

# Improving timeliness of consumer expenditure estimates: Experimental methods using nowcasting and card data

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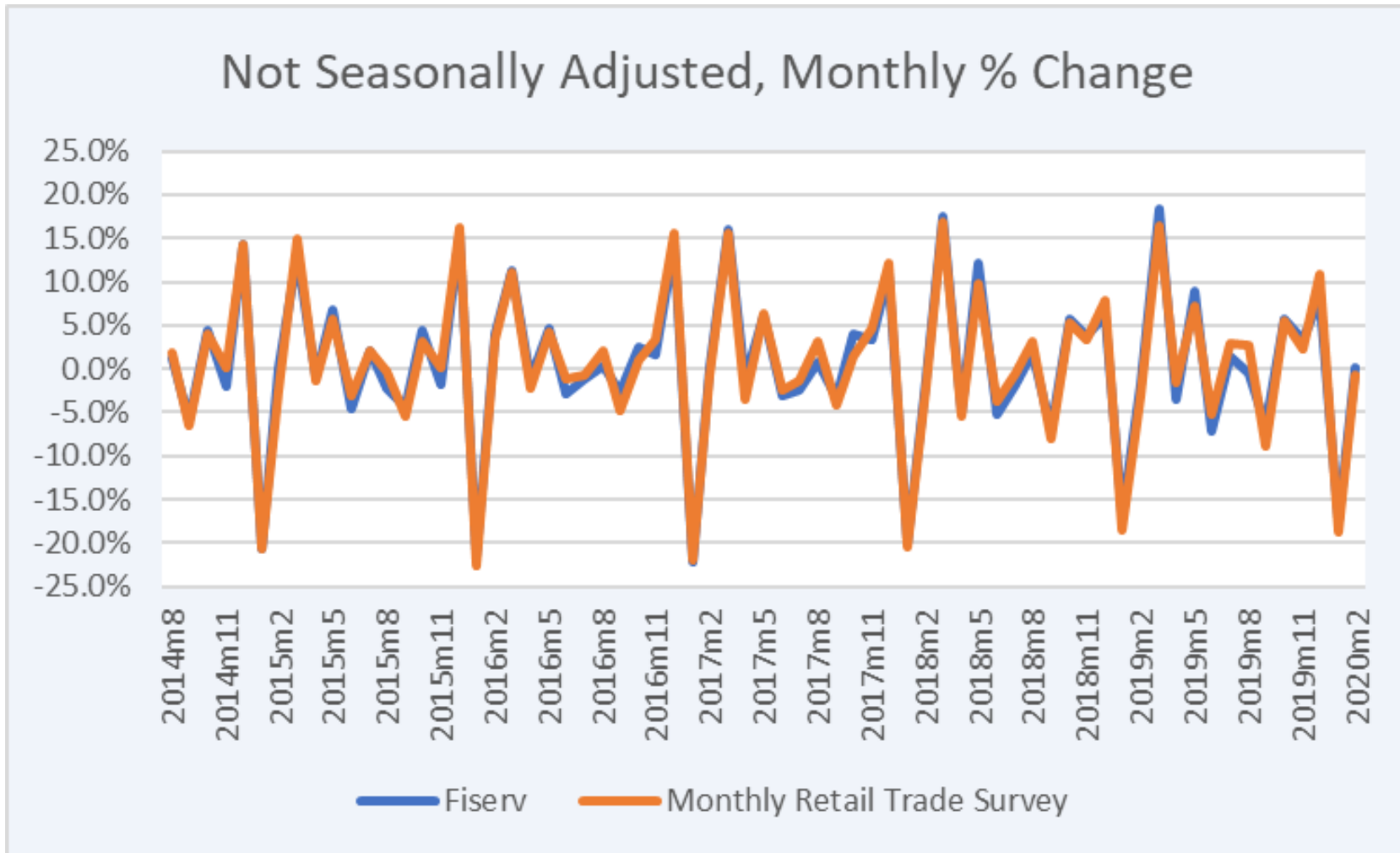
- This talk covers work from two projects at BEA
- Project I: Measuring spending using card transaction data
  - Coauthors: Abe Dunn, Andrea Batch, Alex Driessen
- Project II: Nowcasting advance estimates of private consumption of services in the US National Accounts
  - Coauthor: Baoline Chen

- The COVID-19 pandemic required an immediate response
  - Pandemic declaration and policy responses caused large, rapid shifts in economic conditions
  - High-frequency economic data (daily or weekly) are needed to trace the path of the economy
  - Concerns about survey data quality (mostly unfounded) and indicators
- We use card transactions to respond to this challenge
  - Rapid (3-5 day delay)
  - High frequency (daily)
  - Granular (3-digit NAICS based on merchant category)

