Consumer Prices During a Stay-in-Place Policy:

Theoretical Inflation for Unavailable Products

by Rachel Soloveichik

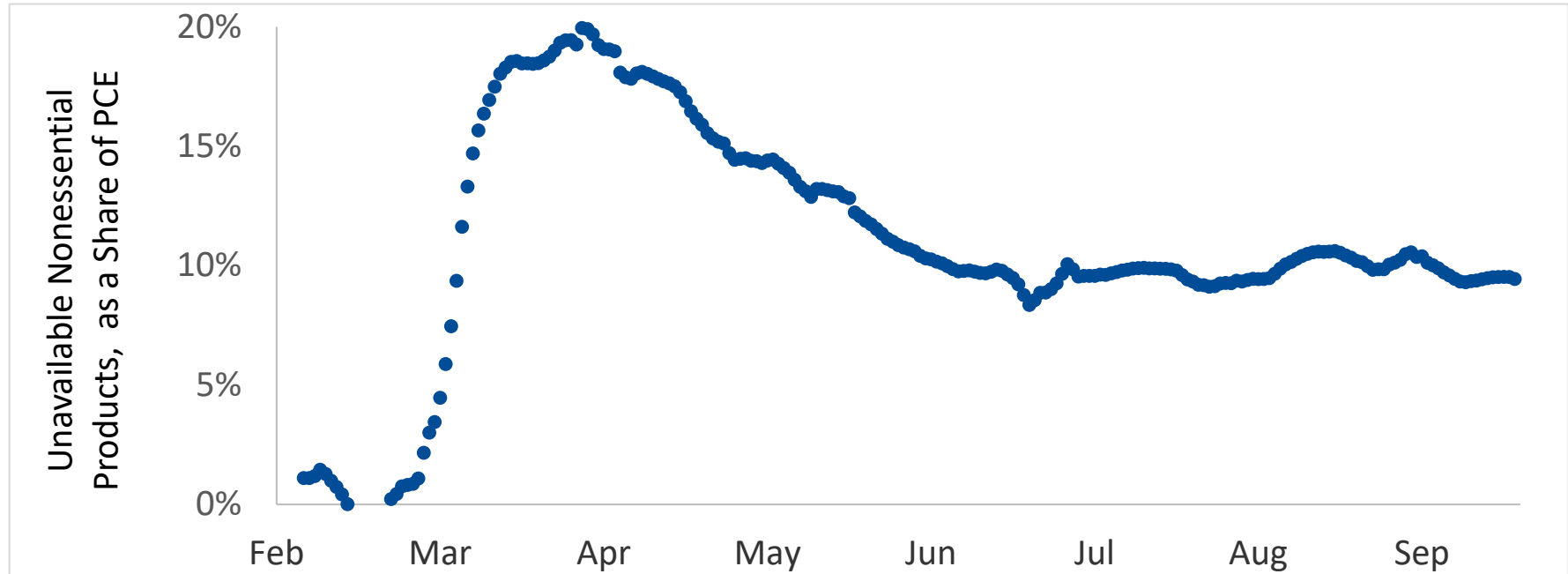**bea**
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Motivation for Research:
Estimated Product Unavailability During Covid-19

- Unavailable nonessential products are calculated have a theoretical inflation rate of at least 59 percent
  - These products include major categories like elective medical care, in-person restaurant dining, in-store clothing purchases, childcare, etc.
  - The paper does not study shortages of essential products like toilet paper
  - The theoretical model in this paper does not imply any data problems or computational mistakes with published government price indexes

Theoretical Price Measurement Problem

- Standard price index formulas require prices for every product in the market basket
  - Prices cannot be meaningfully measured for unavailable products

- CPI assumption: imputed prices for unavailable products are equal to measured prices for comparable available products
  - This assumption works well in normal economic times (Bradley 2003)

- The CPI assumption may not apply when broad categories of products are unavailable
  - This paper uses a model to impute theoretically grounded prices

Previous Price Index Research

- Theoretical papers studying imputed prices:

