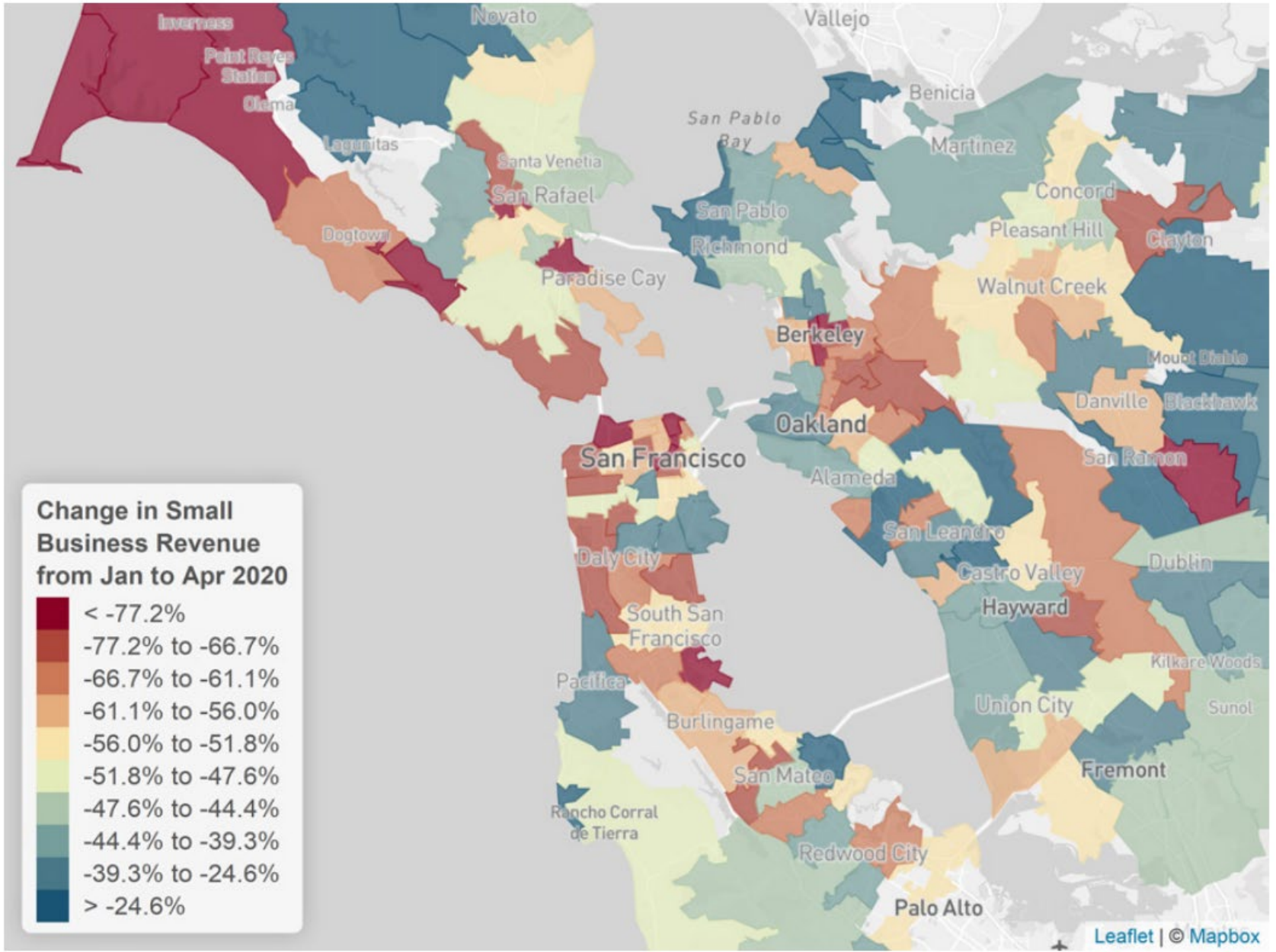
Changes in Small Business Revenues from January to April by ZIP Code

New York



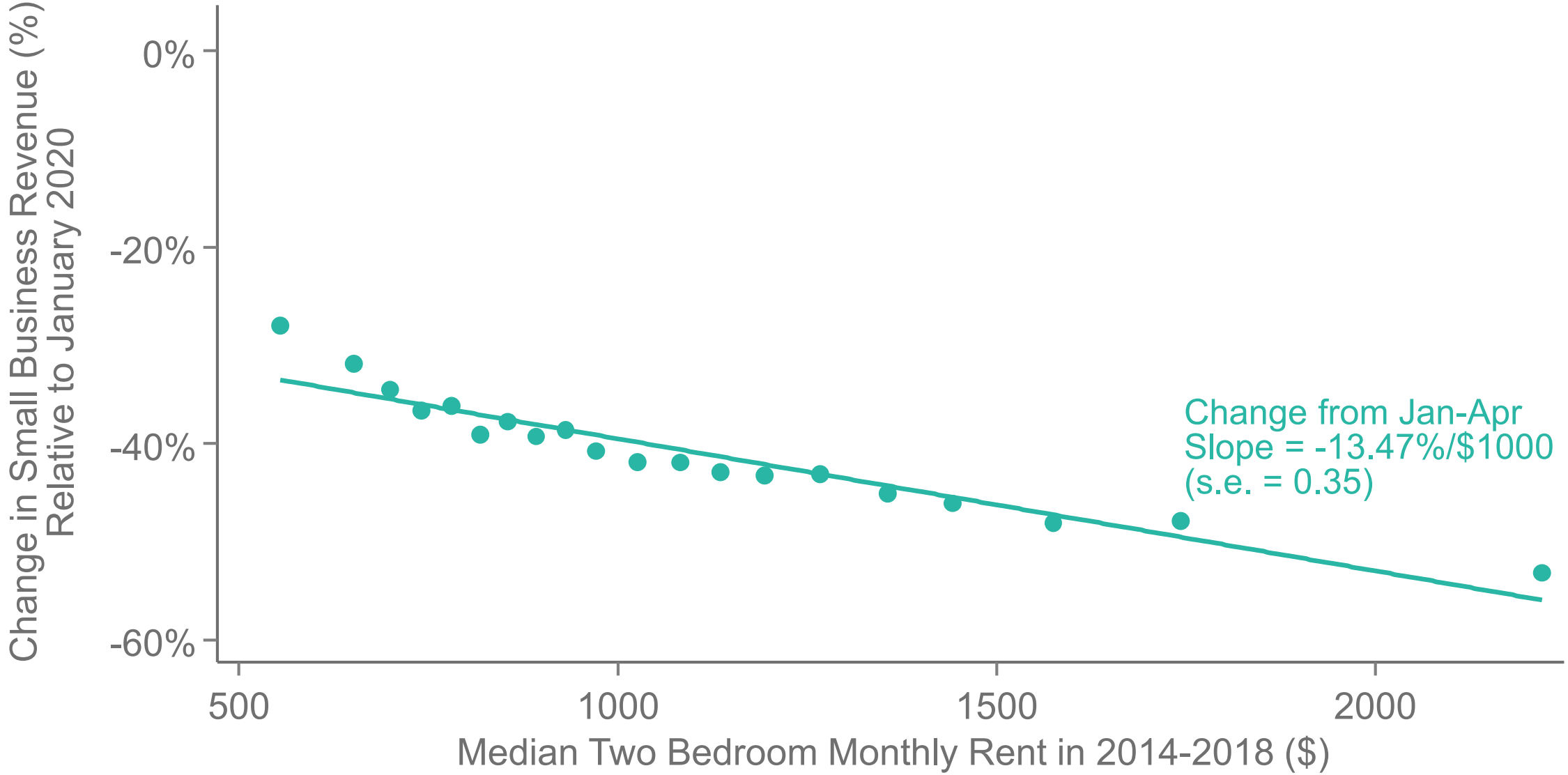
Changes in Small Business Revenues from January to April by ZIP Code

San Francisco



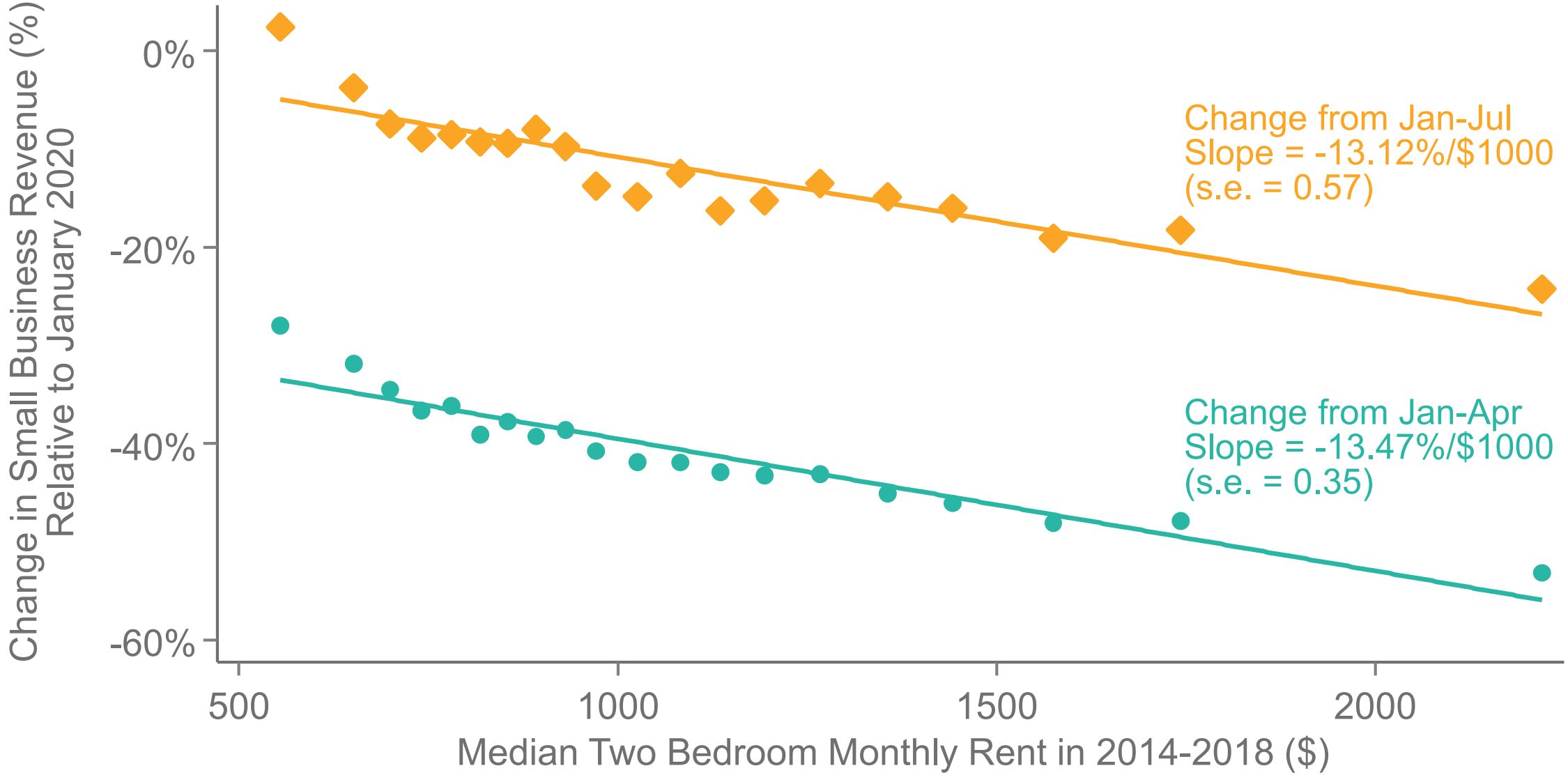
Changes in Small Business Revenues vs. Rent, by ZIP Code