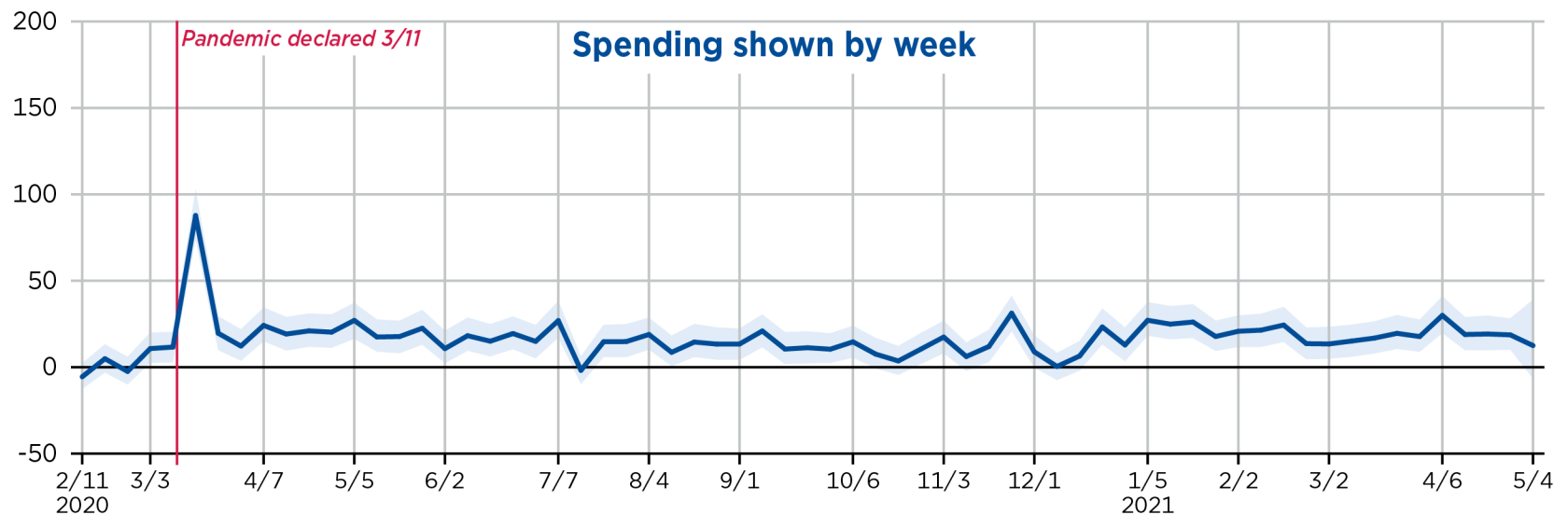
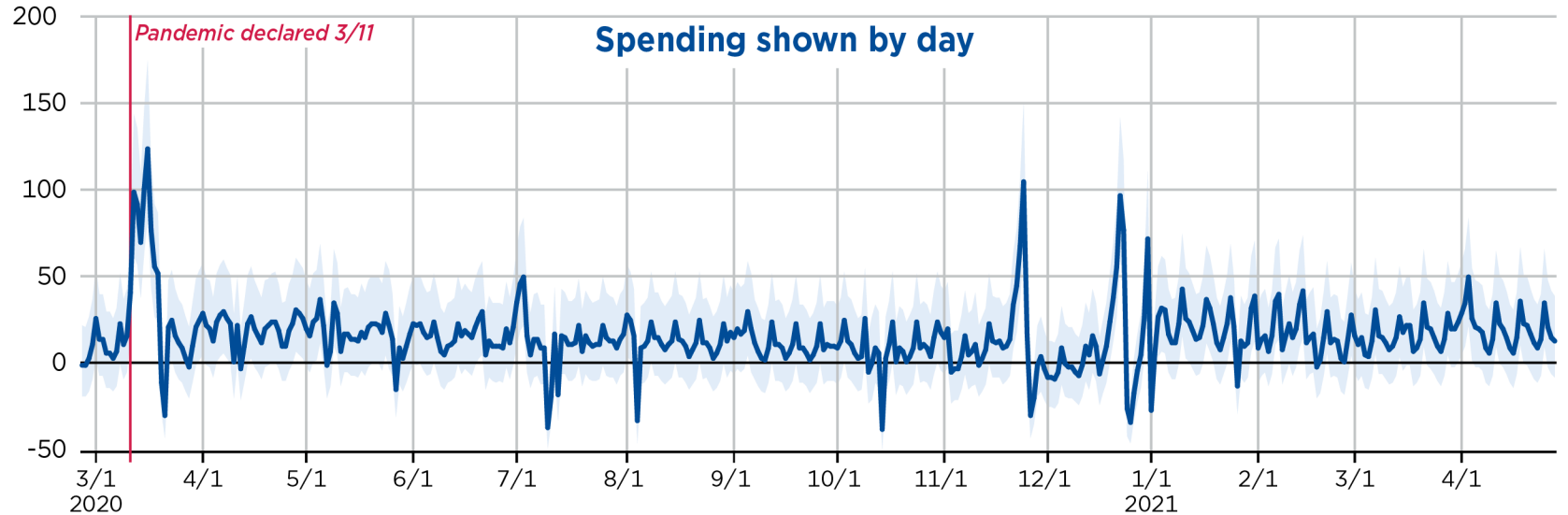
- High-frequency estimates and initial response
  - Overview of data source
  - We develop a simple model to eliminate seasonal patterns and trends and to evaluate the daily patterns after the pandemic was declared
  - We provide an overview of the daily estimates and discuss the timeline of how these estimates were released and updated
- Lessons from comparisons with source data before and after the pandemic
  - We compare card with official sources before and after the pandemic to show the data's usefulness in more or less volatile periods
  - We find that the card data series were more informative than some pre-pandemic estimates had suggested
  - Interpretation of these results

- Fiserv card transaction data
  - Fiserv is one of the world's largest card transaction intermediaries: \$2.6 trillion in annual card transactions worldwide
  - Each observation is a card swipe (e.g., debit, credit or gift card) or online transaction, but aggregated to national level by 3-digit NAICS
  - More details discussed by Dunn *et al.* (2020)
- Data series constructed using FRB and Palantir methodology
  - FRB Paper - Aladangady *et al.* (2019) – 13-month rolling panel methodology with benchmarking to 2012 Economic Census
  - Produces a much more stable and informative series
- The data have some limitations
  - They may not be representative, variable coverage across categories, and unclear how well entry/exit are captured
- Method: Regression on daily data eliminates some seasonality, long-term trends

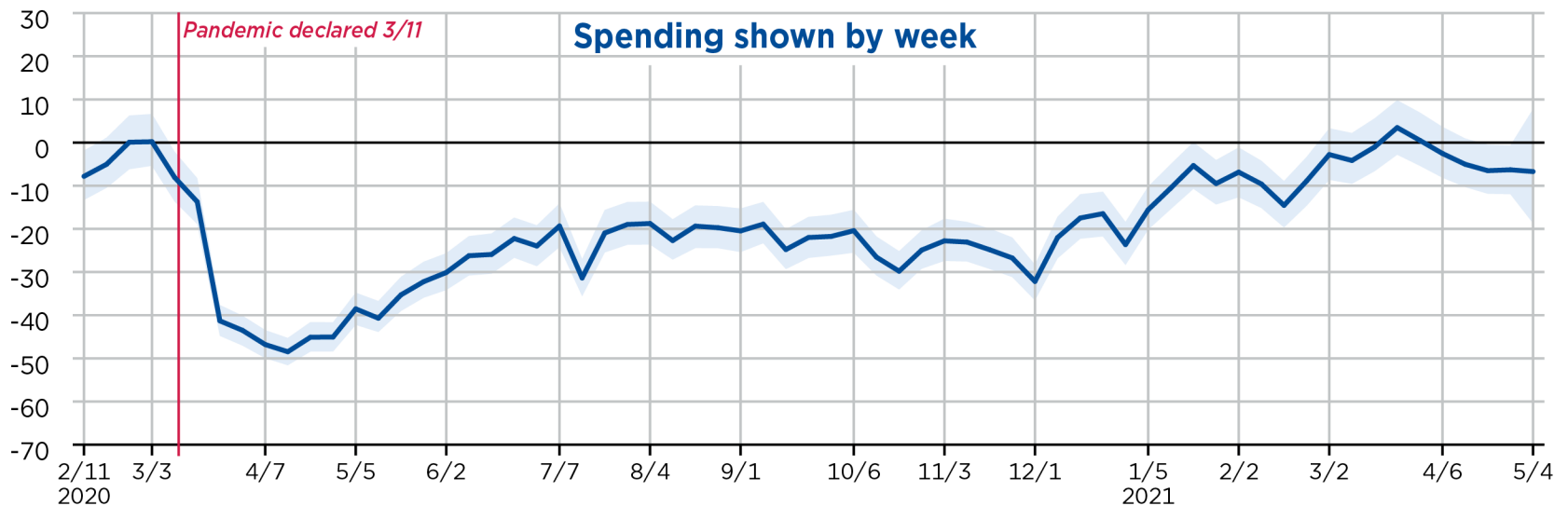
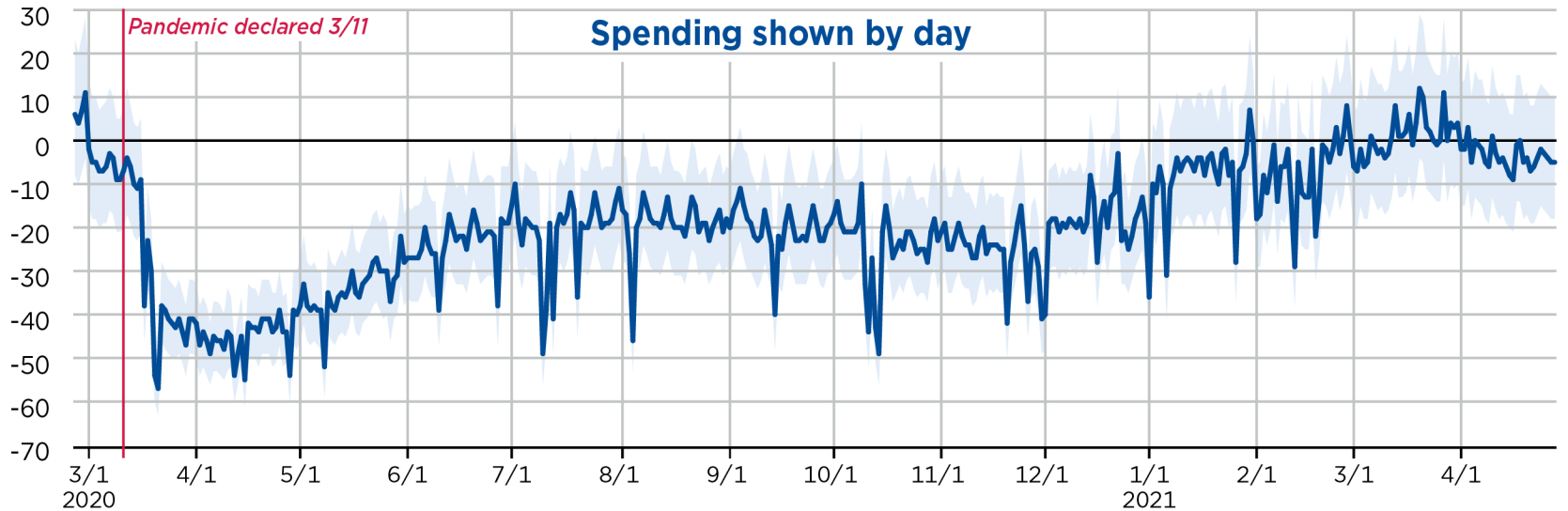
# Comparison with MRTS