  – "New Goods": (Hausman 1999), (Hausman 1997), (Petrin 2002), (Goolsbee and Petrin 2004), (Berndt et al. 1996), (Nordhaus 1996), (Diewert and Feenstra 2019), and (Diewert et al. 2019)

  – "Outlet Substitution Bias": (Reinsdorf 1993), (Hausman and Liebtag 2009), and (Greenlees and Mclelland 2008)

  – "Variety Bias": (Feenstra 1994), and (Broda and Weinstein 2010)

- Measurement papers studying practical issues:

  – Price aggregation formulas: (Diewert 2003), (Diewert 2001), (Passero, Garner, and McCully 2015), and (Barret, Levell, and Milligan 2015)

  – Price weights in pandemics: (Cavallo 2020) and (Diewert and Fox 2020)

New Price Measurement Model

- Assumption: tourists visit the region where a vacation budget buys the most utility
  - Prices for hotels, restaurant meals, etc. are lower in rural regions
  - Amenities like live entertainment are only available in urban regions
  - Weather and other non-price factors are similar in all regions
  - So, the theoretical price for unavailable amenities must be very high

Louisiana Vacations: New Orleans vs. Rural Region

Previous Regional Price Research

- Papers finding higher prices in wealthy urban regions:
  - (Aten and D'Souza 2008), (Gyourko, Mayer, and Sinai 2013), (Glaeser and Gyourko 2018), (Stroebel and Vavra 2019), and (Paredes and Loveridge 2014)

- Measuring regional product availability
  - (Glaeser, Kolko, and Saiz 2001), (Florida 2018b), (Couture et al. 2020), and (Handbury and Weinstein 2014)
  - This literature typically argues that modern cities flourish when they provide high quality amenities that aren't available elsewhere

- This paper doesn't study regional differences in nominal consumption, disease risk, etc.

Prices During A Stay-in-Place Policy

- Assumption: theoretical prices for unavailable rural amenities (ip_{aR}) ≤ theoretical prices for unavailable products during a stay-in-place policy
  - Tourist amenities are generally less important than non-essential products. For example, Broadway plays vs. elective medical care
  - Tourists are better able to predict and plan for unavailable products

- Formulas to calculate aggregate prices when good 2, service 2, and amenities are unavailable:
  - $ip_{aR} = [(1-w_{hT}p_{hR} - (w_{g1T}p_{g1R}+w_{g2T}p_{g2R})- (w_{s1T}p_{s1R}+w_{s2T}p_{s2R})]/w_{aT}$
  - Theoretical ≥ $w_h p_{hSIP} +w_{g1}p_{g1SIP}+ w_{g2}ip_{aR}+ w_{s1}p_{s1SIP} +w_{s2}ip_{aR}+ w_a ip_{aR}$
  - Quasi-CPI = $w_h p_{hSIP} +w_{g1}p_{g1SIP}+ w_{g2}p_{g1SIP}+w_{s1}p_{s1SIP} +w_{s2}p_{s1SIP}+w_a ip_{s1SIP}$

Time Use As a Proxy for Product Availability

- Datasets used to measure time use:
  - Google's published COVID-19 Community Mobility Reports gives changes in retail and recreational time relative to a winter base period
  - The American Time Use Survey (ATUS) gives normal time use
  - Wunderground gives summarized weather data that is used to adjust the Google mobility data for seasonal trends