From January to April 2020



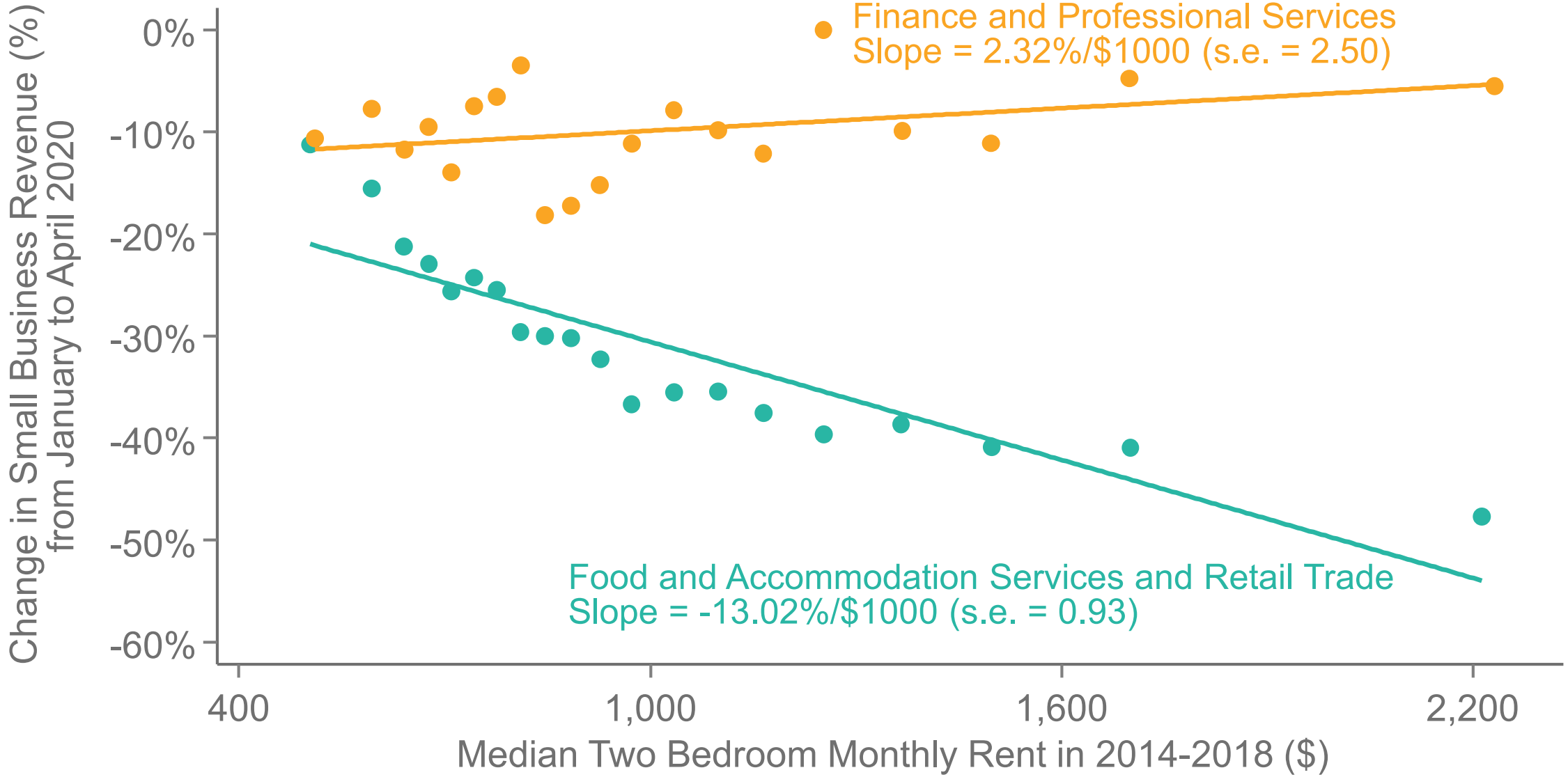
Changes in Small Business Revenues vs. Rent, by ZIP Code

From January to April vs. July 2020



Changes in Small Business Revenues vs. Rent, by ZIP Code

Finance and Professional Services vs Food and Accommodation Services and Retail Trade



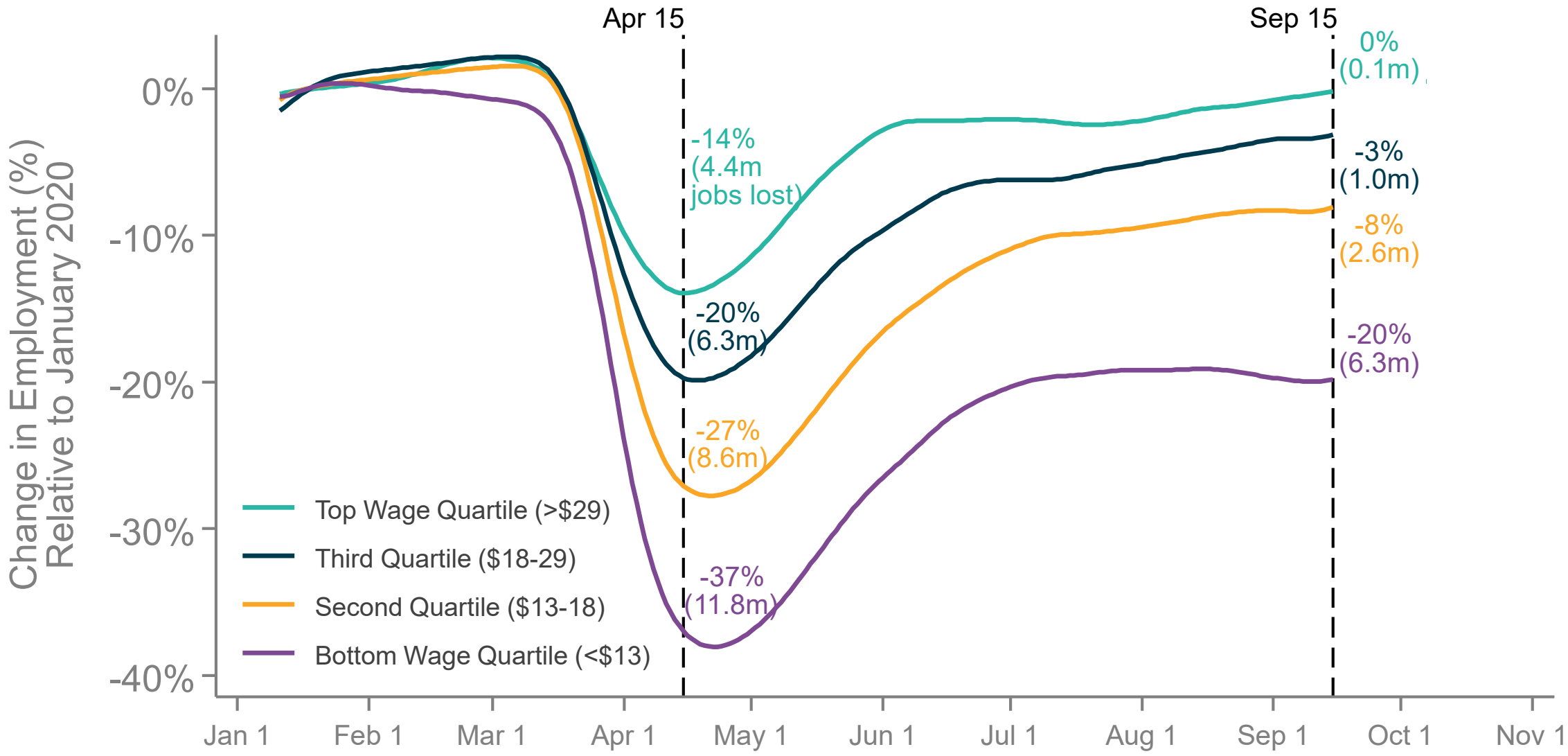
Employment

Impacts of COVID-19 on Employment

- How did businesses react to loss in revenues?

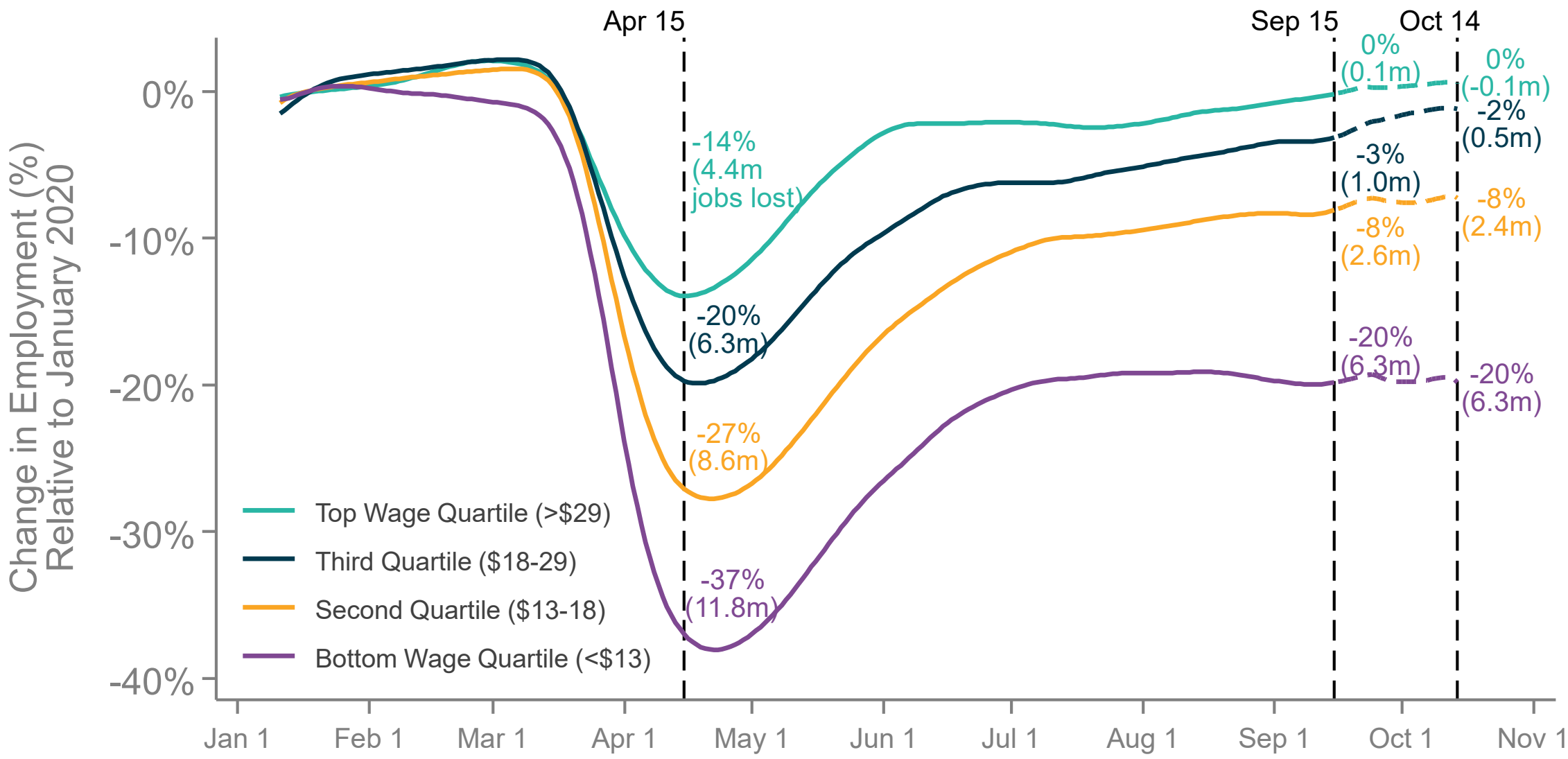
- Begin by analyzing national trends in employment by wage group (as in Cajner et al. 2020) and then turn to geographic variation

Employment Changes by Wage Quartile



Note: dashed lines are forecasts based on Kronos time sheet data and Paychex employment data for workers on weekly pay cycles

