

Commuting times stay constant even as distances change

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How much commuting can you tolerate? A new study by MIT researchers shows that across countries, people assess their commutes by the time it takes them to complete the trip, generally independent of the distance they have to travel—as long as they have a variety of commuting options to choose from.

The study, which compares commuting practices in five locations on four continents, also demonstrates the methodological validity of using mobile phone data to create an accurate empirical picture of commuting.

"Every country has had its own different way of doing things and collecting data," says Carlo Ratti, an associate professor of the practice in MIT's Department of Urban Studies and Planning, director of MIT's Senseable City Lab, and a co-author of the new study. "Here we have standard data which allows us, for the first time, to evaluate mobility across countries."

Commuting research has often been conducted via surveys, making it difficult to develop cross-country comparisons. But by using anonymized phone data, the MIT researchers found some fundamentally similar patterns in different locations.

"It really reveals that commuting patterns around the globe are constant," says Stanislav Sobolevsky, a researcher at the Senseable City Laboratory and a co-author of the paper, published in the journal *PLoS ONE*. The paper's co-authors are Ratti, Sobolevsky, Kevin Kung, and Kael Greco, all of the Senseable City Laboratory.

"There was an element of surprise in how well the data showed this," says Kung, the corresponding author on the paper.

From Massachusetts to Africa

The researchers studied three metropolitan areas where a diversity of transport options let commuters keep travel times steady.

In Portugal, people could tolerate about 70 minutes of commuting in the morning, a figure that held fairly constant for commutes ranging anywhere from about 5 kilometers to more than 40 kilometers. About 28

percent of commuting trips around the country's largest city, Lisbon, occurred on public transport—suggesting that commuters seem willing to budget the same amount of time whether they walk, drive, or take buses or trains.

The data show that in Ivory Coast, morning commutes average just under 80 minutes regardless of distance, while in the Boston area, morning commutes range from 50 to 60 minutes, again across many distances.

By contrast, using GPS data in a location where automobiles are the only realistic commuting option—Riyadh, Saudi Arabia—the researchers found that the amount of time spent commuting did, in fact, correlate to the distance traveled: The further commuters had to go by car, the longer it took them.

In Riyadh, only 2 percent of commuting trips were on public transport, and the average morning commute was about 50 minutes for trips of 5 to 20 kilometers, but increased to about 65 minutes for commutes of 20 to 40 kilometers.

People adapt

The researchers also used GPS data to study automobile-based commutes in Milan, Italy. There, the morning commutes of drivers increased from 40 minutes, for those traveling up to 10 kilometers, to 60 minutes for those traveling 10 to 20 kilometers, and more than 80 minutes for those traveling 20 to 40 kilometers.

As in Riyadh, driving distance related to time spent in the vehicle, although data from all forms of commuting—Milan also has suburban rail lines, for instance—would be needed to characterize the overall pattern of commuting in the area.

The researchers believe the findings may have practical applications for urban planners and designers—especially knowing that commuters will use a variety of transportation options to stabilize their commute times, rather than insisting on driving to work.

"It suggests that in places that have a lot of different transportation options available, this [limit on time] holds quite well," Greco says. "In places that lean in one direction, car cultures, we saw a stronger association between distance and time." Sobolevsky adds: "People try to adapt to their situations."

The research also gives some support to a hypothesis, published by Italian physicist Cesare Marchetti in the 1990s, that humans have universally had commute times of about an hour, throughout history. Because the new findings show commute times varying across countries, but having regular patterns within those countries, the co-authors in the paper say the data represents the "localized form" of Marchetti's idea.

The researchers suggest that additional studies, with more granular [phone data](#), could further refine the broad patterns found in their research.

"When cities in general take survey approaches to understand how people move, these are fraught with inaccuracies, and they're inconsistent from country to country," Greco says. "If you can standardize that measurement procedure, it becomes much easier to look at how people move on global level."

Provided by Massachusetts Institute of Technology

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