# Food and beverage (445)

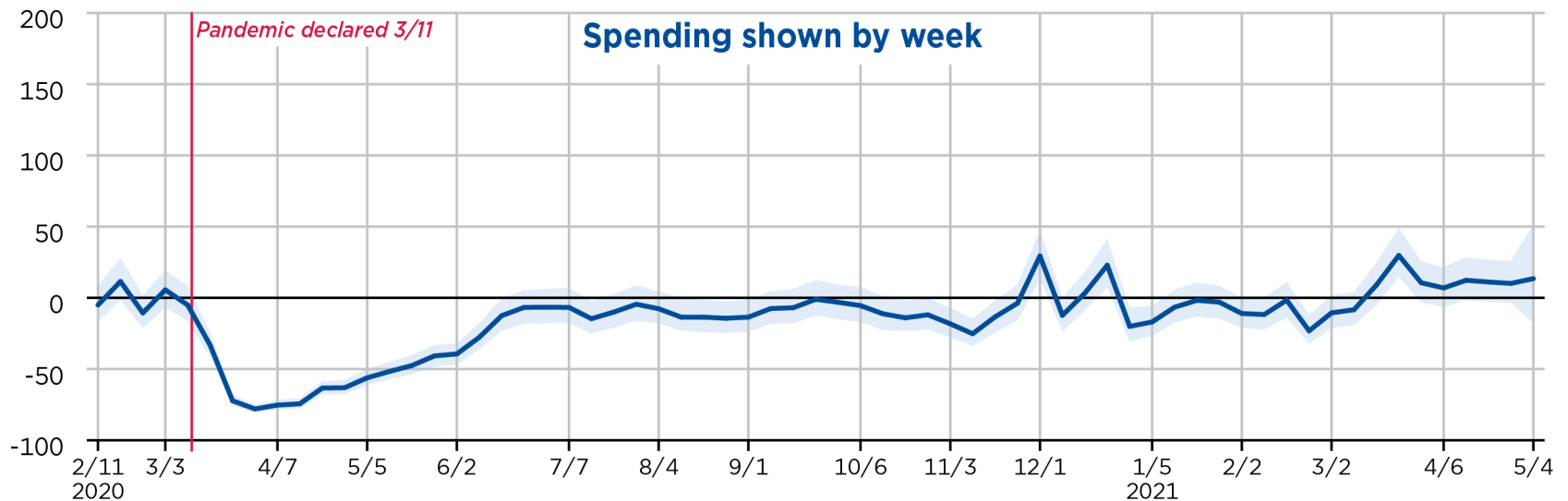
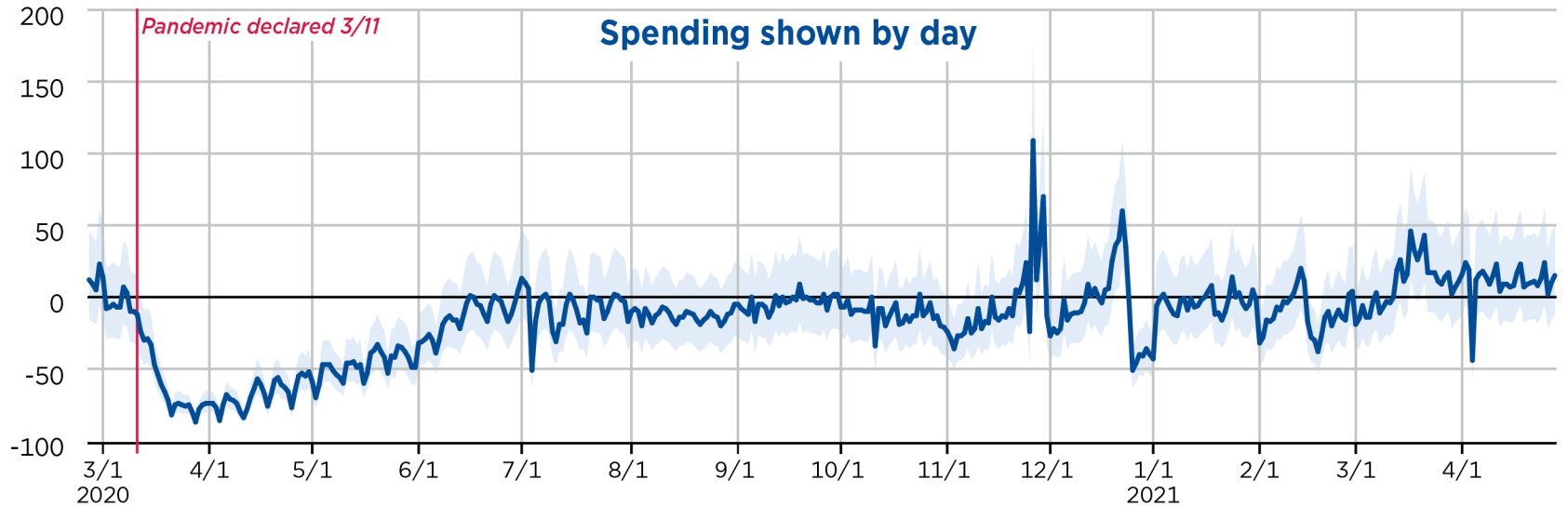