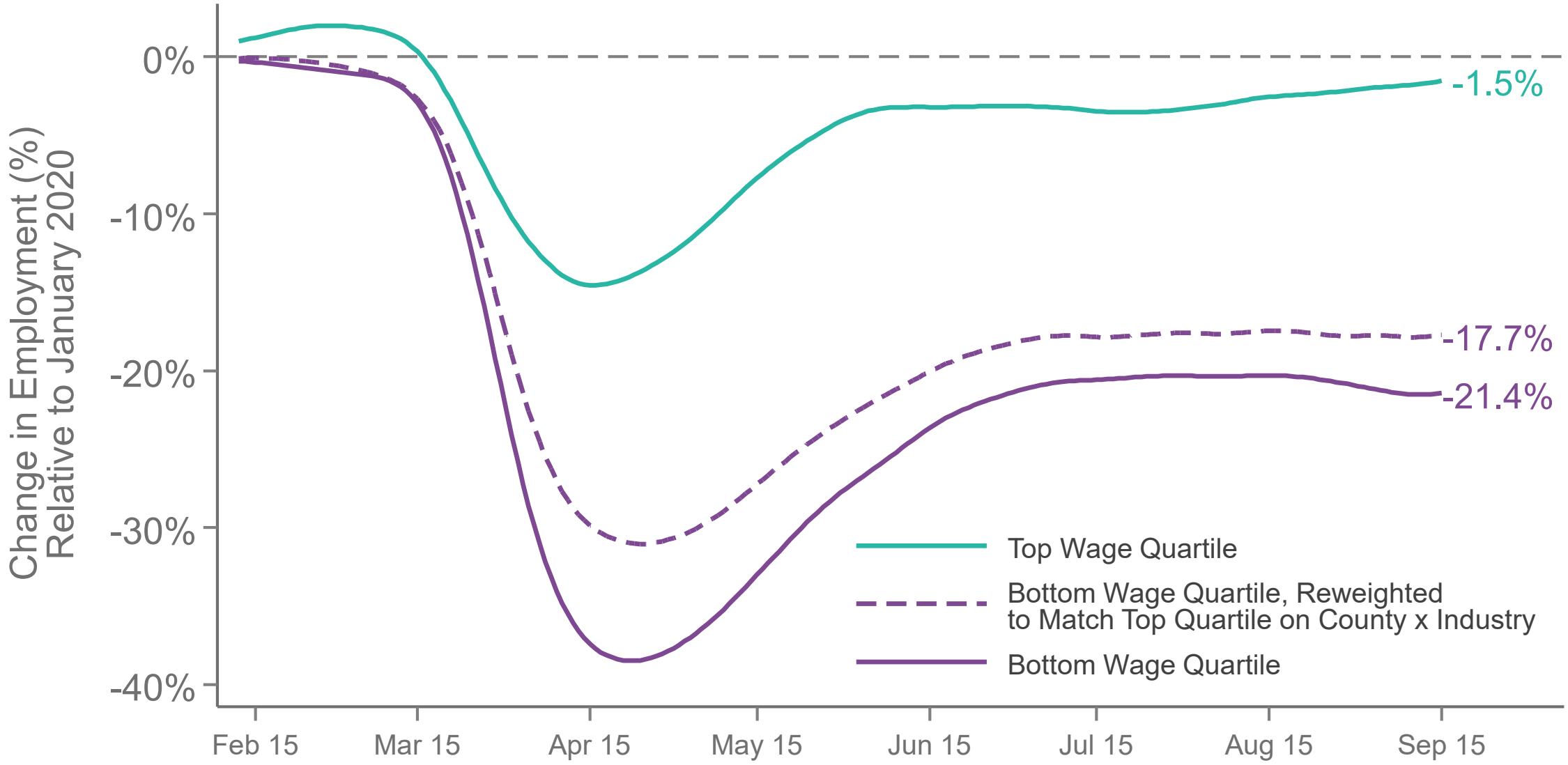
Employment Changes by Wage Quartile



Note: dashed lines are forecasts based on Kronos time sheet data and Paychex employment data for workers on weekly pay cycles

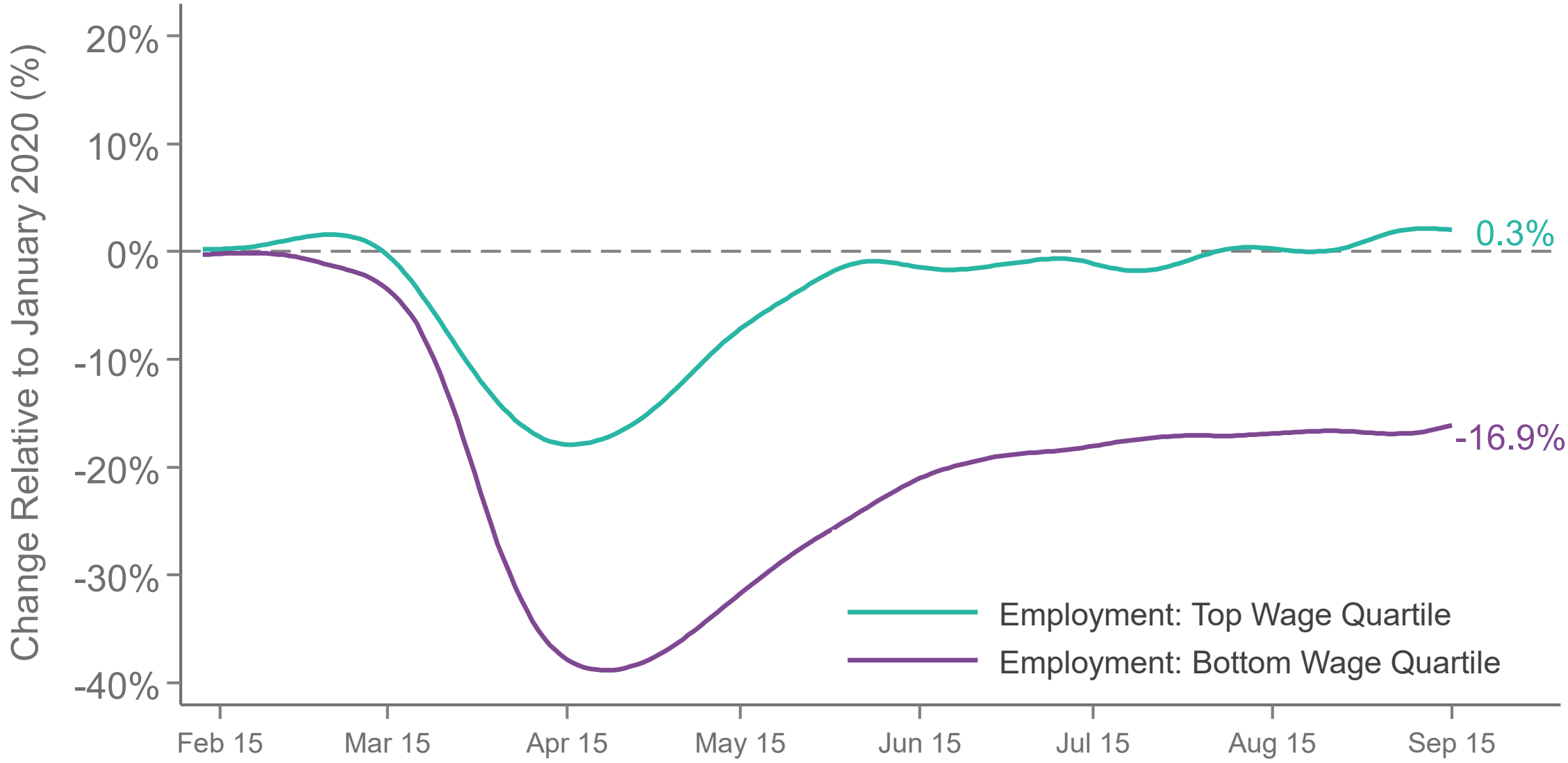
National Trends in Consumer Spending vs. Employment Rates

Bottom Wage Quartile Reweighted to Match Top Quartile by Industry and County



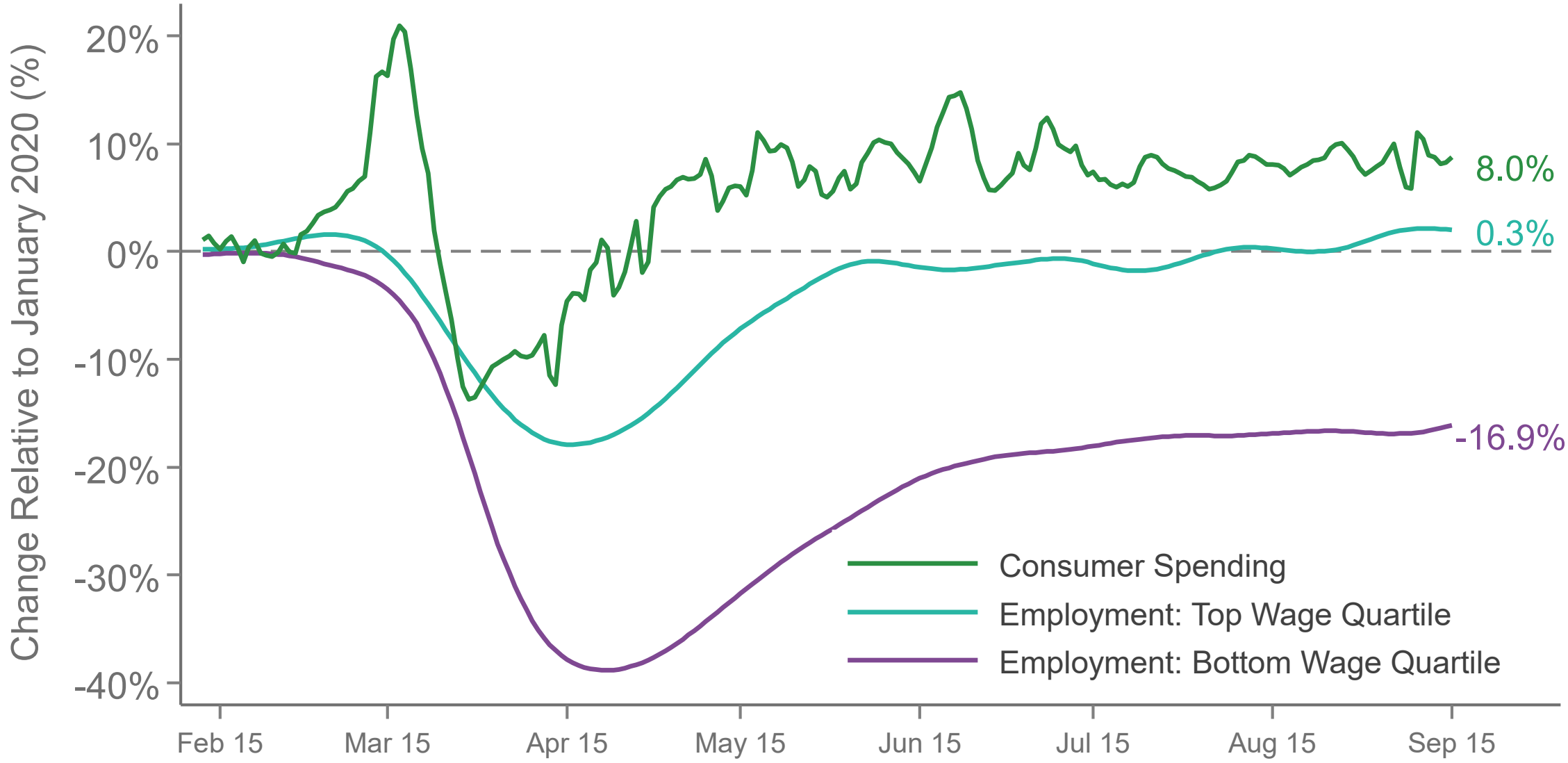
National Trends in Consumer Spending vs. Employment Rates

