

CHAZEN INSTITUTE RESEARCH BRIEF

The Value of Satellite Imagery in Mapping Urban Markets

KEY TAKEAWAYS

- ✓ Satellite imagery is one of the most promising data sources for detecting how cities are developing over time.
- ✓ Daytime satellite imagery is much more precise in defining the dimensions of cities and identifying the gaps that exist in urban development.
- ✓ Nighttime imagery has limitations, and is better suited for measuring the intensive margin of economic activity within cities.
- ✓ High resolution satellite imagery has the potential to shape cities and policies that reduce poverty and boost economic activity by more accurately identifying geographical and infrastructural factors associated with economic growth and development.

For years, economists have relied on more traditional data collection methods like censuses to study urban markets. But in many developing countries, these data sources are often difficult to obtain. In recent years, however, satellite imagery has emerged as a new and increasingly valuable source for tracking the economic growth of cities worldwide.

In “[Detecting Urban Markets with Satellite Imagery: An Application to India](#),” Amit Khandelwal, Director of the Jerome A. Chazen Institute for Global Business; Kathryn Baragwanath-Vogel, PhD student at UC San Diego; Ran Goldblatt, remote sensing scientist and senior consultant at New Light Technologies; and Gordon Hanson, professor at UC San Diego, explore these new methodologies, and specifically how markets detected from nighttime satellite imagery compare to those detected from daytime satellite imagery.

Research

This is the first study of its kind to use both nighttime and daytime satellite imagery to define urban markets based on economic activity. While daytime imagery isn’t typically used in economic studies, the researchers found that using nighttime imagery alone had the drawbacks of making some cities appear larger than they actually were (so that a city like Los Angeles might appear larger because the city lights diffuse into less densely populated parts of Los Angeles County).

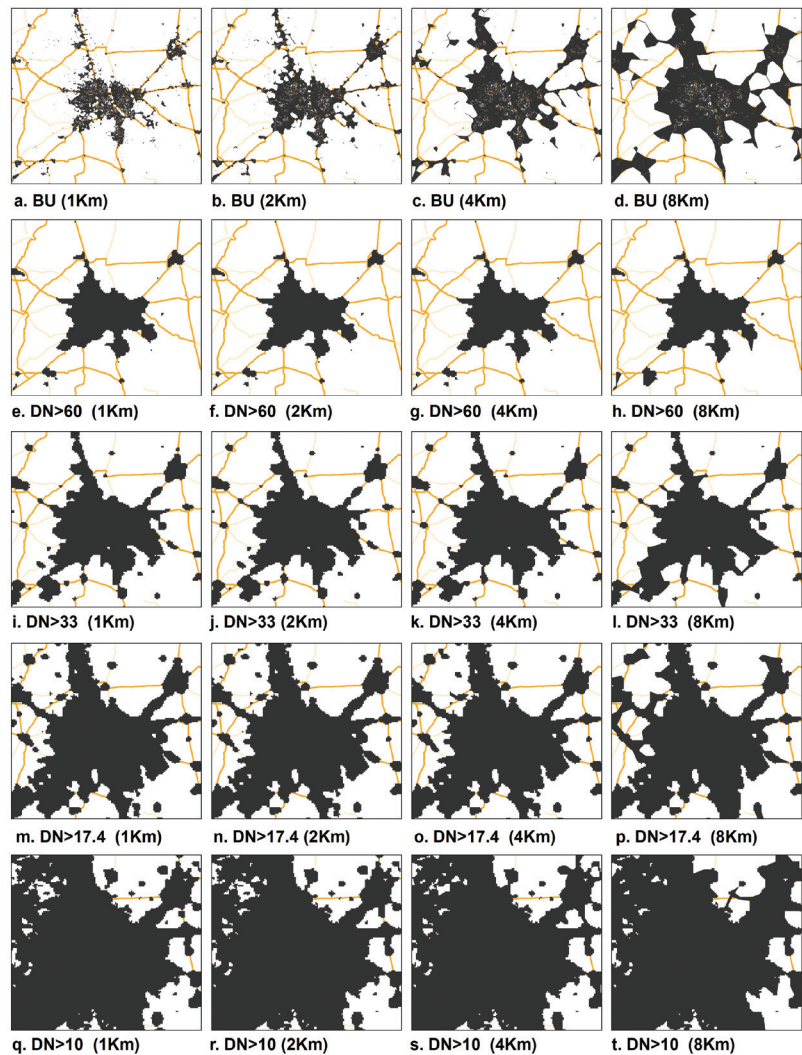
Khandelwal and his co-authors used this combination of daylight and nightlight satellite imagery to detect thousands of cities and towns in India. Among the many applications this methodology proposes is the ability to evaluate the impact of infrastructure investments on the growth of cities without relying on standard data sources, such as censuses or households surveys.

Results

By comparing nightlight-based markets to those formed using daytime satellite imagery, the researchers found daytime imagery to be generally more precise in defining the dimensions of a city. They also found that the size of an urban market was acutely sensitive to its proximity to paved roads, a discovery only revealed through the aid of daylight satellite imagery.

The research shows the value of combining different types of satellite imagery in economic analysis. Daytime imagery is well-suited for defining the spatial expanse of urban markets, and identifying the gaps in urban development that exist even within densely populated cities. Nighttime imagery, on the other hand, is better suited for measuring the intensive margin of economic activity within cities.

This data could aid governments in shaping cities and policies that reduce poverty and boost economic activity by helping to more accurately identify geographical and infrastructural factors associated with economic growth and development. Its application is particularly relevant to cities across Asia and Africa, which are continuing to invest heavily in infrastructure.



The above figure displays markets around New Delhi. Row 1 displays landcover-based markets using daytime satellite imagery. Row 2-5 displays markets detected through different thresholds of nighttime imagery.

Download the full paper:
<http://www.nber.org/papers/w24796>

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