Transferring the Pedestrian Index of the Environment: Models & measures across & within regions

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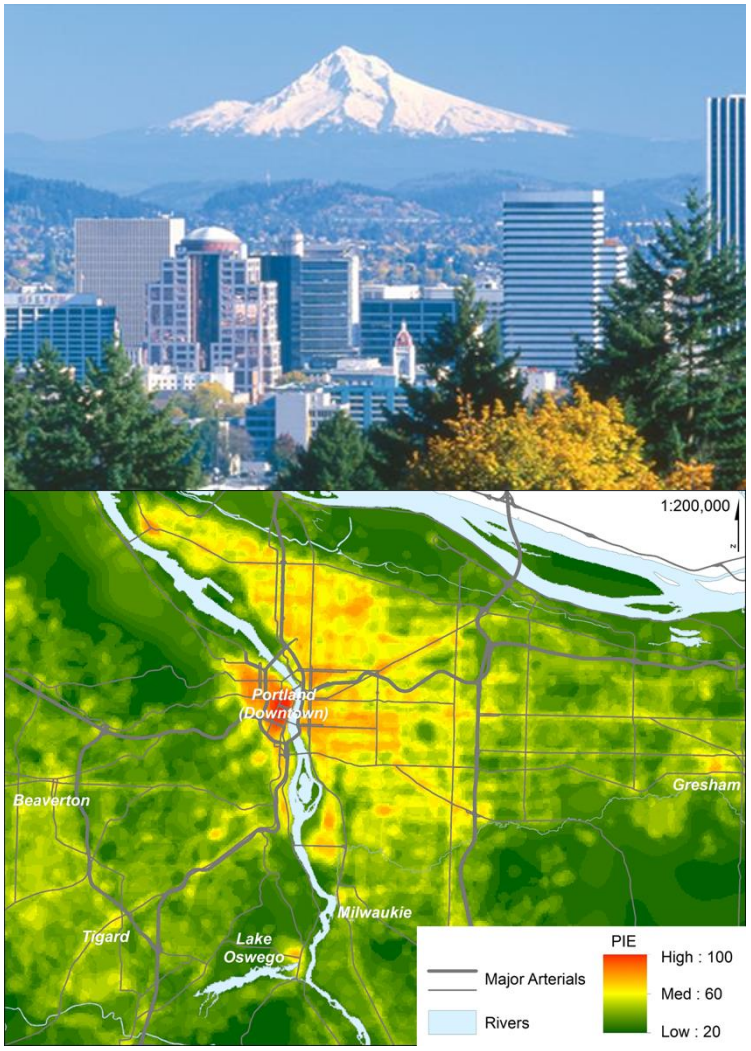
Problem

- We have developed pedestrian demand model (MoPed)
- Estimated using measures of pedestrian environment (PIE) from Portland, OR
- We would like to apply it elsewhere. Can we?
- Studies of travel behavior tend to focus on one region and cannot explore importance larger urban spatial structure
- Assume linear relationships