Retail Trade



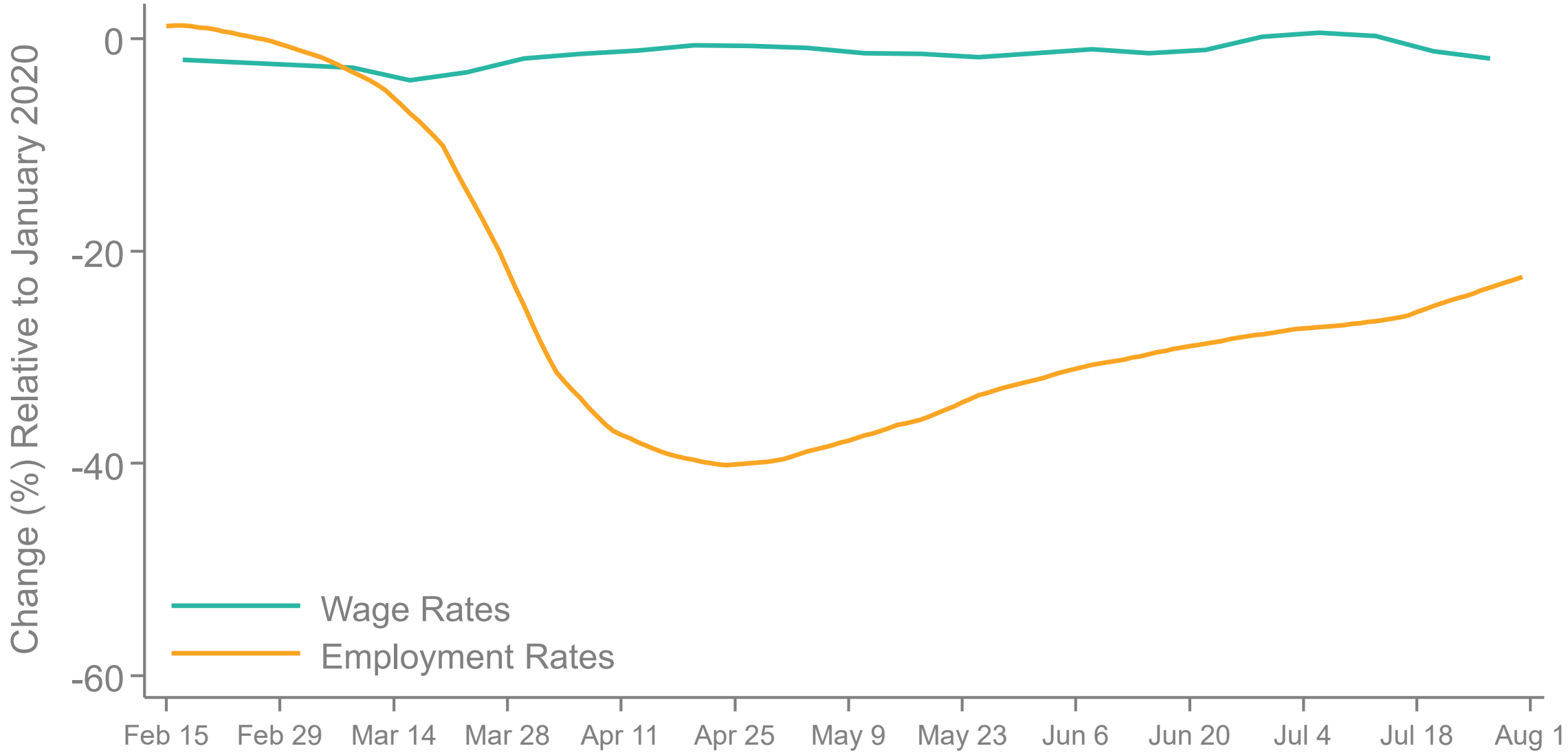
National Trends in Consumer Spending vs. Employment Rates

Retail Trade



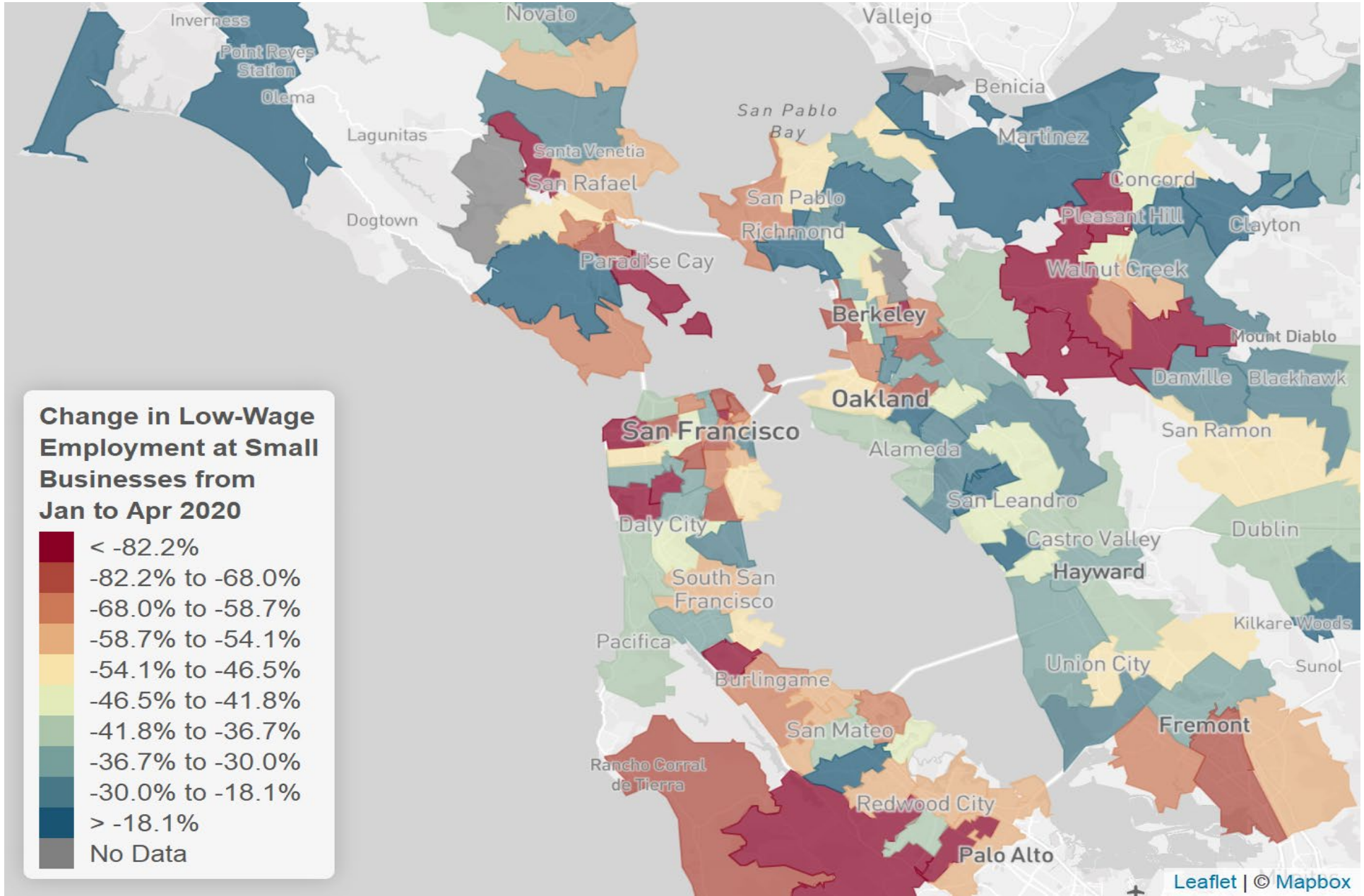
Changes in Wage and Employment Rates

Chained Estimates Using Wage Growth for Job Stayers from Week t to t+1

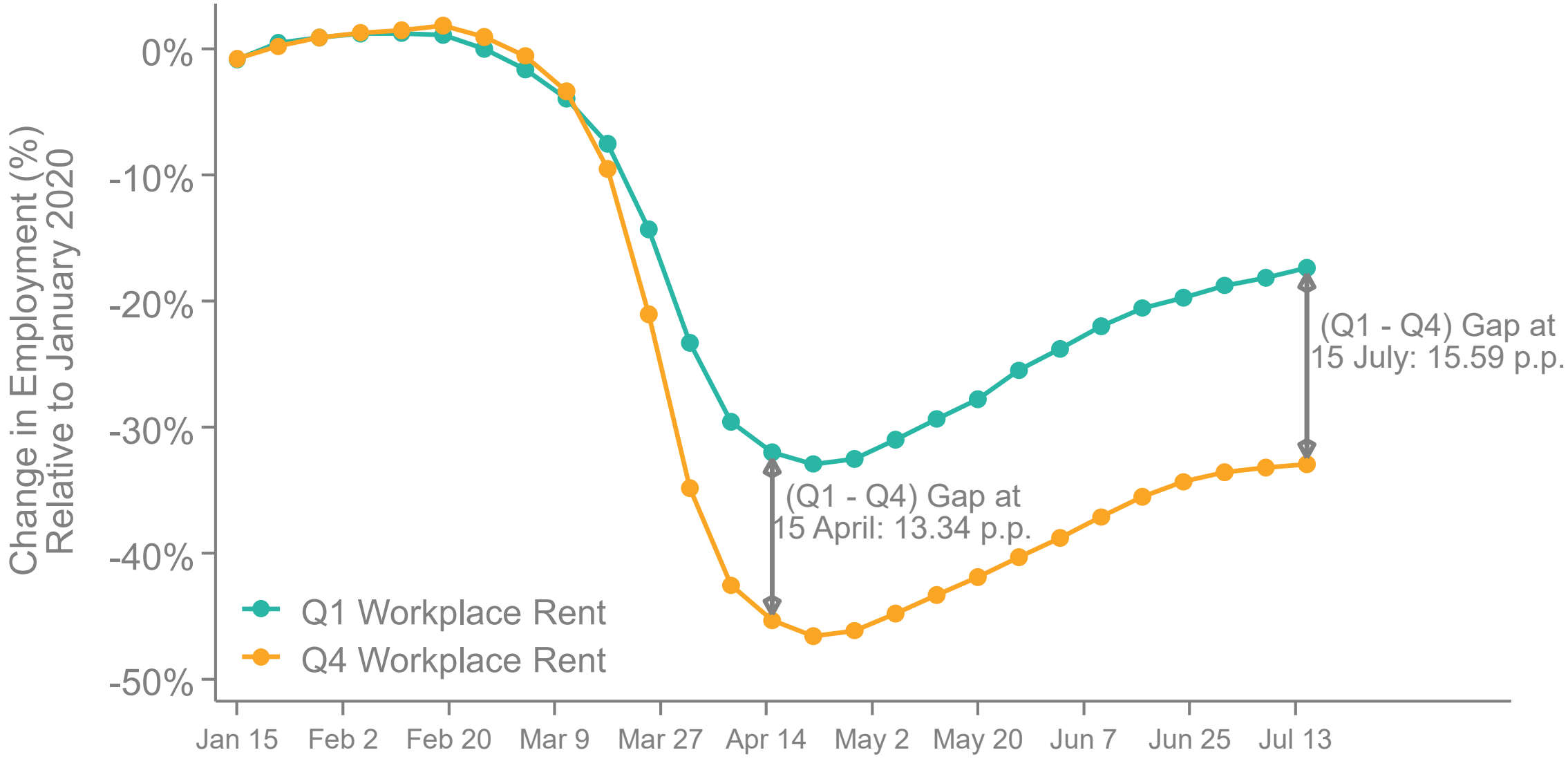


Changes in Low-Wage (Bottom Quartile) Employment Rates by ZIP Code

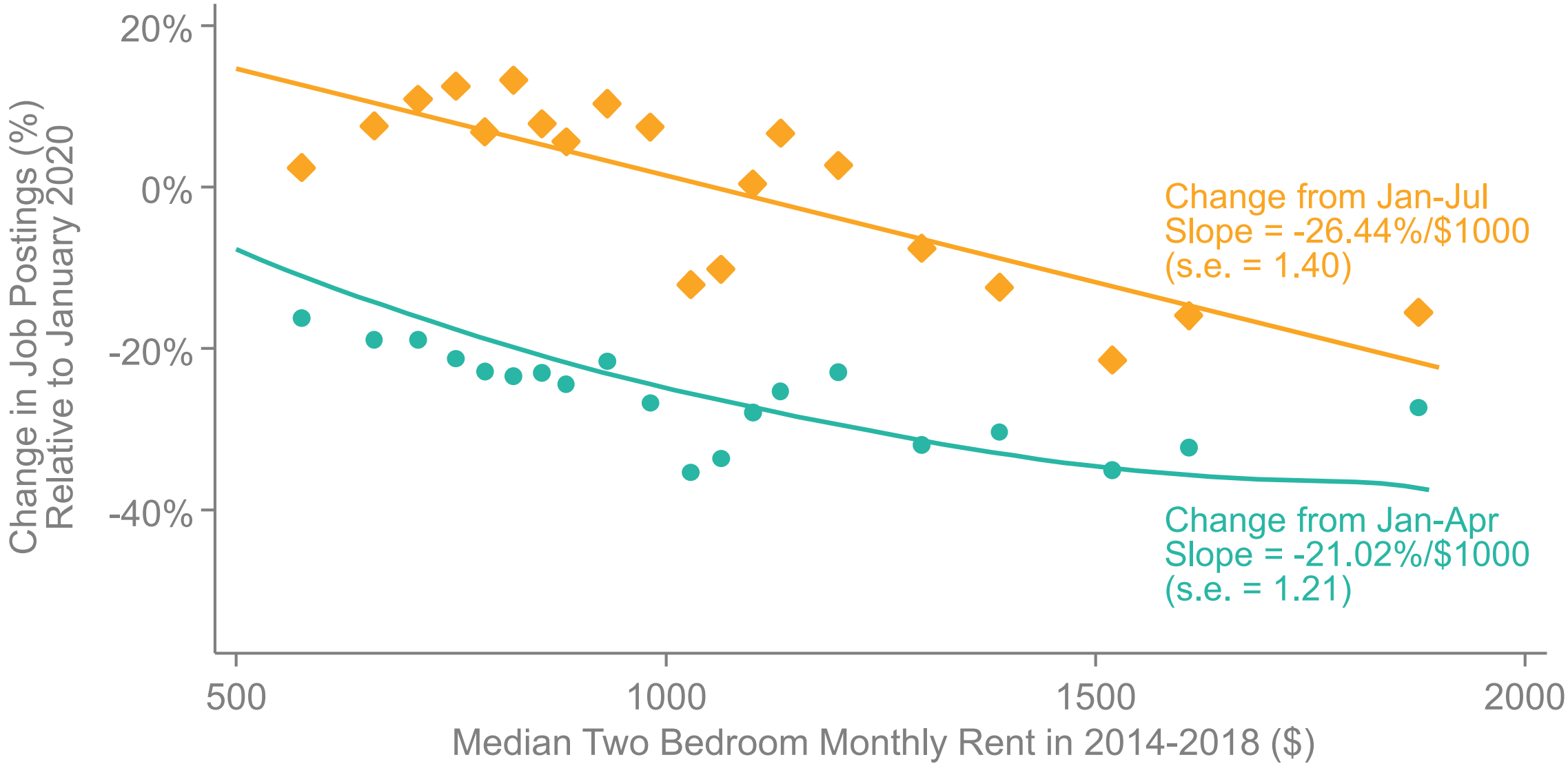
San Francisco



Low-Wage Employment Rates Over Time by Workplace Rent Quartile



Changes in Job Postings for Low-Education Workers vs. Rent, by County



Employment Recovery from the COVID-19 Shock

- Reduction in spending by the rich led to loss of jobs for low-income individuals, especially those working in affluent areas

- Will employment of low-wage workers revert to baseline as spending recovers?