# Gas stations (447)

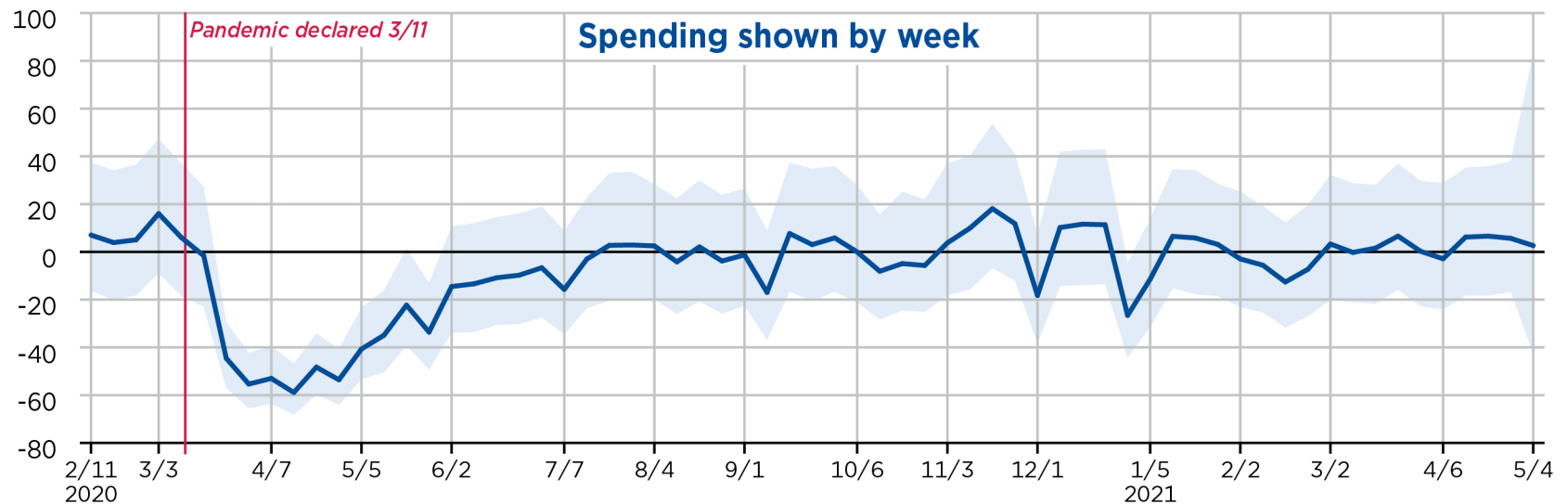
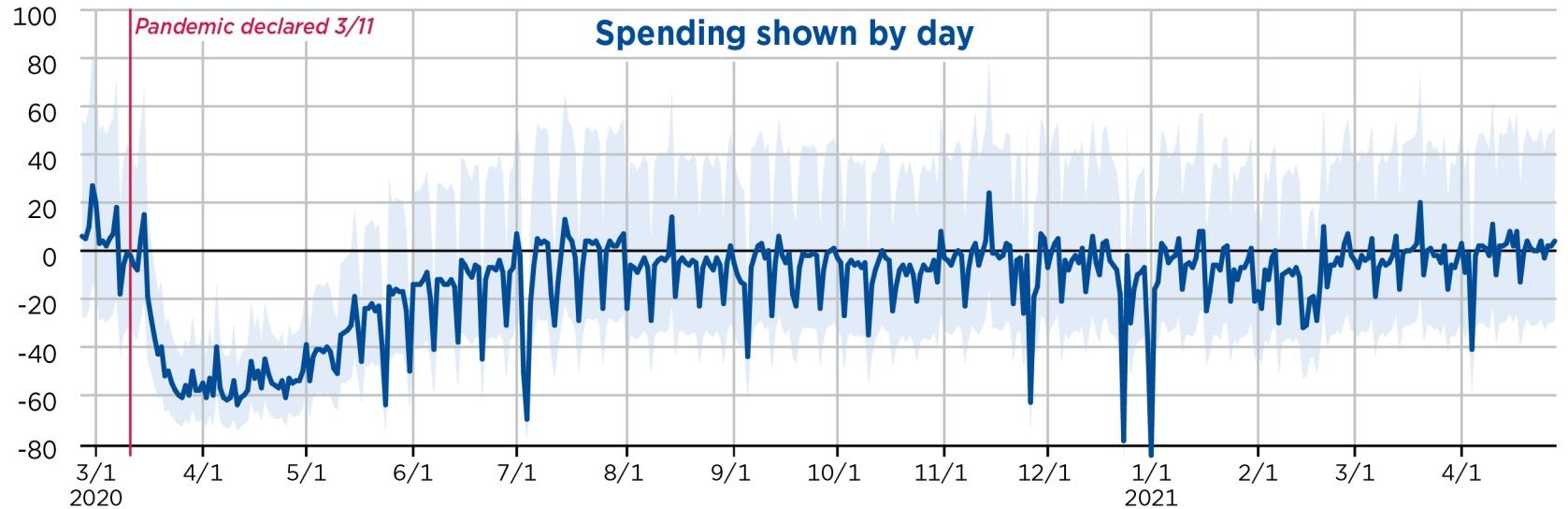