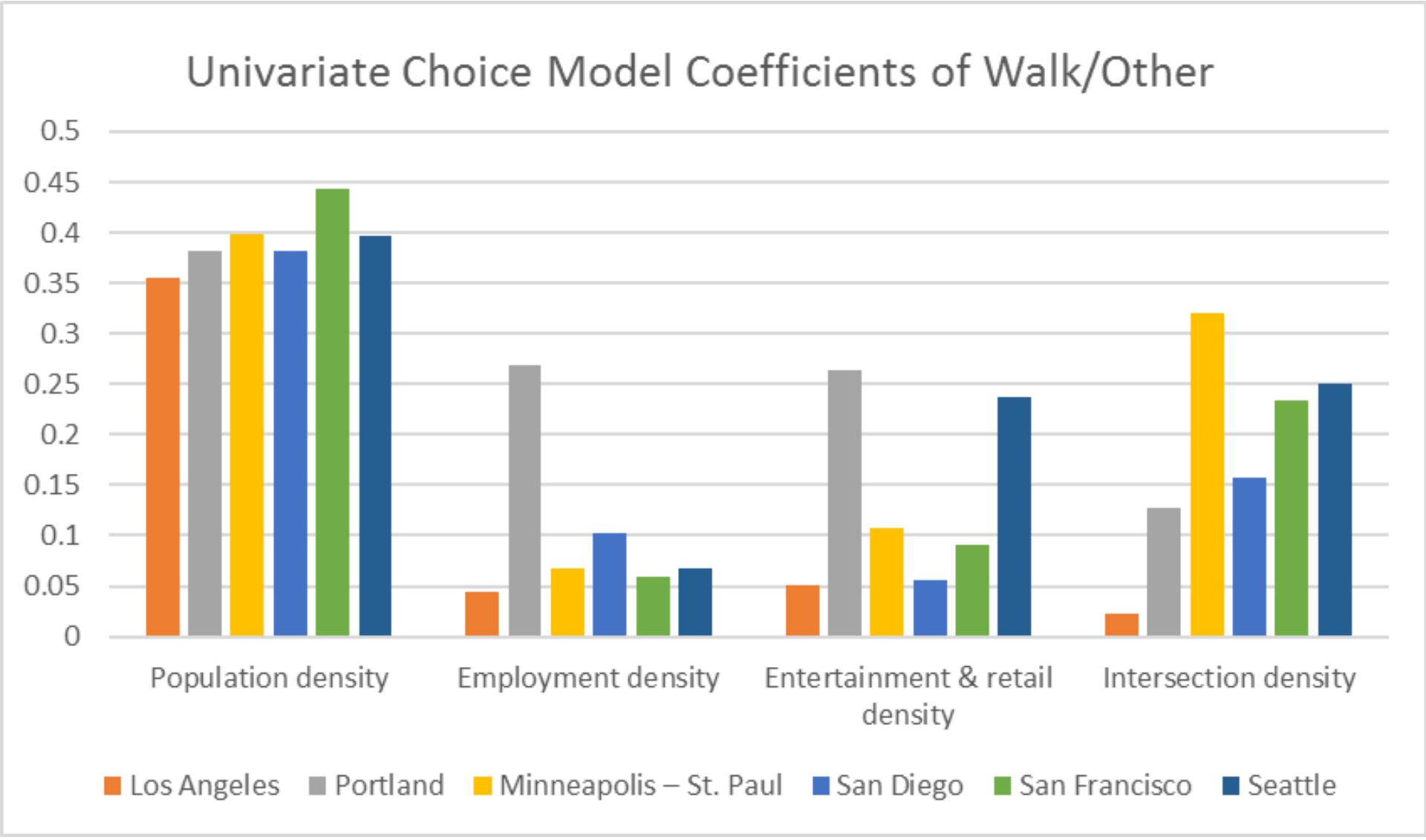
Research goals

Understand how transferrable measures and models are across various locations

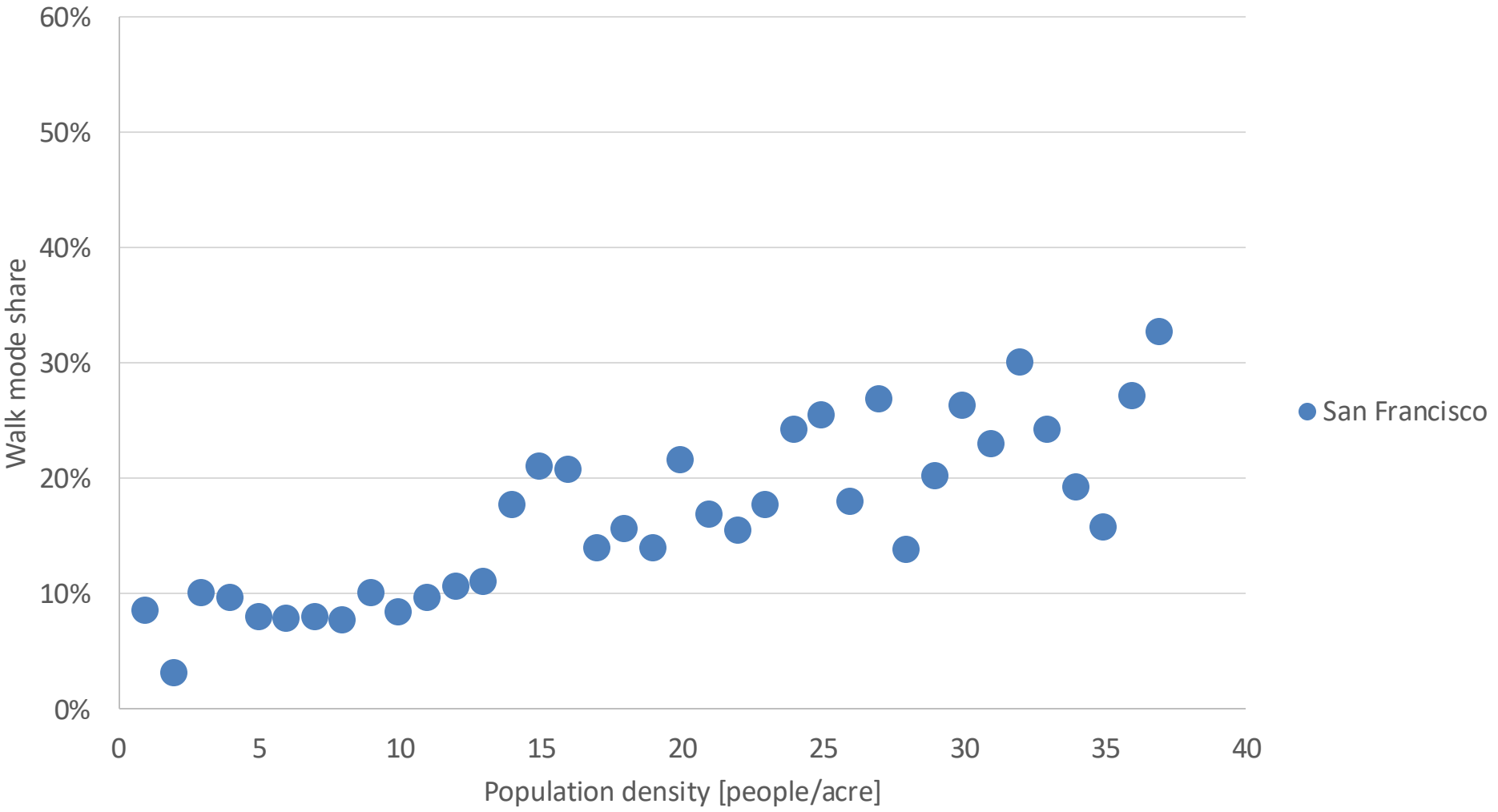
- Do the relationships between the built environment and walking in Portland hold in other places?
- Are these relationships even applicable within different environments in the Portland region?