- Assumption: product availability tracks time use
  - 26 percent of products are unavailable in a full stay-in-place policy
  - Non-essential retail and recreational time would fall from 57 minutes per day (the ATUS average) to 0 in a full stay-in-place policy
  - Average retail and recreational time fell 16 minutes in March, etc.
  - Average unavailability in March is 7 percent [(16/57)*26 percent]
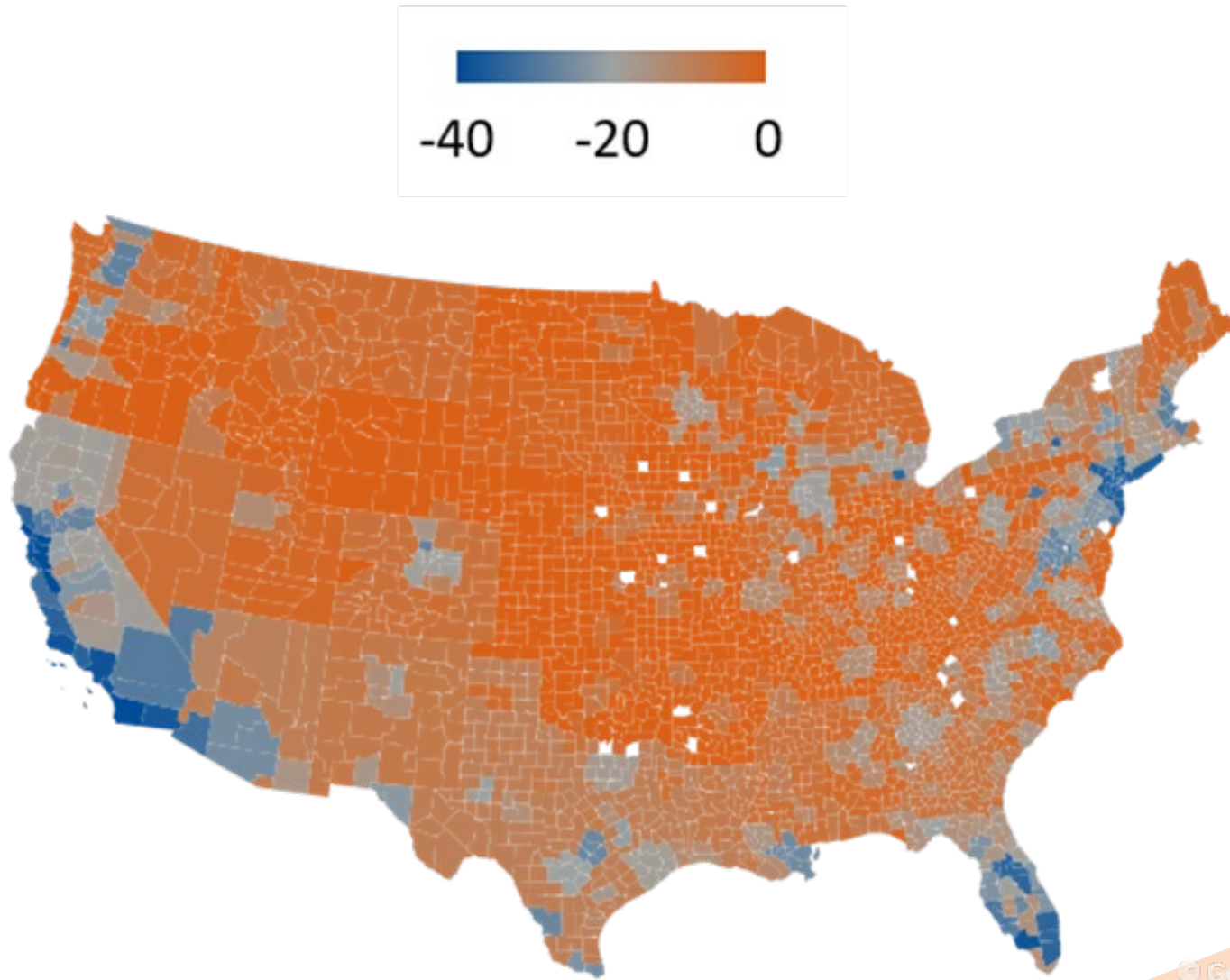
Retail and Recreational Location Time
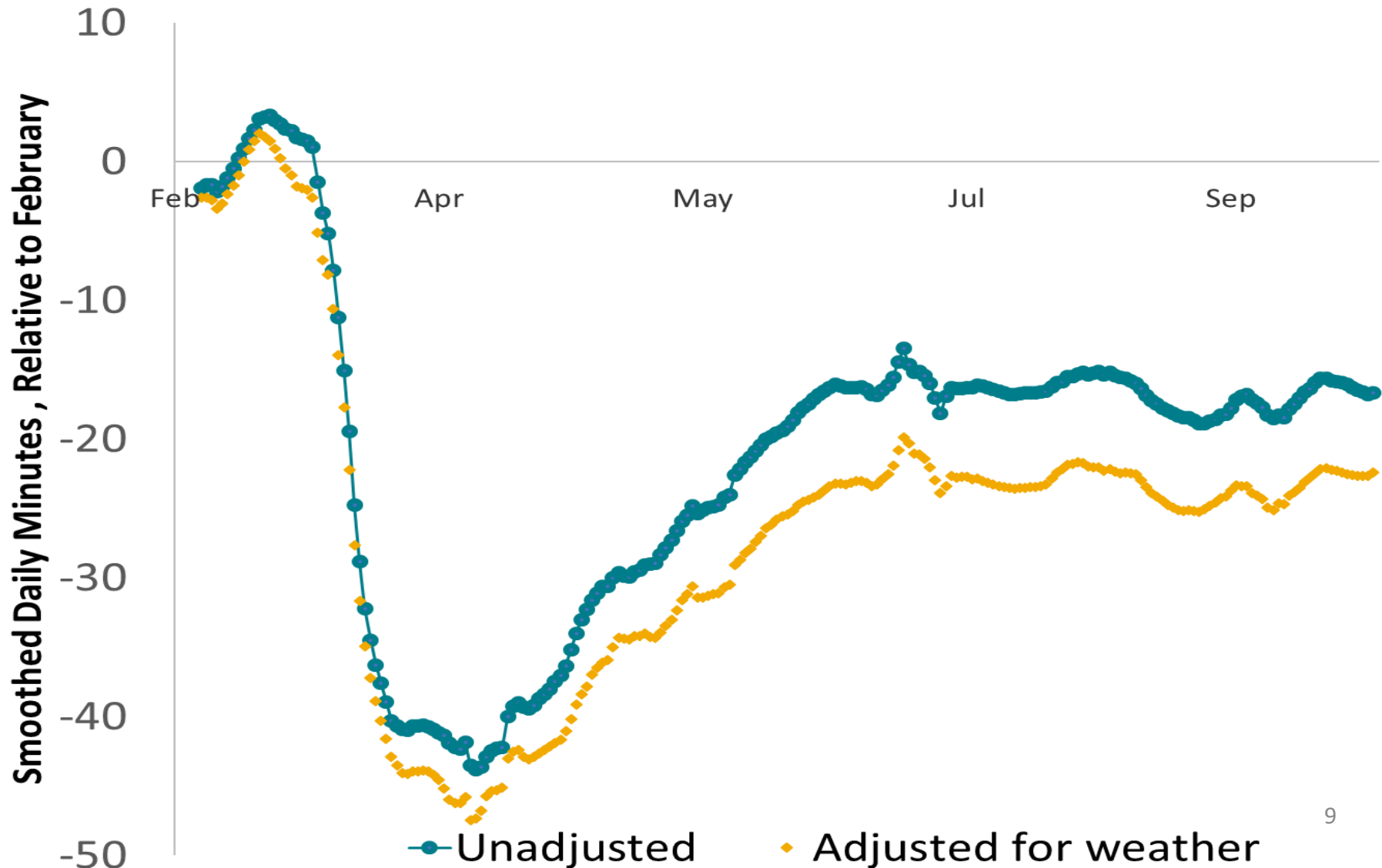
# Retail and Recreational Time, Q2 2020
Adjusted Daily Minutes Relative to Normal