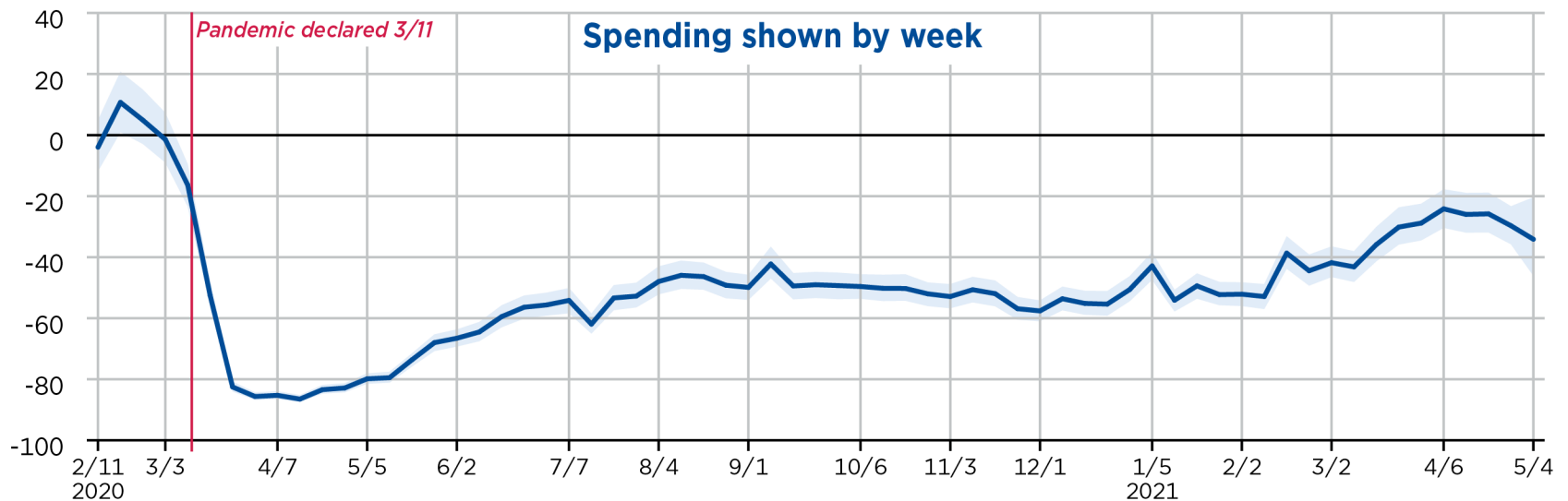
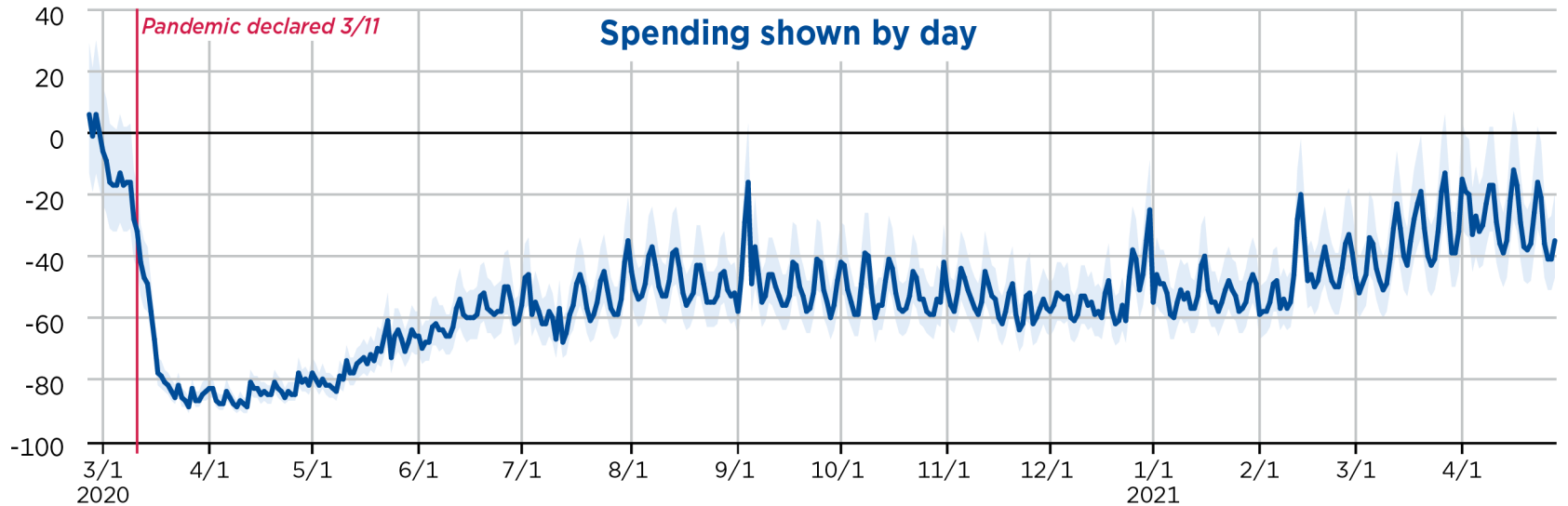
# Clothing (448)



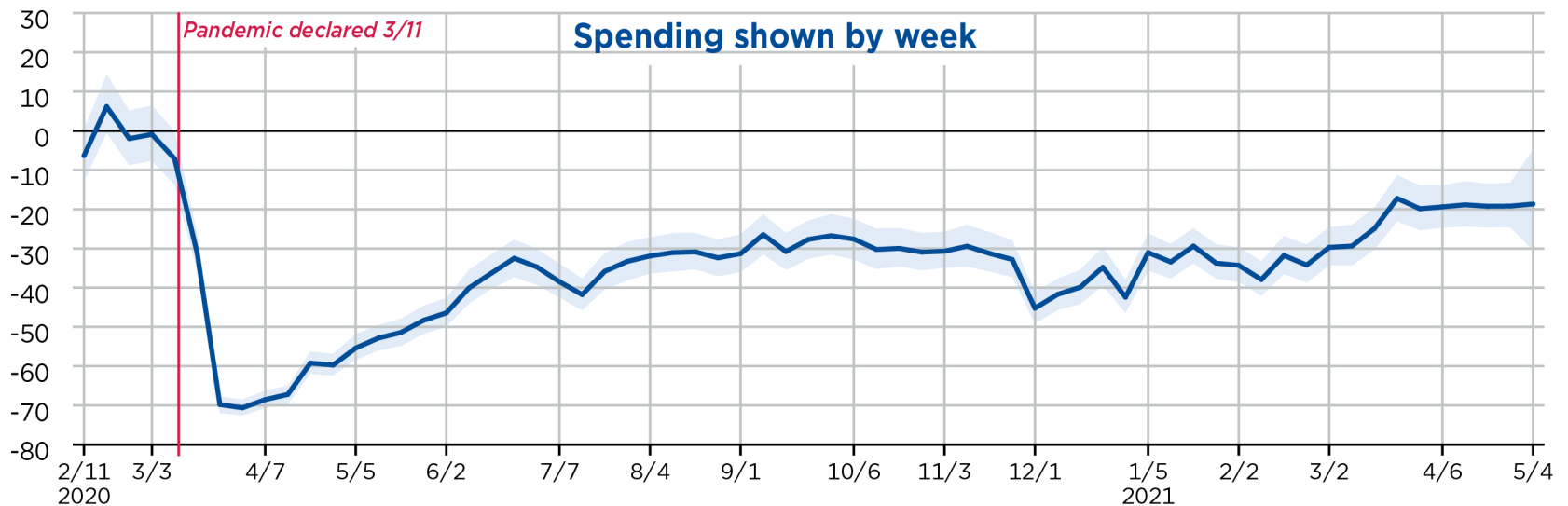
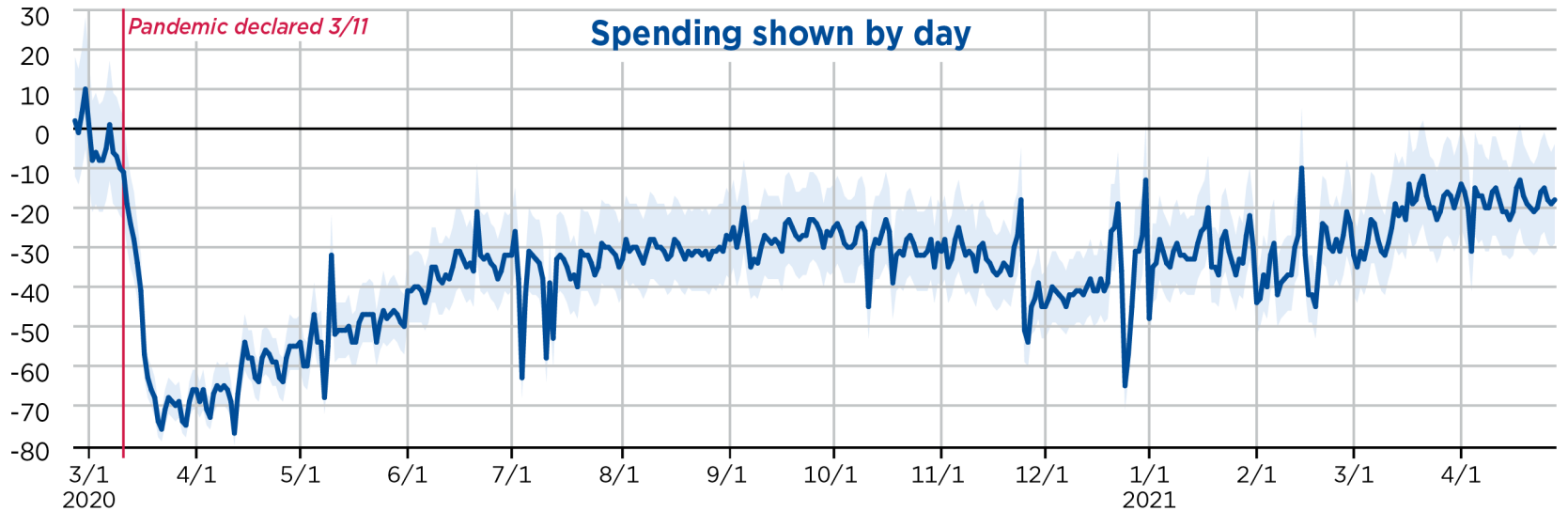
# Ambulatory health care (621)



