Nowhere to Run: Speed, Proximity, and Their Relative Contributions to Accessibility

INTRODUCTION
Access to destinations is widely held as the raison d’être of transportation systems. Given its importance, however, little attention has been paid to how the two primary determinants of accessibility—mobility and destination proximity—combine at the neighborhood level to determine levels of access. In seeking to maximize accessibility to destinations, are localities better served by maximizing destination density, or should they manage density in service of greater mobility? The research presented here addresses this question through an examination of Los Angeles regional data.

DATA & METHODS
Our research approach consists of the following steps:
2. Neighborhood-to-neighborhood automobile travel times, network distances, and derived speeds taken from 2002 Southern California Association of Governments (SCAG) travel demand model time skims.
3. Neighborhood-level estimates of average peak-hour travel speeds within 10 km, total employment proximity within 10 km, and an exponential decay employment accessibility measure, all derived from data in (1) and (2).
4. Relationships among these variables modeled through both descriptive relationships, OLS models, multilevel models, and linear models accounting for spatial lags and variable heteroskedasticity.

RESULTS

Data Description:
- Data were assembled for 1,799 TAZ across Los Angeles, Orange, Ventura, San Bernardino, and Kern Counties.
- Average peak-hour travel speeds ranged from 20 km/h to 80 km/h with neighborhood average of 44 km/h.
- Number of jobs within a 10 km radius ranged from over 265,000 to 0. Exponential decay-based accessibility measure also demonstrated unevenly distributed density (d).

Access to Employment by Job and Distance:
- Spatial accessibility by distance varied widely, with the highest accessibility occurring near the CBD.
- Job-accessibility by distance ranged from 0.11 to 0.88.

OLS Modeling:
- Distance to own, greater job proximity corresponds to much higher accessibility, while greater peak-hour travel speeds correspond to much lower accessibility.
- Combining proximity, speed becomes positive, but is still outweighed by proximity.
- Job availability is robust to correction for heteroskedasticity and spatial lags, effect estimates and their diagnostic errors change very little.

Spatial Distribution:
The three panels map are zoomed in on LA County.
- Speed (top) and job proximity (bottom) show roughy inverse patterns.
- Proximity and accessibility (bottom left) show nearly identical patterns.
- Scattered in bottom right shows three-way interaction: speed increases linearly with job proximity while accessibility increases weakly with proximity.
- At any given level of proximity, speed plays a bounded role in increasing accessibility.

CONCLUSIONS
Clear trade-off between travel speed and destination proximity
Destination proximity overwhelmingly stronger predictor of accessibility
Speed increases within communities -> greater positive influence on access
Efforts to improve speed by limiting density likely to be counterproductive
Density-neutral speed improvements still valuable in appropriate context

ACKNOWLEDGEMENTS
The research presented here has been facilitated by grants from the National Foundation and from Caltrans. The authors are grateful for this support.