

ECONOMIC FINDING

Measuring Movement and Social Contact with Smartphone Data: A Real-Time Application to COVID-19

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The authors develop and make publicly available a location exposure index that summarizes county-to-county movements, and a device exposure index that quantifies social contact within venues.

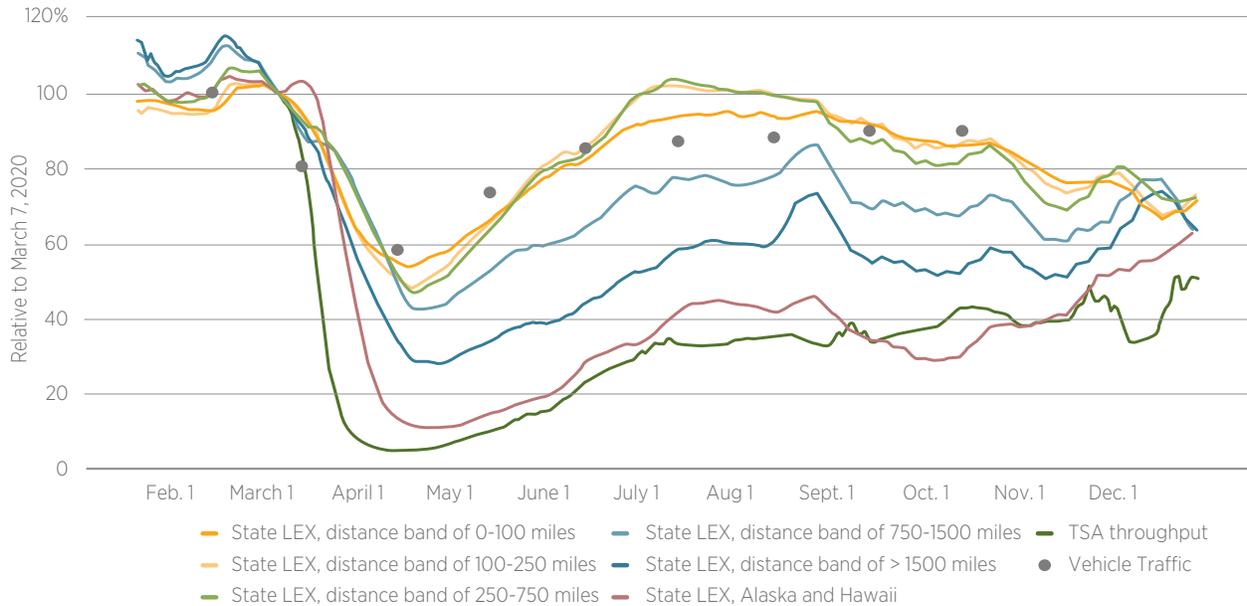
Personal digital devices generate streams of detailed data about human behavior. Their temporal frequency, geographic precision, and novel content offer social scientists opportunities to investigate new dimensions of economic activity.

The authors find that smartphone data cover a significant fraction of the US population and are broadly representative of the general population in terms of residential characteristics and movement patterns. They

produce a location exposure index (“LEX”) that describes county-to-county movements and a device exposure index (“DEX”) that quantifies the exposure of devices to each other within venues. These indices track the evolution of intercounty travel and social contact from their sudden collapse in spring 2020 through their gradual, heterogeneous rises over the following months.

Importantly for researchers, the authors are publishing these indices each weekday in a [public repository](#) available

Figure 1 • State-Level LEX Values by Distance Between States



Notes: This figure depicts average LEX values for pairs of states grouped by the distance between their population-weighted centroids. Each series depicts a 7-day moving average relative to its value on March 7, 2020. The Transportation Security Administration (TSA) throughput series reports the number of travelers passing through TSA checkpoints on each day. Monthly seasonally adjusted vehicle miles traveled comes from the Federal Highway Administration (series TRFVO- LUSM2275FWA).

to noncommercial users for research purposes. Their aim is to reduce entry costs for those using smartphone movement data for pandemic-related research. By creating publicly available indices defined by documented sample-selection criteria, the authors hope to ease the comparison and interpretation of results across studies.

More broadly, this work provides guidance on potential benefits and relevant caveats when using smartphone movement data for economic research. Researchers in economics and other fields are turning to smartphone movement data to investigate a great variety of social science questions, and the authors focus on the distinctive advantages of the data frequency and immediacy.

Figure 2 • Smartphone Visits and Affinity Expenditures

(a) Grocery Stores



(b) Restaurants



(c) Arts, Entertainment, and Recreation



Notes: This figure depicts total smartphone visits to grocery stores, restaurants, and arts, entertainment, and recreation (A&E). A&E includes visits to movie theaters, museums, nightclubs, bars, theme parks, and theatres. Credit card data for the same categories comes from Affinity Solutions (Chetty, Friedman, Hendren, Stepner, and The Opportunity Insights Team, 2020). Both series are normalized relative to the January 4-31 average and smoothed using a 7-day moving average (MA-7).