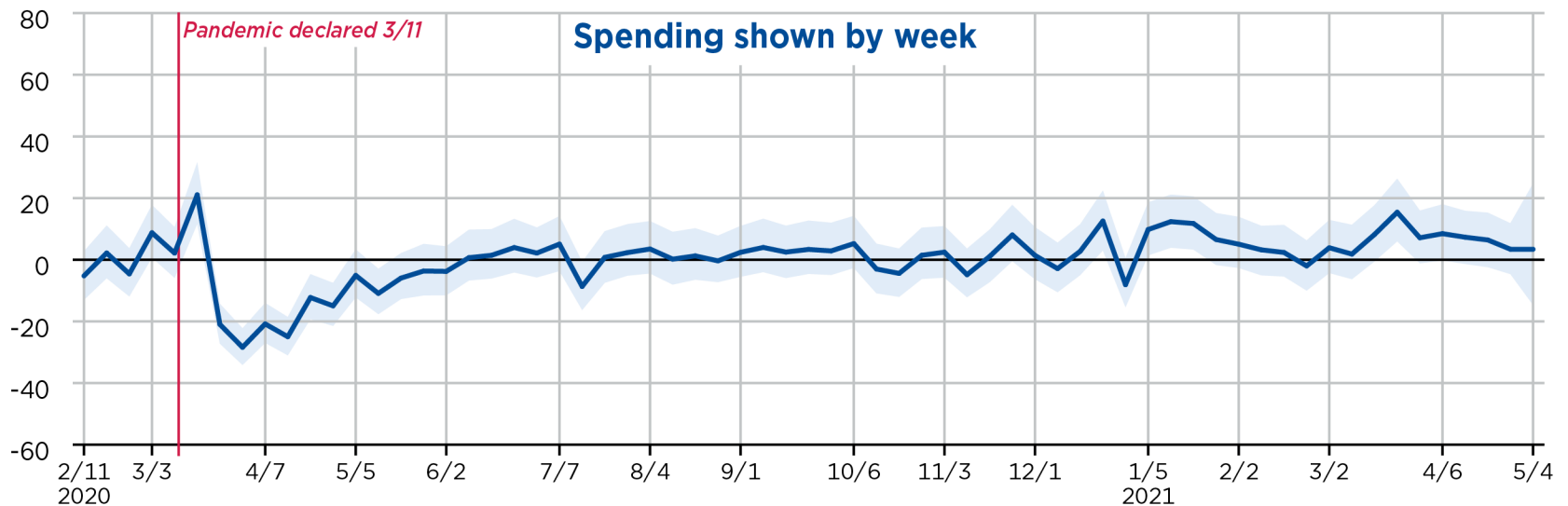
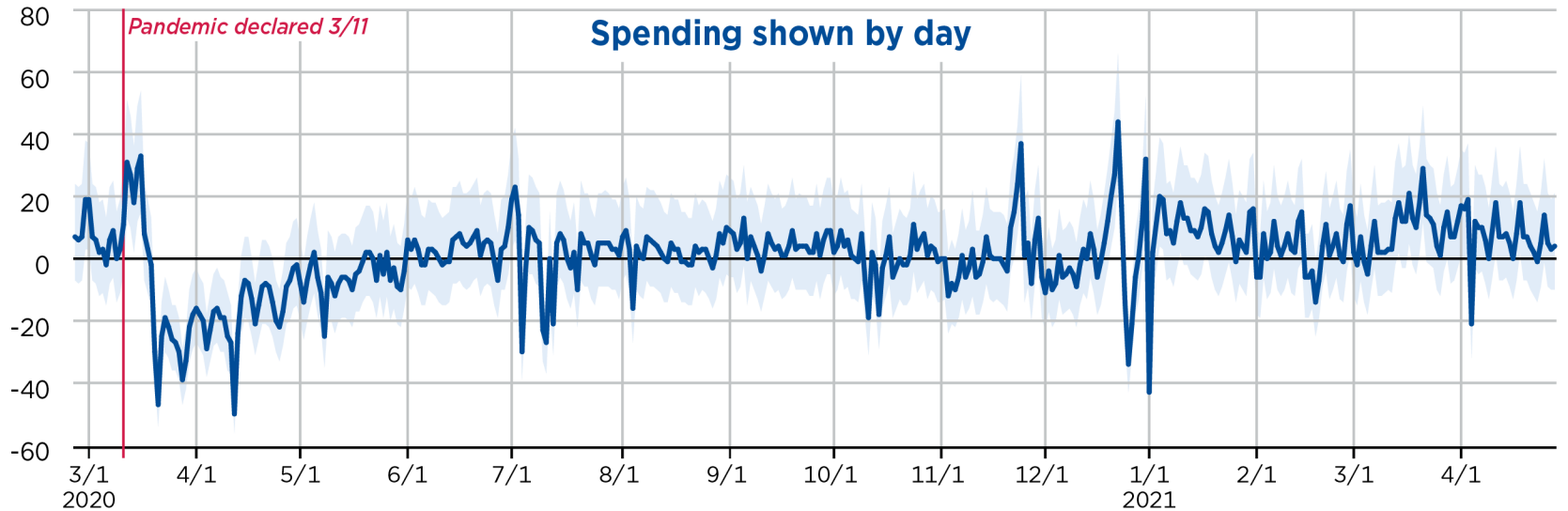
# Accommodation (721)