Employment Recovery from the COVID-19 Shock

- Reduction in spending by the rich led to loss of jobs for low-income individuals, especially those working in affluent areas

- Will employment of low-wage workers revert to baseline as spending recovers?

- Signs of a potential “jobless recovery” in this recession as well for low-wage workers, perhaps because of technological shifts away from routine occupations [Jaimovich and Su 2018]
  - Evidence from Great Recession suggests that disparate job losses across regions/sectors could have persistent effects for many years because workers do not move to find jobs [Yagan 2019]

- How can we mitigate the employment impacts of the crisis via macroeconomic policy?

Impacts of Stabilization Policies

Impacts of COVID-19 on Employment: Summary

- In rest of talk, examine what policies can mitigate impacts of pandemic, focusing in particular on employment of low-income workers

- Focus on three major policies that target chain of events (consumer spending → business revenue → employment) at different points

1. State-ordered re-openings

2. Stimulus payments to households

3. Loans to small businesses

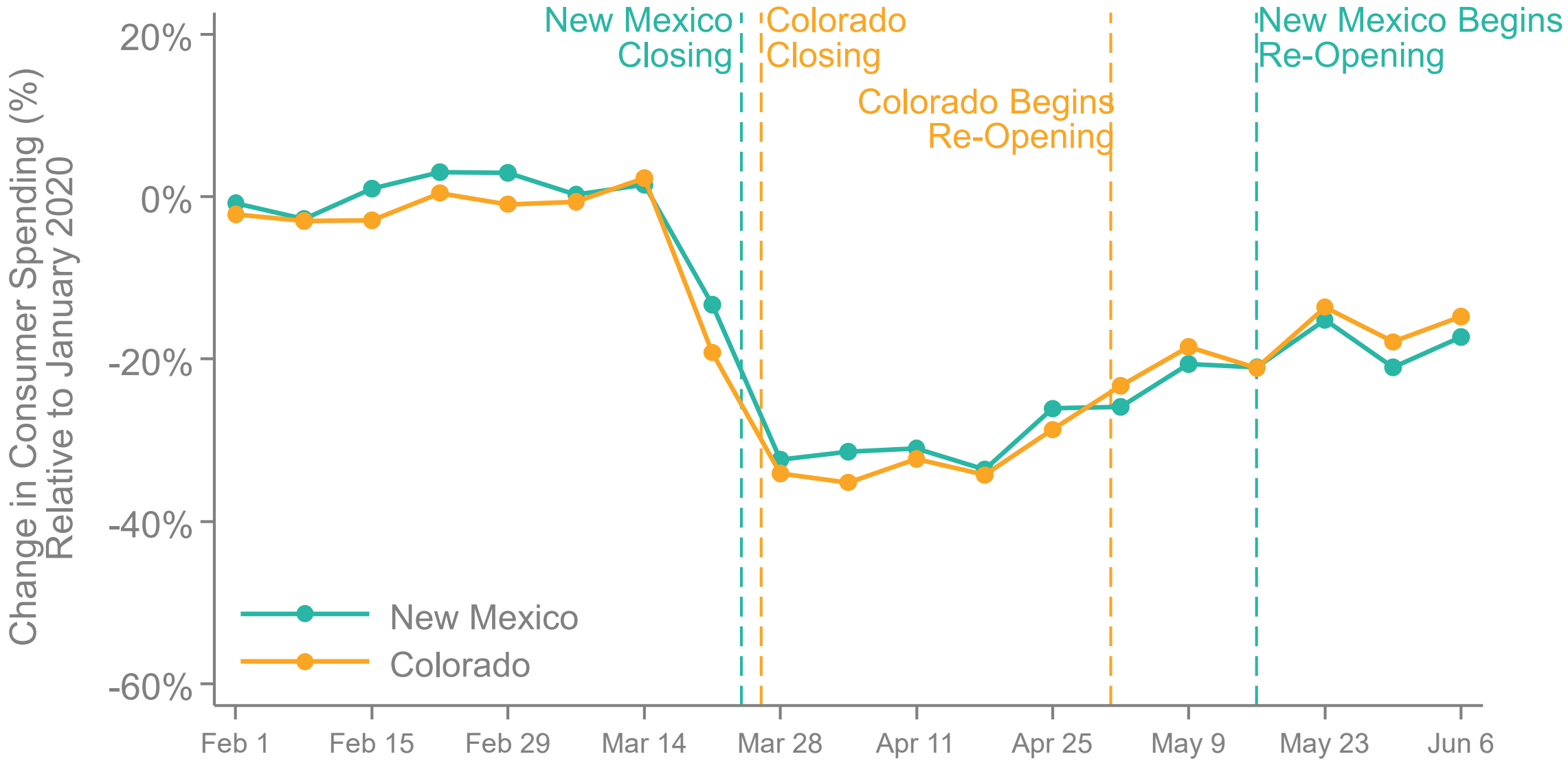
State-Ordered Reopenings

State-Ordered Reopenings

- Can executive orders restore economic activity?
- Compare trends in spending and employment in states that reopened earlier vs. later

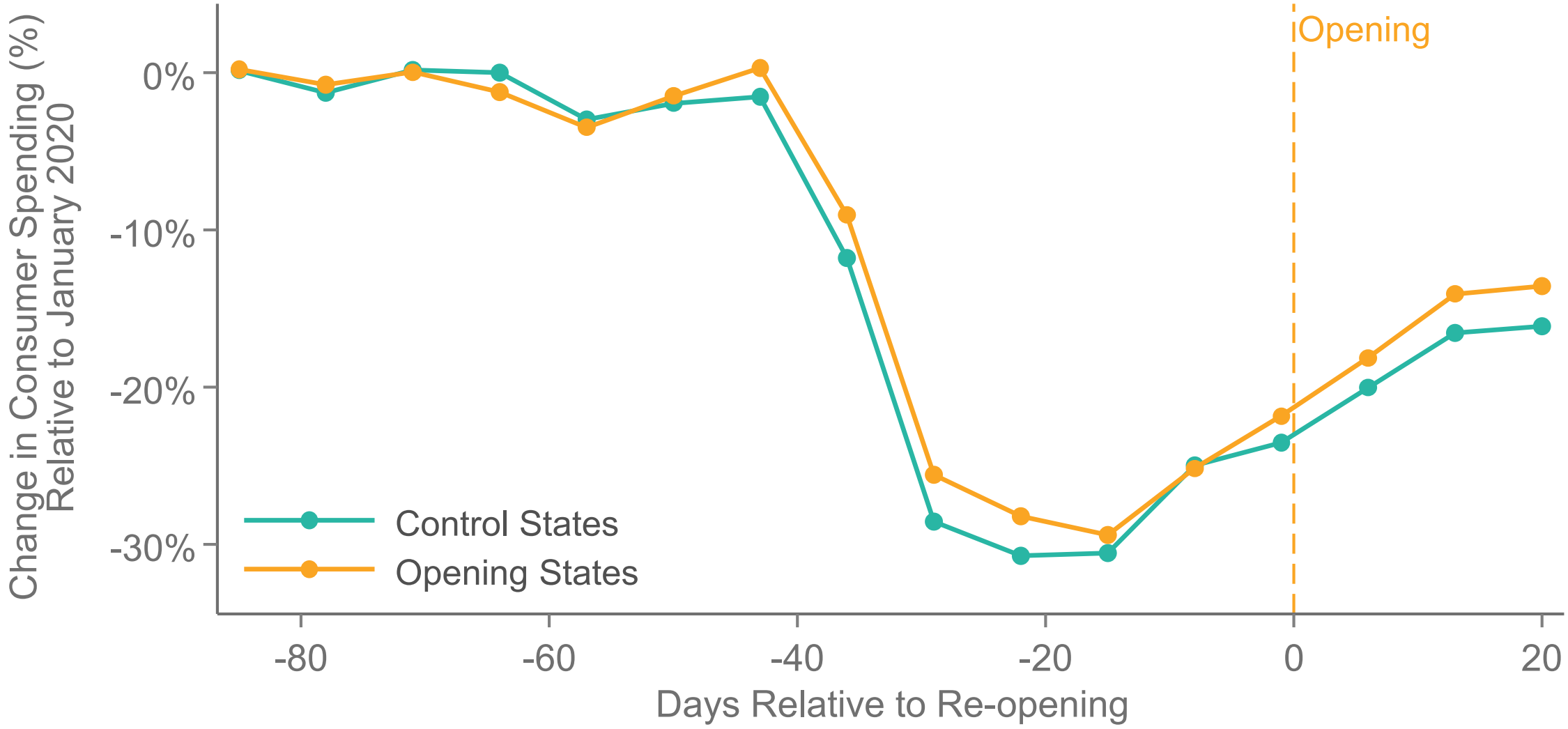
Causal Effect of Re-Opening on Consumer Spending

Case Study of New Mexico vs. Colorado



Causal Effects of Re-Openings on Economic Activity: Event Studies

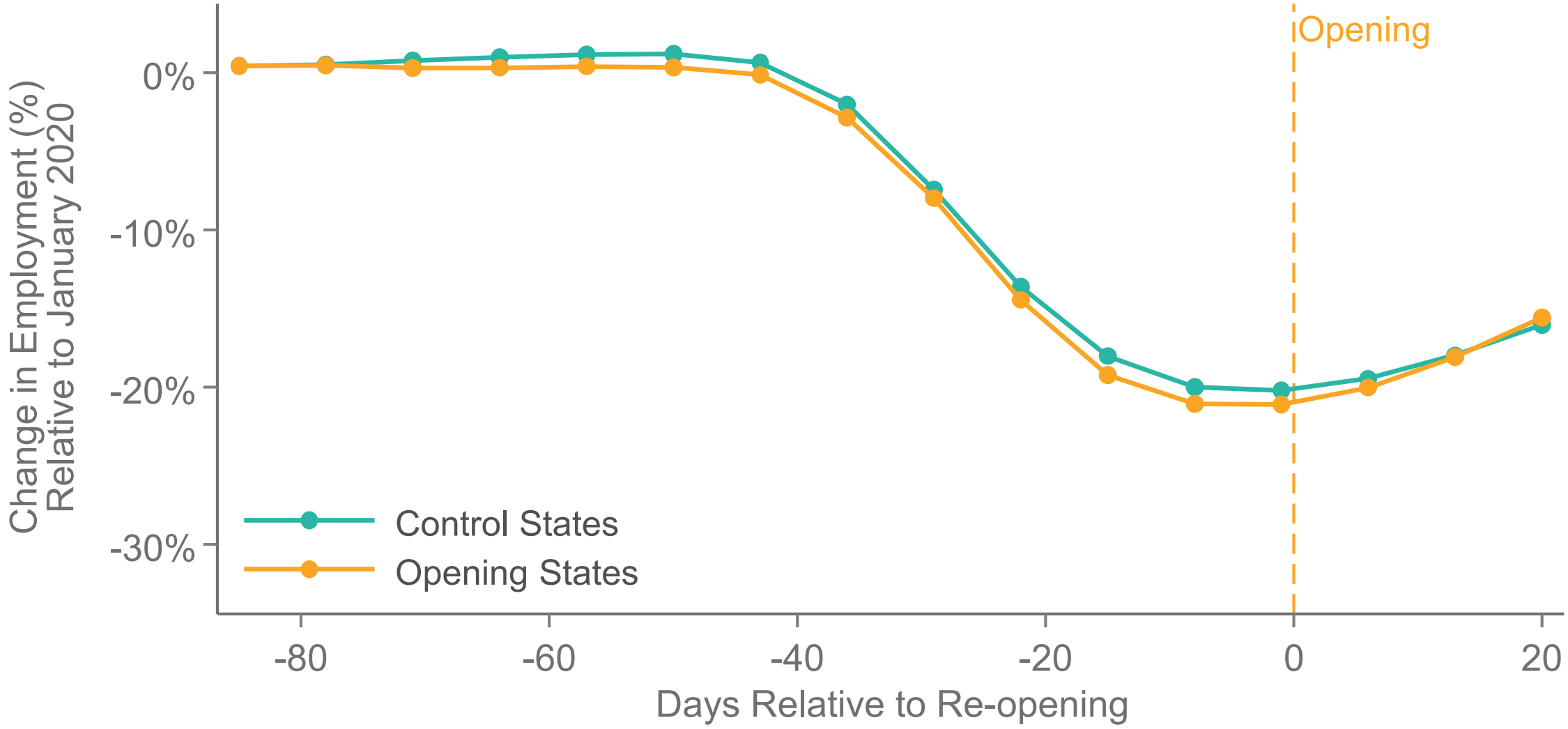
Re-Opened States vs. Control States: Consumer Spending