Calculating Theoretical Inflation

- Tourist behavior shows that unavailable products have an inflation rate of at least 59 percent

    – Average inflation in March is ≥4 percent [(7 percent)*(59 percent)]

- Theoretical inflation by region:

    – Appendix B reports monthly retail and recreational time for every region of the country. This data is used to calculate regional inflation

    – For example, Houston time use fell 25 minutes per day in March, so regional inflation is ≥7 percent [(25/57)*(26 percent)*(15 percent)]

- Wealthy regions have higher inflation

    – In normal times, daily minutes of retail and recreation time are higher

    – During Covid-19, daily minutes of retail and recreational time is lower

Monthly Inflation During Covid-19

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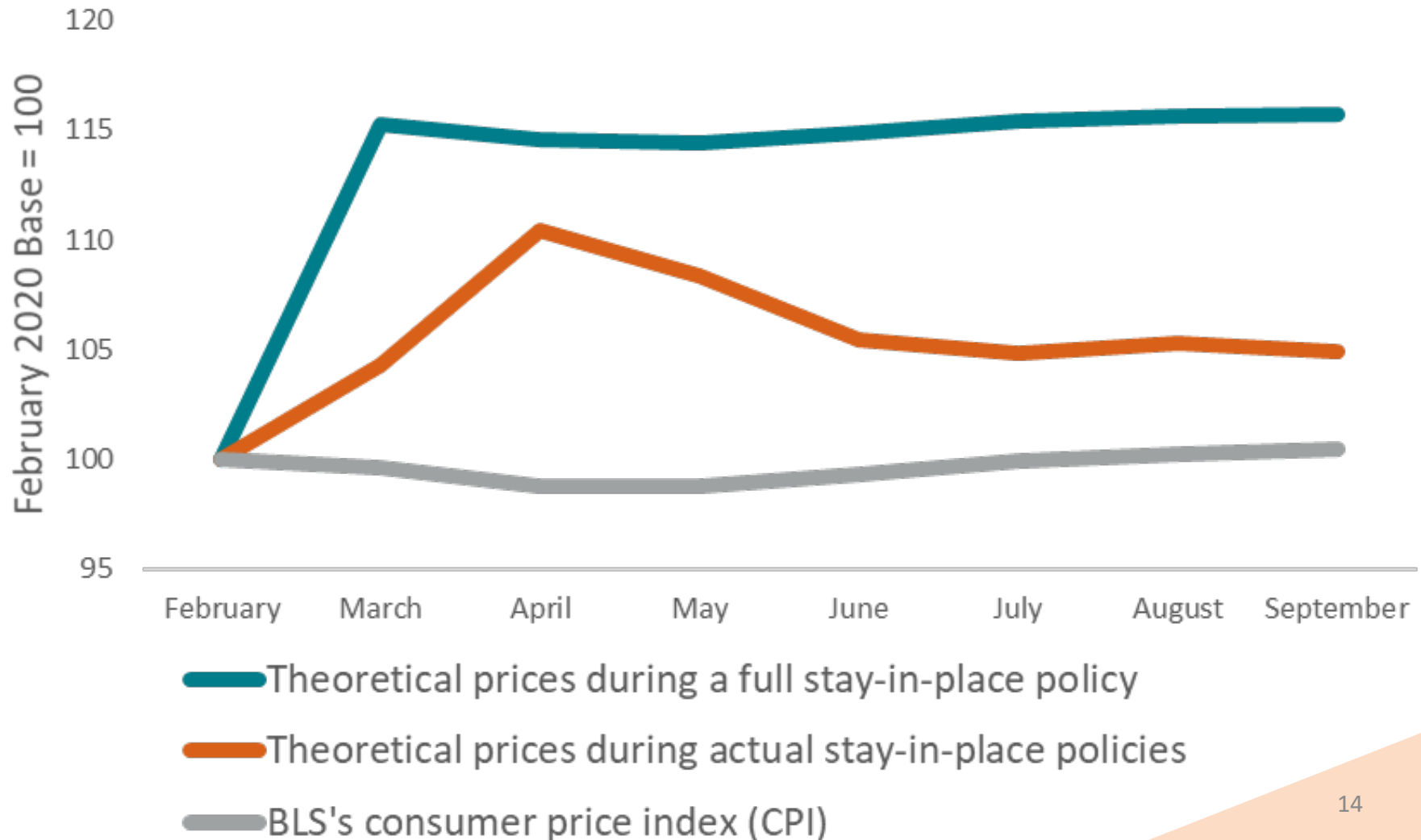
Theoretical Q3 Inflation vs. 2018 Income
Bubble size is proportional to regional population