# Restaurants (722)



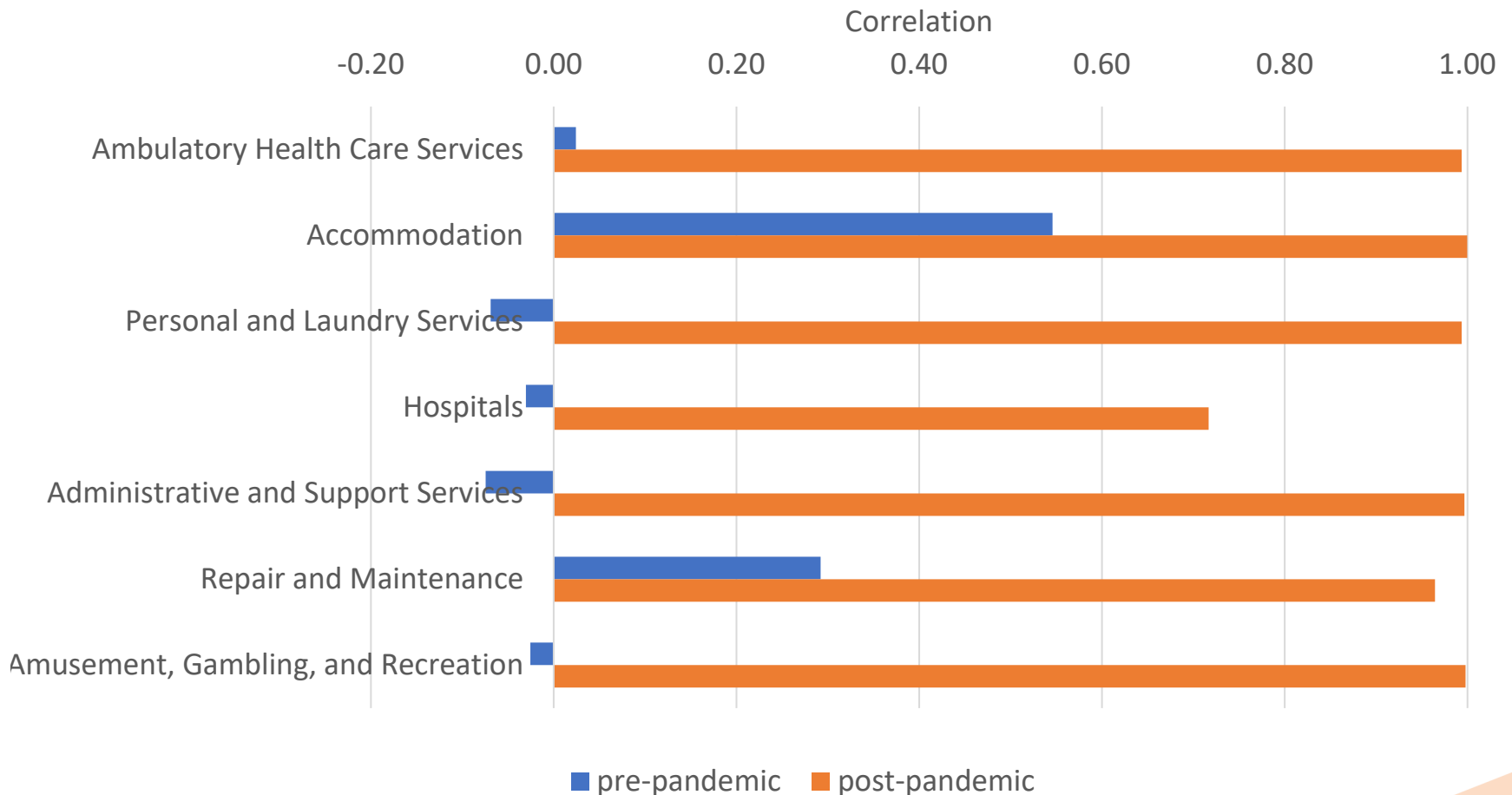
# Aggregate retail and food services



- After the initial pandemic declaration, we were able to release an event study within just over a month (see Dunn *et al.*, 2020)
- The data were used to inform estimates for some components of consumption expenditures
- In June of 2020, we began releasing updates regularly (first bi-weekly, then weekly)
- Familiarity with data sources enabled rapid deployment
  - We have been working with these data for a few years
  - Other forecasting projects (e.g., Chen *et al.*, 2019) and data use cases
  - We were able to anticipate for which categories Fiserv data would perform relatively well

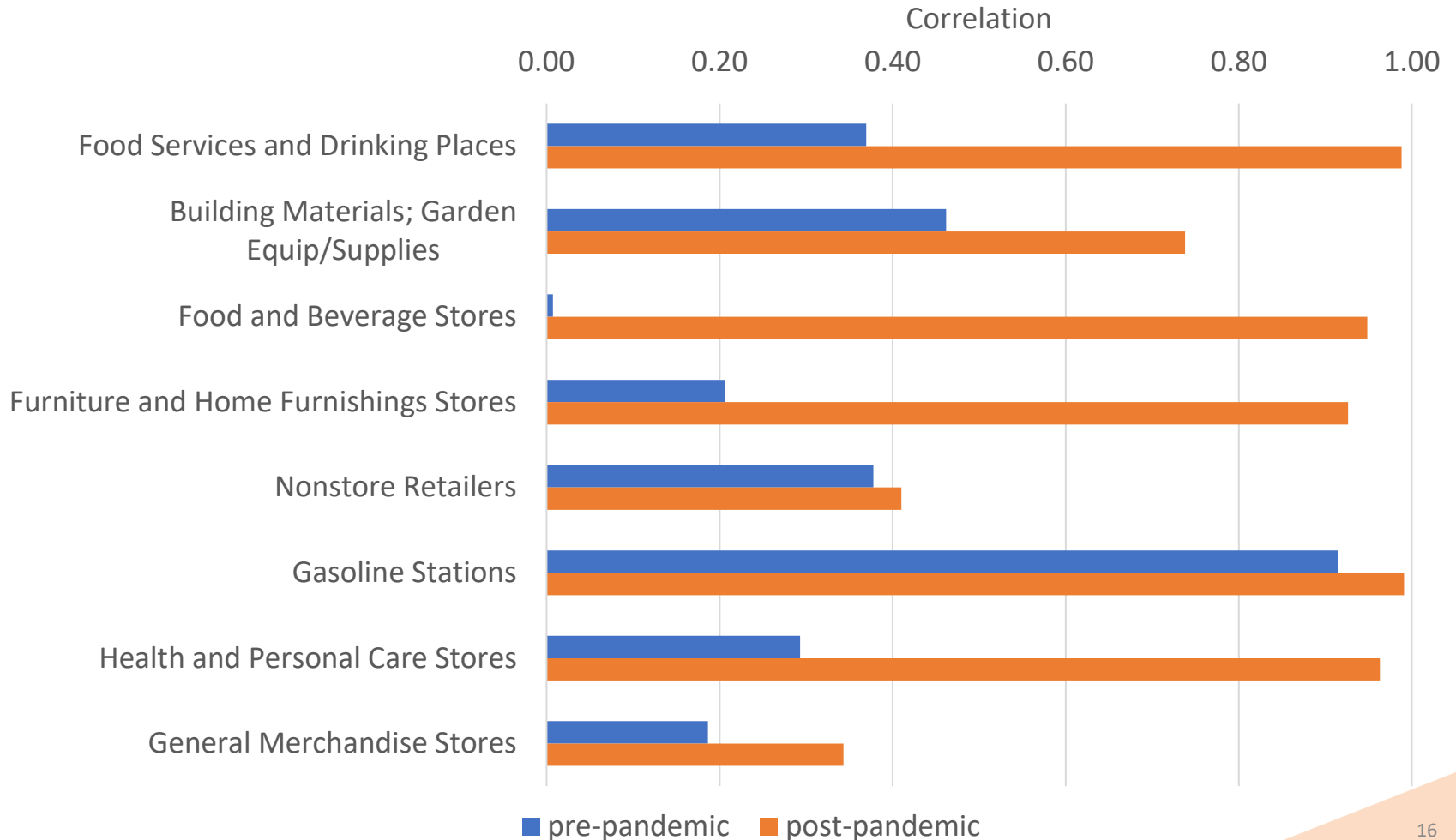
# Fiserv and QSS correlations: Services

## Fiserv and Quarterly Services Survey Correlations: Select Categories



# Fiserv and MRTS correlations: Retail

## Fiserv and Monthly Retail Trade Survey Correlations: Select Retail and Food Service Categories





- Summary

- Prior to the pandemic period, the Fiserv data exhibited high correlations in levels but low correlations in growth rates with official series
- We assumed that the correlations in levels were informative during the much more volatile pandemic period
- After the pandemic the correlations in growth rates were much higher across the board