Diff-in-Diff Estimate: +1.43p.p. (s.e. = 0.51)

Causal Effects of Re-Openings on Economic Activity: Event Studies

Re-Opened States vs. Control States: Employment



Diff-in-Diff Estimate: +0.65p.p. (s.e. = 0.51)

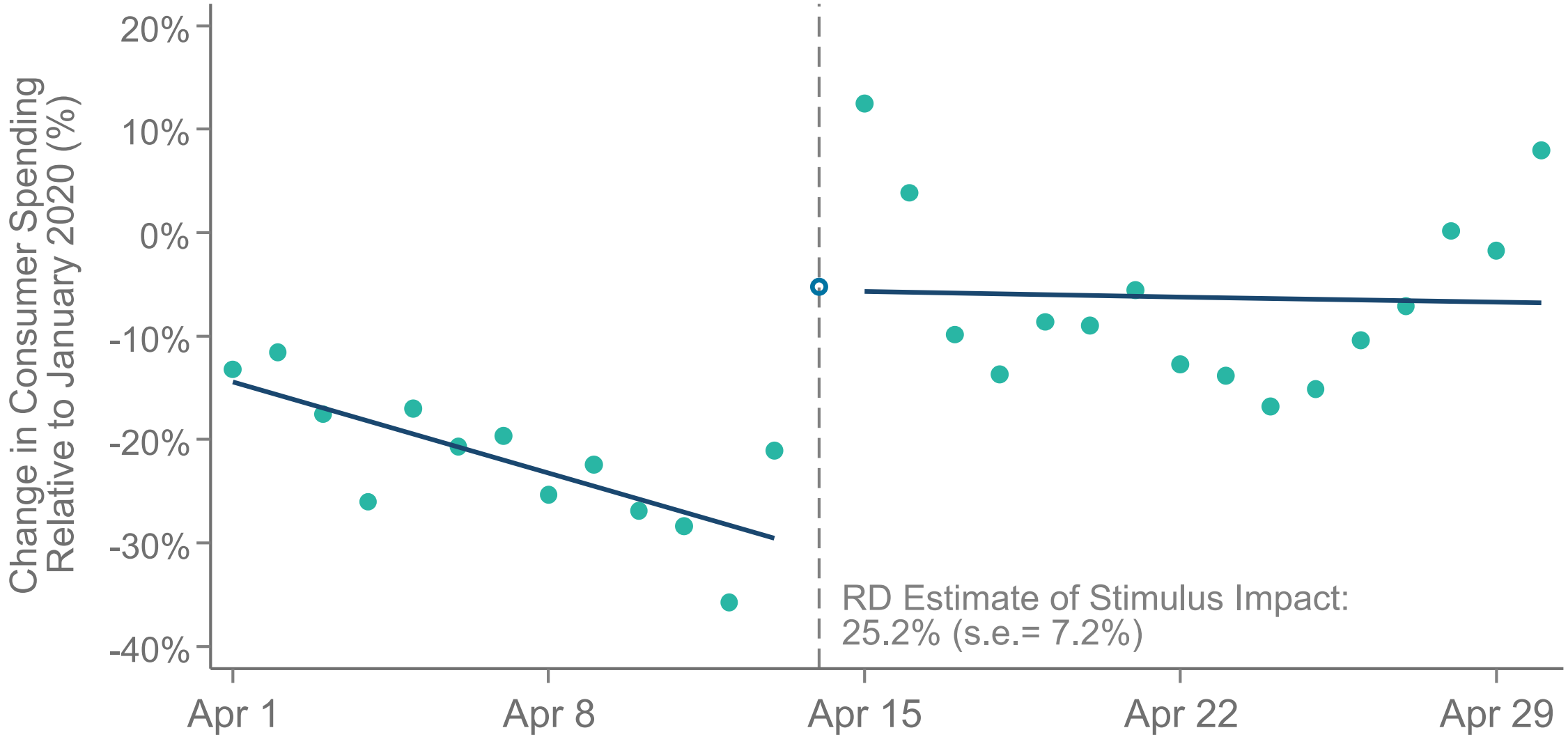
Stimulus Payments

Impacts of Stimulus Payments

- Coronavirus Aid, Relief, and Economic Security (CARES) Act made direct payments to nearly 160 million people, totaling $267 billion as of May 31, 2020
  - Larger payments for lower-income households
  - Vast majority of payments made exactly on April 15, 2020
- Was stimulus effective in increasing consumer spending and restoring employment?

Impact of Stimulus Payments on Consumer Spending

Bottom Income Quartile Households



Causal Effects of Stimulus

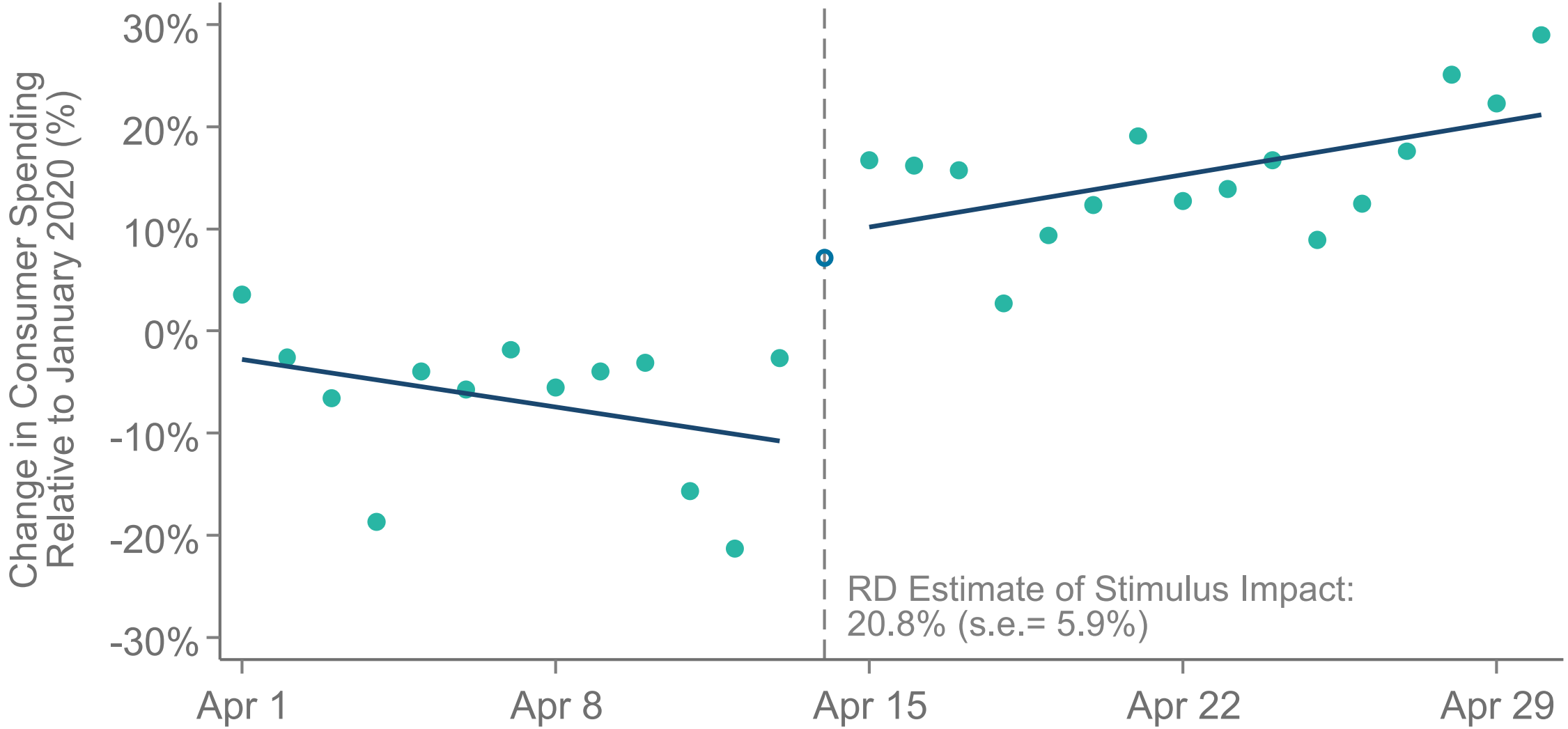
- Stimulus payments increased aggregate consumer spending, especially among low-income households

- Key question for determining potential multiplier effects: where was the money spent?

  - If spending went up in sectors where employment didn't fall, multiplier effects could be muted [Guerrieri et al. 2020]

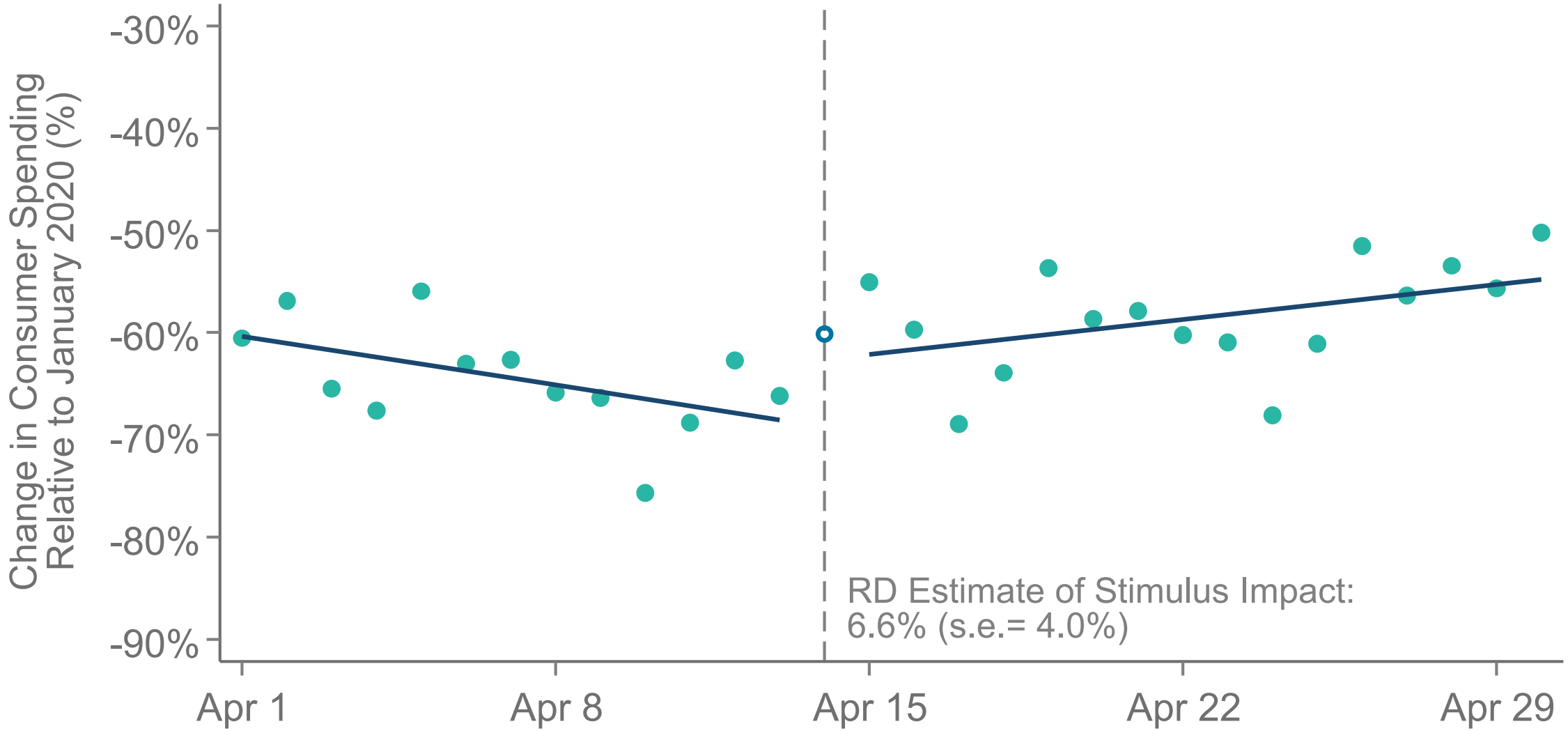
Impact of Stimulus Payments on Consumer Spending

