

Researchers use mobile phone data to predict employment shocks

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Northeastern University computational social scientist David Lazer and his interdisciplinary research team have demonstrated that mobile phone data can be used to quickly and accurately detect, track, and predict changes in the economy at multiple levels.

The findings, published Wednesday in the journal of the *Journal of the Royal Society Interface*, highlight the potential of [mobile phone](#) data to improve forecasts of critical economic indicators—information that is extremely valuable to policymakers in the public and private sectors.

In particular, the team found that call detail records can be used to predict unemployment rates up to four months before the release of official reports and more accurately than using historical data alone.

'Our findings are of great practical importance, potentially facilitating the identification of macroeconomic statistics faster and with much finer spatial granularity than traditional methods of tracking the economy,' said Lazer, a distinguished professor of political science and computer and information science.

'We are hopefully just beginning to learn what this data can tell us, and the promise of more accurate, less expensive, and higher-resolution measures of critical economic indicators is very exciting,' added lead author Jameson Toole, a doctoral student at the Massachusetts Institute of Technology. 'We hope that our results can be used to help policymakers react more rapidly to future economic downturns, giving

them a more accurate picture of the state of the economy.'

In the paper, Lazer, Toole, and their collaborators—a quartet of experts in economics, engineering, public policy, and information science from MIT, Harvard University, the University of Pittsburgh, and the University of California, Davis—harnessed the power of algorithms to analyze call record data from two undisclosed European countries. Their first study focused on unemployment at the community level, where they examined the behavioral traces of a mass layoff at an auto-parts manufacturing plant in 2006.

Using call record data spanning a 15-month period between 2006 and 2007, they designed a so-called structural break model to identify mobile phone users who had been laid off. Then they tracked the mobility and social interactions of the affected workers, looking at several quantities related to their social behavior, including total calls, number of incoming calls, number of outgoing calls, and calls made to individuals physically located at the plant.

The findings revealed that job loss had a 'systematic dampening effect' on their mobility and social behavior. For example, the researchers found that the total number of calls made by laid-off individuals dropped 51 percent following their layoff when compared with non-laid-off residents while their number of outgoing calls decreased 54 percent. What's more, the month-to-month churn of a laid-off person's social network—that is, the fraction of contacts called in the previous month that were not called in the current month—increased approximately 3.6 percentage points relative to control groups. In terms of mobility, they found that the number of unique mobile phone towers visited by people who had lost their jobs decreased 17 percent relative to a random sample.

'These results suggest that a user's social interactions see significant

decline and that their networks become less stable following job loss,' the authors wrote. 'This loss of social connections may amplify the negative consequence associated with [job loss](#) observed in other studies.'

The paper's second study analyzed the call detail records of thousands of subscribers in a different European country, one that had experienced macroeconomic disruptions during the period in which the data was available.

This time, the researchers looked for behavioral changes that may have been caused by layoffs—fewer outgoing calls, for example, or an increase in churn—to determine whether those changes could predict general unemployment statistics.

Indeed, they found that changes in mobility and [social behavior](#) predicted unemployment rates before the release of official reports and more accurately than traditional forecasts. Specifically, the researchers noted that their novel methods allowed them to predict present [unemployment](#) rates two to eight weeks prior to the release of traditional estimates and forecast future employment rates up to four months ahead of official reports.

While Lazer praised the rapidity, accuracy, and cost-effectiveness of collecting—and subsequently analyzing—passively generated data from digital devices, he cautioned against viewing his group's methods as a substitute for survey-based approaches to detecting and predicting future [unemployment rates](#). 'We consider mobile phone data a powerful yet complementary tool,' he explained. 'Big data approaches are fast and inexpensive, but the norms governing phone use are constantly changing, forcing us to constantly calibrate how we use them in connection with other methodologies.'

More information: [Tracking Employment Shocks Using Mobile](#)

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