- Our interpretation of these results

- Statistical relationships break down in the face of structural changes
- Less volatile times: Idiosyncratic factors dominate
- More volatile times: Economic signal dominates

# Nowcasting advance estimates of private consumption of services in the US National Accounts

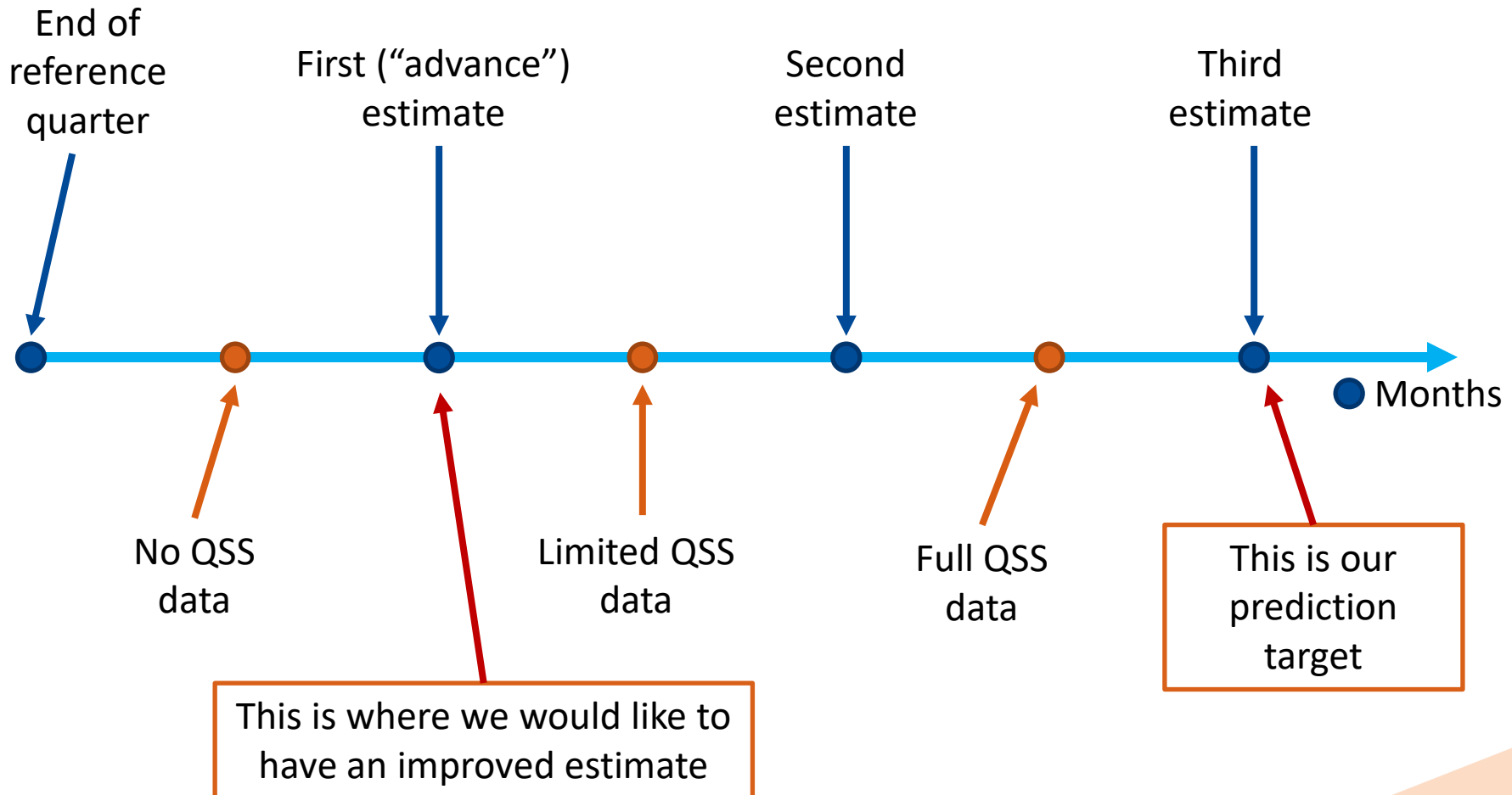
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- Gross Domestic Produce (GDP) estimated three times each quarter with 1-month (“advance estimate”), 2-month (“2<sup>nd</sup> estimate”) and 3-month (“3<sup>rd</sup> estimate”) delays
- Differences in source data availability can yield large revisions in components of GDP
- Our project focuses on reducing revisions for detailed components of Personal Consumption Expenditures (PCE) on Services
- We will employ a combination of traditional time series techniques and model averaging
- Results show that model averaging can improve forecasts

- The category PCE Services makes up between 45% and 50% of GDP, and is composed of 122 detailed components
- For many of these, the third estimate uses the **Quarterly Services Survey (QSS)**, which is partially available for the 2<sup>nd</sup> estimate, but never for the first estimate
- The alternative indicators used for the first estimate suffer some problems
  - The problems are exemplified by a lack of correlation
  - For example, for health care services, correlations between the indicator and third estimate are negative for 4 of 15 detailed components, and are above 0.5 in only 2 of 15 cases

# Timing of estimates and data for PCE Services



- Motivated by the performance of these indicators, we seek to use statistical techniques to improve the advance estimate, focusing on including information on
  - Long-term trends
  - Medium-term behavior
  - Short-term/medium-term cross-sectional behavior
- Problem: Short time-series (2009 Q3 – Present)
  - Use “nowcasting” approaches
  - Consider several model-averaging techniques
  - Split sample to estimate and validate each approach
  - Look for general trends across indicators

# Summary table of results (reduction in RMSR)

Service Category	No. of Components	No. of Largest Reduction in RMSR from Current Method	No. of Largest Reduction in RMSR from GB	No. of Largest Reduction in RMSR from BF	No. of Largest Reduction in RMSR from Model-averaging Methods	Range of % reduction in RMSR
Communication Service	6	3	1	0	2	(29.3, 50.2)
Health Care Service	20	1	1	0	18	(1.5, 43.4)
Personal Service	7	1	1	3	2	(2.5, 49.3)
Professional Service	5	0	0	0	5	(11.5, 36.5)
Recreational Service	17	2	4	0	11	(2.3, 46.1)
Social Service	19	0	1	4	14	(5.8, 35.5)
Transportation Service	14	1	1	1	11	(5.4, 63.0)
<b>SUM</b>	<b>88</b>	<b>8</b>	<b>9</b>	<b>8</b>	<b>63</b>	<b>(2.3, 63.0)</b>
<b>% of SUM</b>	<b>100%</b>	<b>9.1%</b>	<b>10.2%</b>	<b>9.1%</b>	<b>71.6%</b>	

- The BEA is exploring several avenues to increase timeliness and frequency of our statistics
- Alternative data sources offer the potential to help produce high-frequency, timely estimates
  - There were benefits to working with these data sources before the pandemic
  - Card data performed better than what was suggested by pre-pandemic estimates
- Nowcasting techniques can be used to improve timeliness, reducing potential revisions in early estimates
  - Model averaging approaches show potential
  - Revision reductions vary in detailed components up to more than 50%
- Next steps
  - Explore new alternative data sources
  - Combine nowcasting techniques and other prediction techniques with alternate data