Durable Goods



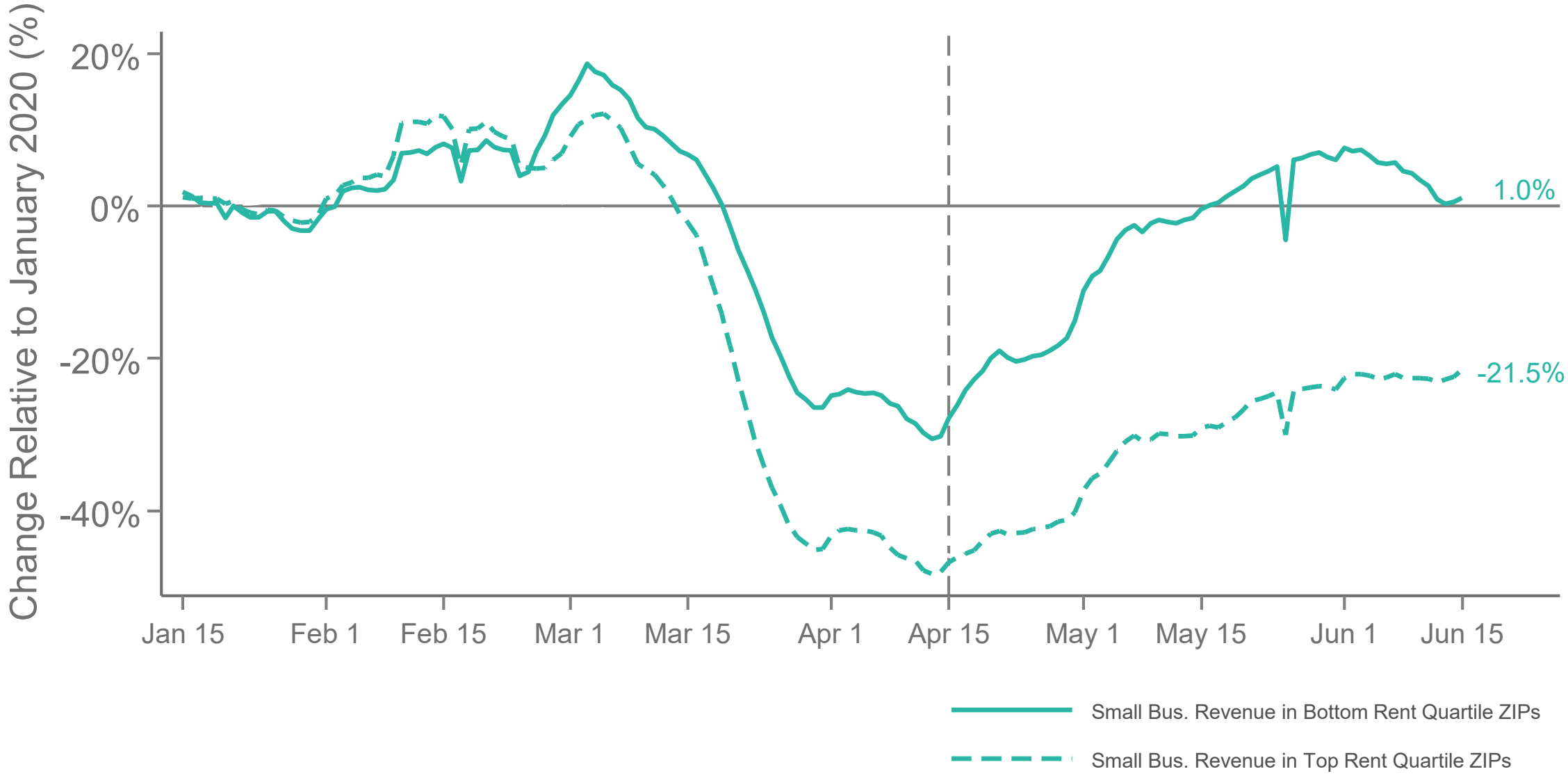
Impact of Stimulus Payments on Consumer Spending

In-Person Services



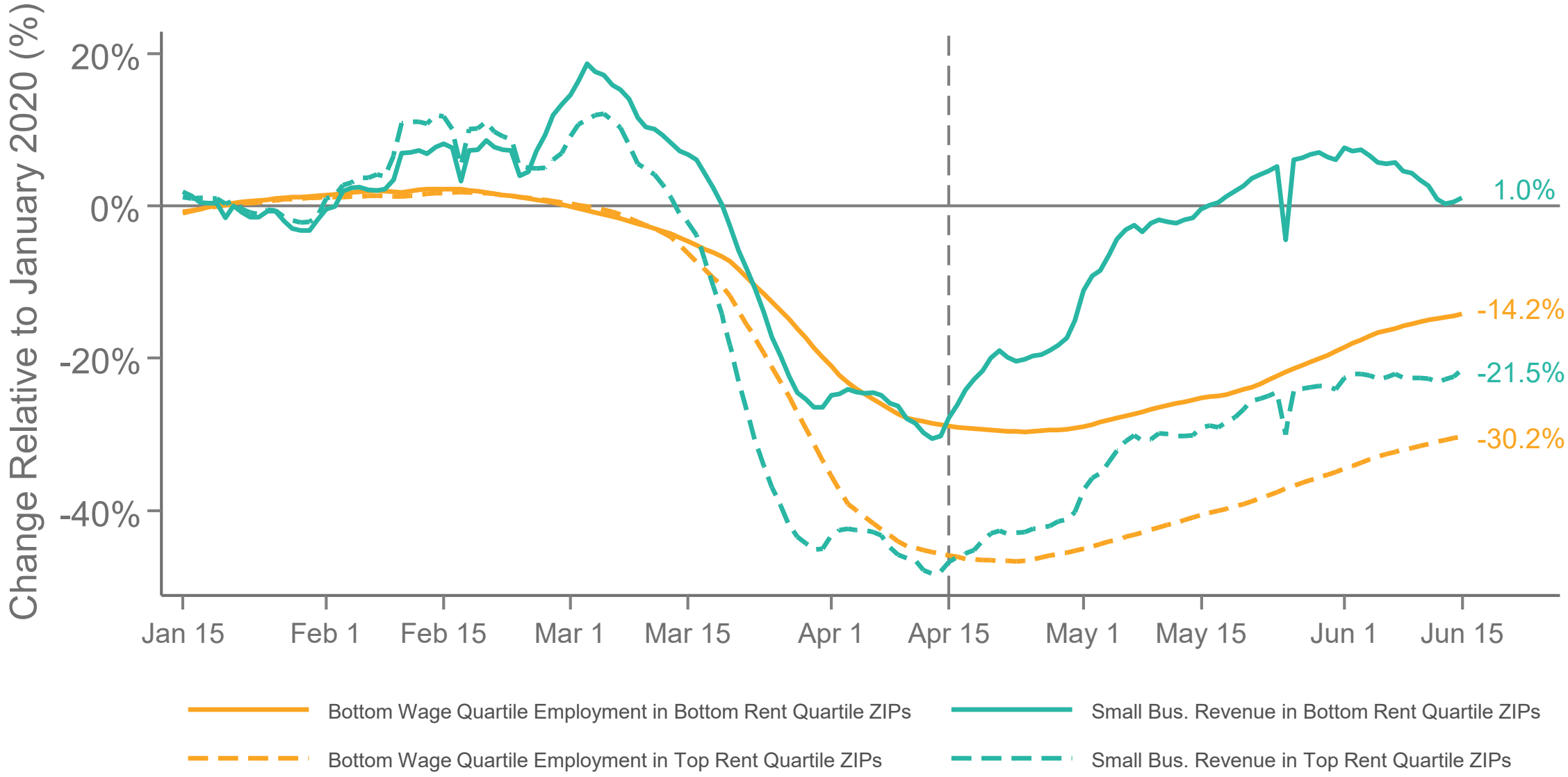
Impact of Stimulus Payments on Business Revenue and Employment Rates

Revenue and Employment Changes Among Small Businesses, by ZIP Rent Quartile



Impact of Stimulus Payments on Business Revenue and Employment Rates

Revenue and Employment Changes Among Small Businesses, by ZIP Rent Quartile



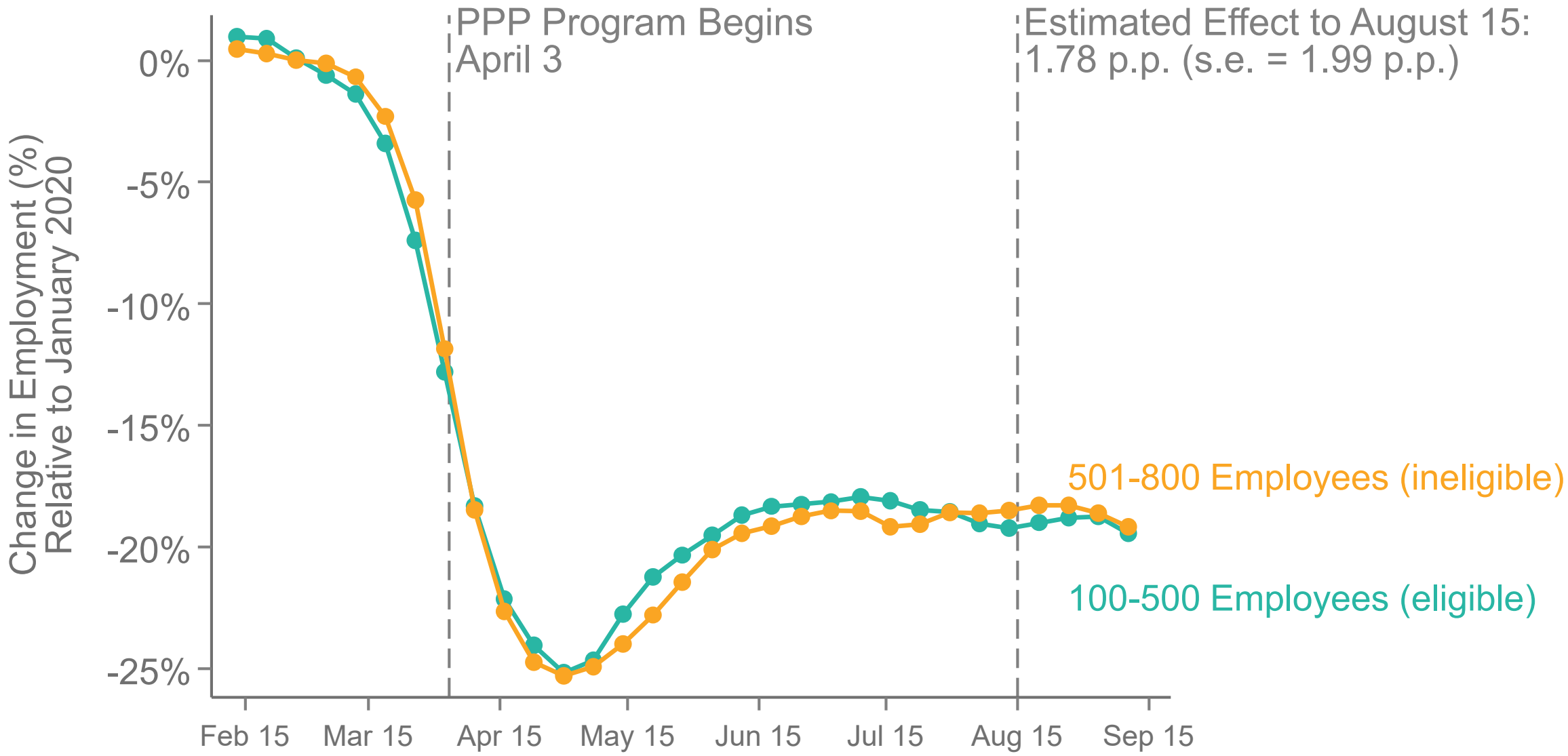
Loans to Small Businesses

Paycheck Protection Program

- CARES Act also provided $500 billion in loans to small businesses starting on April 3
- Loans were forgivable if payroll was not reduced significantly relative to pre-COVID levels
- Firms with fewer than 500 employees were eligible for these loans (with some exceptions)

