Why New York City is average: Researchers want to improve how we determine urban exceptionality?

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Think New York is an exceptional city? It's not. The Big Apple is just about average for a city of its size. However, San Francisco is exceptional. Its inhabitants are wealthier, more productive, more innovative, and subject to fewer crimes than you would expect, given its size.

Turns out many of the cities we typically think of as great ones probably wouldn't show up near the top of most rankings, if Luis Bettencourt of the Santa Fe Institute has his way. He and his colleagues believe traditional per-capita measures are not very useful for determining what makes one city better or worse than another because they don't treat separately the roles population size and local character play in making it so.

In their paper published today in *PLoS ONE*, they propose ditching per-capita comparisons for more scientific ones that take into account the natural advantages of larger cities. The research team includes Jose Lobo of Arizona State University, Deborah Strumsky of the University of North Carolina at Charlotte, Geoffrey West, and Bettencourt. West and Bettencourt are theoretical physicists affiliated with both the Santa Fe Institute (SFI) and Los Alamos National Laboratory.

Big cities naturally have a statistical advantage because the agglomeration of people, more intense social interactions, and better

developed infrastructures naturally invoke efficiencies and speed up the pace at which things happen, Bettencourt says. The researchers have shown, in fact, that with each doubling of city population, each inhabitant is, on average, 15 percent wealthier, 15 percent more productive, 15 percent more innovative, and 15 percent more likely to be victimized by violent crime, regardless of the city's geography or the decade in which you pull the data.

Scientists call this phenomenon "superlinear scaling." Rather than metrics increasing proportionally with population – in a "linear," or one-for-one fashion – measures that scale superlinearly increase consistently at a nonlinear rate greater than one for one.

"Almost anything you can measure about a city scales nonlinearly," Bettencourt says. "This is the reason we have cities in the first place. But if you don't correct for these effects, you are not capturing the essence of particular places."

As part of their study, the researchers developed scale-adjusted metropolitan indicators (SAMIs) that allowed them to compare the socioeconomic performance of large, midsized, and smaller U.S. cities.

By their measures, they found that exceptionality, both over- and under-performance, tends to be persistent. That is, when a city is more or less wealthy or more or less crime-ridden than its size suggests, it tends to stay that way for decades.

They also found that some features tend to pair up, such as wealth and safety; a wealthy but dangerous town like Fairbanks, Alaska is rare, as is a poor but safe city like Provo, Utah.

And they found that highly exceptional cities tend to be smaller and more monocultural, such as Corvallis, Oregon, which boasts a high

number of patents for its size as well as a large Hewlett-Packard lab.

"If we used per-capita comparisons, we would have seen different exceptions, with a bias towards many more large cities ranking closer to the top," Bettencourt says.

So what does a city's ranking matter? In and of itself, not much, he says. But when a city is under- or over-performing the expectations for its size, it is doing something uniquely right or wrong. Understanding what that is provides essential clues as to how a city can improve or further capitalize on its successes, he says.

"Our results reveal in a new, scientifically based way what is truly exceptional about a particular city, including the influence of its history, its policy choices, the consequences of its local flavor, the outcome of which can now be measured quantitatively," he says. "Our hope is that this perspective and methodology can help us better understand cities and design more science-based and effective policy."

More information: Bettencourt LMA, Lobo J, Strumsky D, West GB (2010) Urban Scaling and Its Deviations: Revealing the Structure of Wealth, Innovation and Crime across Cities. PLoS ONE 5(11): e13541. doi:10.1371/journal.pone.0013541

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