Conclusion
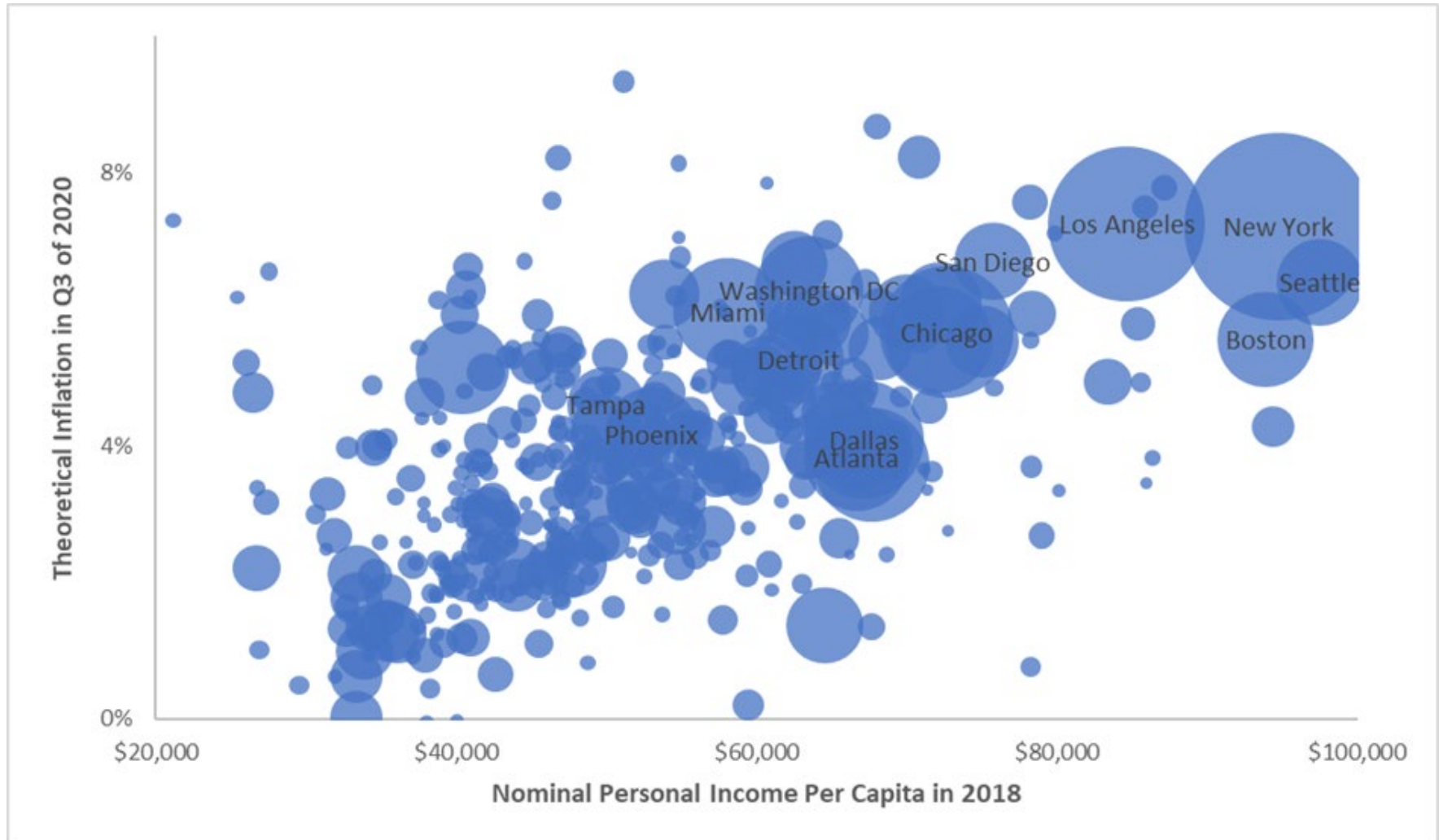
- This paper was motivated by the widespread product unavailability during stay-in-place policies

  – This paper adapted the regional price literature to develop a new method of imputing prices for unavailable products

  – The theoretical model in this paper does not imply any data problems or computational mistakes with published government price indexes

- Theoretical quarterly inflation: ≥1.4 percent in Q1, ≥6.0 percent in Q2, and ≤-2.8 percent in Q3

  – These results imply that at least one third of the theoretical drop and recovery in real consumption is not reflected in published economic statistics

  – Theoretical inflation rates vary widely across regions