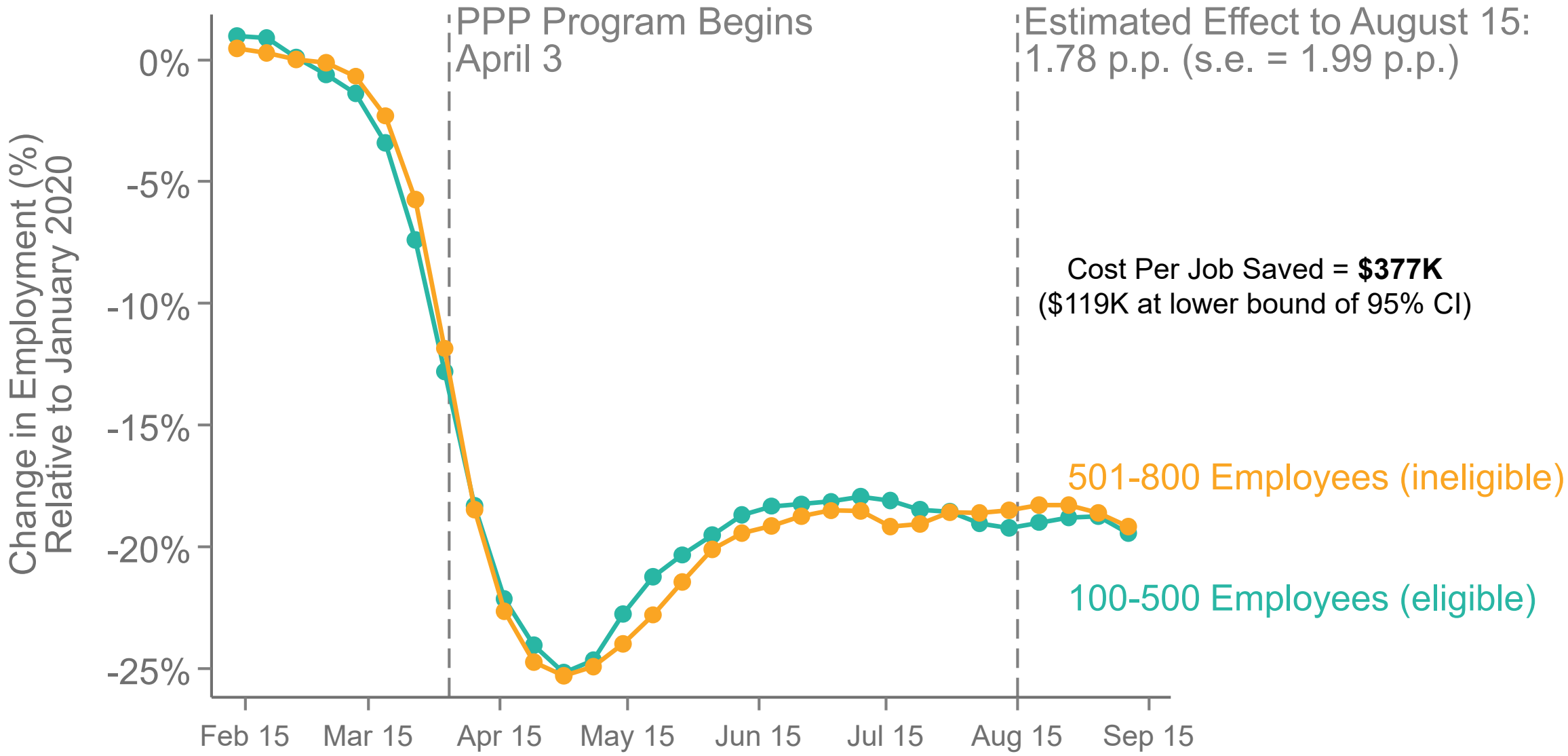
Impact of Paycheck Protection Program on Employment

Reweighted to Match Industries (Excl. Food Services), with NAICS x County x Income Quartile FEs



Impact of Paycheck Protection Program on Employment

Reweighted to Match Industries (Excl. Food Services), with NAICS x County x Income Quartile FEs



Paycheck Protection Program

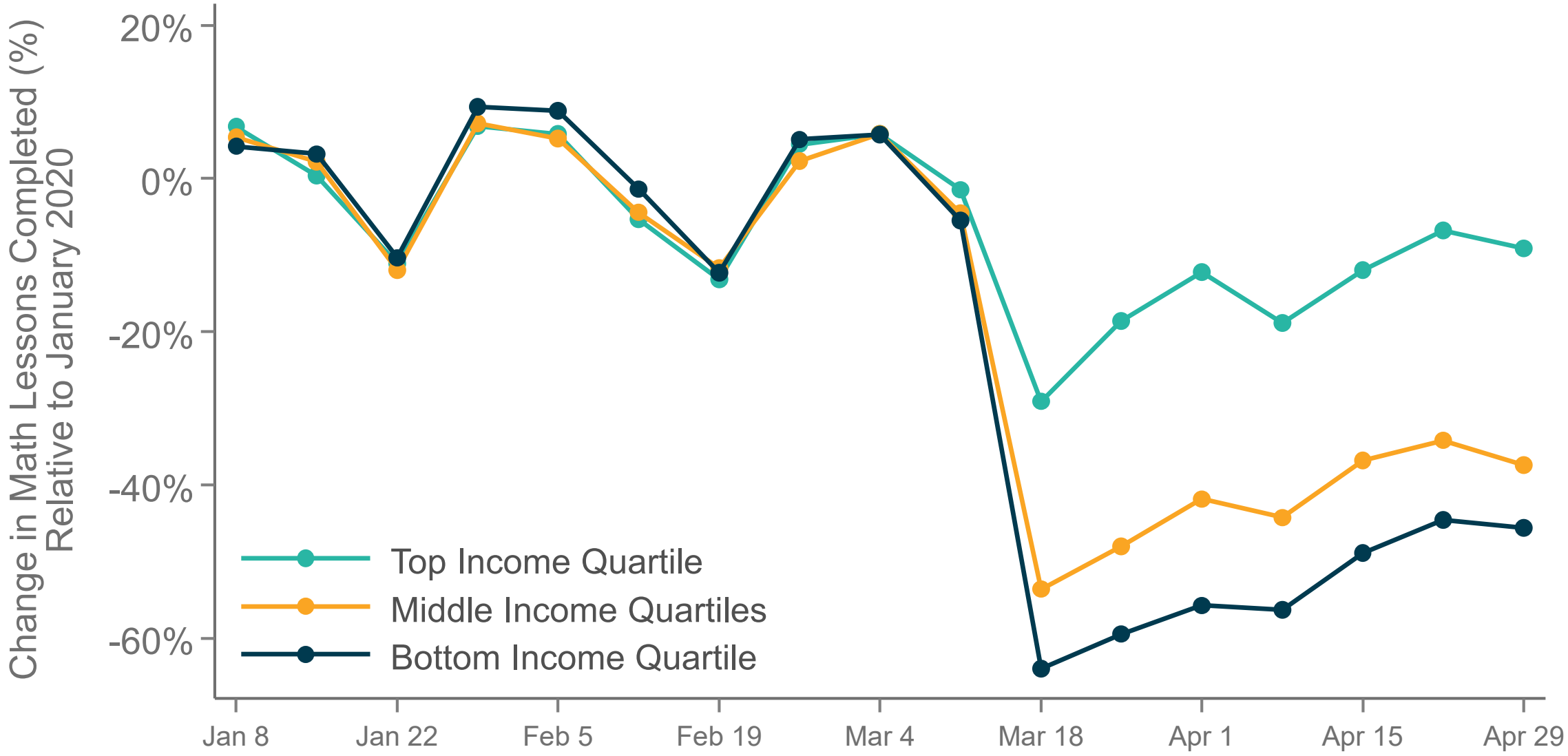
- Why has PPP had limited impact on employment despite substantial expenditure?
  - Businesses who took up loans may not have intended to lay off their workers to begin with
  - Ex: very high take-up rate among firms providing professional and scientific services despite low job losses in that sector
  - Consistent with evidence that loans flowed to areas with *smaller* employment losses in March [Granja, Makridis, Yannelis, Zwick 2020]

Long-Term Impacts

Long-Term Impacts

- We have focused primarily on short-term impacts of COVID crisis on spending and employment
- But this shock may have lasting impacts going forward on inequality and social mobility
- To illustrate, turn to data on educational progress on an online math platform used as part of school curriculum by 800,000 students in the U.S.

Effects of COVID-19 on Educational Progress by Income Group



Policy Implications

Implications for Macroeconomic Policy in COVID-19 Pandemic

- Results suggest that there is limited capacity to restore consumer spending via traditional economic tools in the midst of the pandemic
  - Impacts of stimulus and loans to small businesses may be blunted when spending is constrained by health concerns
  - Long-term solution lies in addressing virus itself and public health efforts
    [Allen 2020, Romer 2020]

Implications for Macroeconomic Policy in COVID-19 Pandemic

- In the meantime, may be most fruitful to use economic policy to limit hardship among low-income workers who have lost their jobs
  - Extending unemployment benefits and social safety net may be a more impactful use of scarce resources than stimulus checks to all households or loans to all businesses
  - May be a role for sectoral training programs and place-based policies targeting hardest hit areas (e.g., low-income workers in affluent counties)
  - Important to take potential long-term impacts on children into account, e.g. in decisions on when to re-open schools vs. businesses

Broader Implications and Future Work

- RETINA: Real Time National Accounts
  - Current paper demonstrates that it is feasible to construct public statistics from private sector data that are useful for research and policy analysis but protect privacy
  - Now working to construct a more permanent system of granular, real time national accounts, building on prototype constructed here
- Policy: real-time fine tuning based on observed state of the economy and empirical impacts of policies
  - New measures for state-contingent policies beyond unemployment rates
  - Re-target PPP program based on observed short-run empirical impacts?

Conclusion

- More broadly, private sector data can provide a new tool to support economic policy in the age of big data
  - Can target aid more effectively
  - And diagnose what the root causes of economic failure are rapidly
- Tracker constructed here is a prototype for a system of “real time” national accounts, building on the vision of Kuznets (1941) in constructing current national accounts
  - All data used to produce results shown here are freely downloadable at www.tracktherecovery.org

Opportunity Insights Team


Camille Baker


Harvey Barnhard


Matthew Bell


Gregory Bruich


Tina Chelidze


Lucas Chu


Westley Cineus


Sebi Devlin-Foltz


Michael Droste

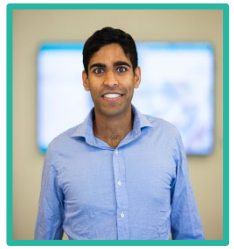

Shannon Felton Spence


Dhruv Gaur


Federico Gonzalez


Rayshauna Gray

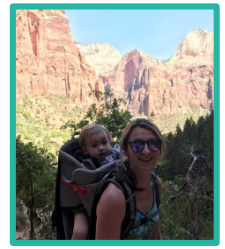

Abby Hiller


Matthew Jacob


Tyler Jacobson


Margaret Kallus


Laura Kincaide


Cailtin Kupsc


Sarah LaBauve


Maddie Marino


Kai Matheson


Christian Mott


Kate Musen


Danny Onorato


Sarah Oppenheimer


Trina Ott


Lynn Overmann


Max Pienkny

Opportunity Insights Team


Jeremiah Prince


Sebastian Puerta


Daniel Reuter


Peter Ruhm


Tom Rutter


Emanuel Schertz


Kamelia Stavreva


James Stratton


Clare Suter


Elizabeth Thach


Nicolaj Thor


Amanda Wahlers


Kristen Watkins


Alanna Williams


David Williams


Chase Williamson


Shady Yassin


Ruby Zhang