Methodology

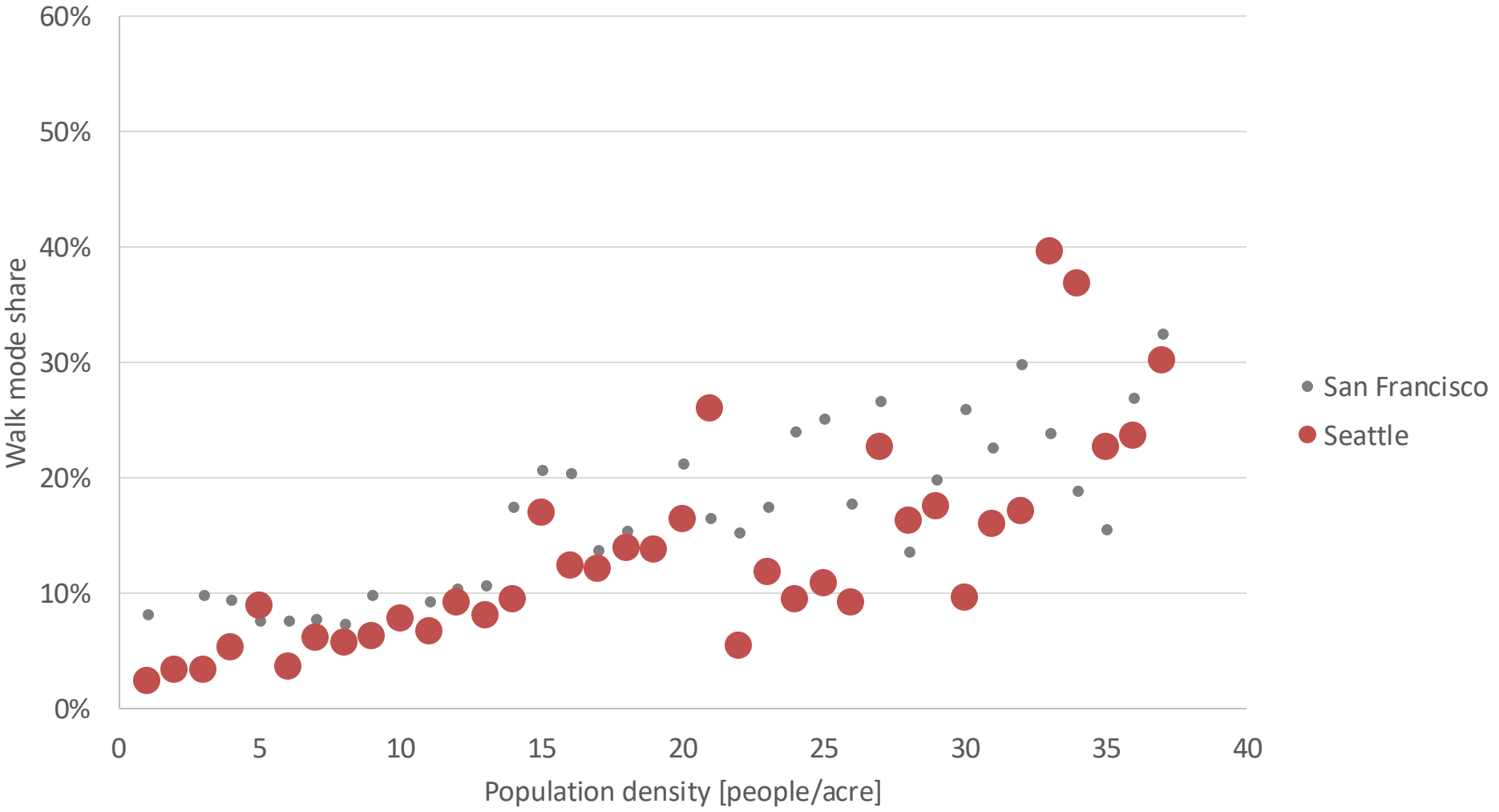
1. Construct a unique data set for several metro regions
   - Regional household travel surveys
   - Trip end data
   - Built environment characteristics at block group level
2. Identify the key variables influencing the travel patterns
3. Estimate univariate binary logits for walking related to each key variable
4. Compare results across and within metro areas


Univariate Choice Model Coefficients of Walk/Other
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Population density
Employment density
Entertainment & retail density
Intersection density
Los Angeles
Portland
Minneapolis – St. Paul
San Diego
San Francisco
Seattle

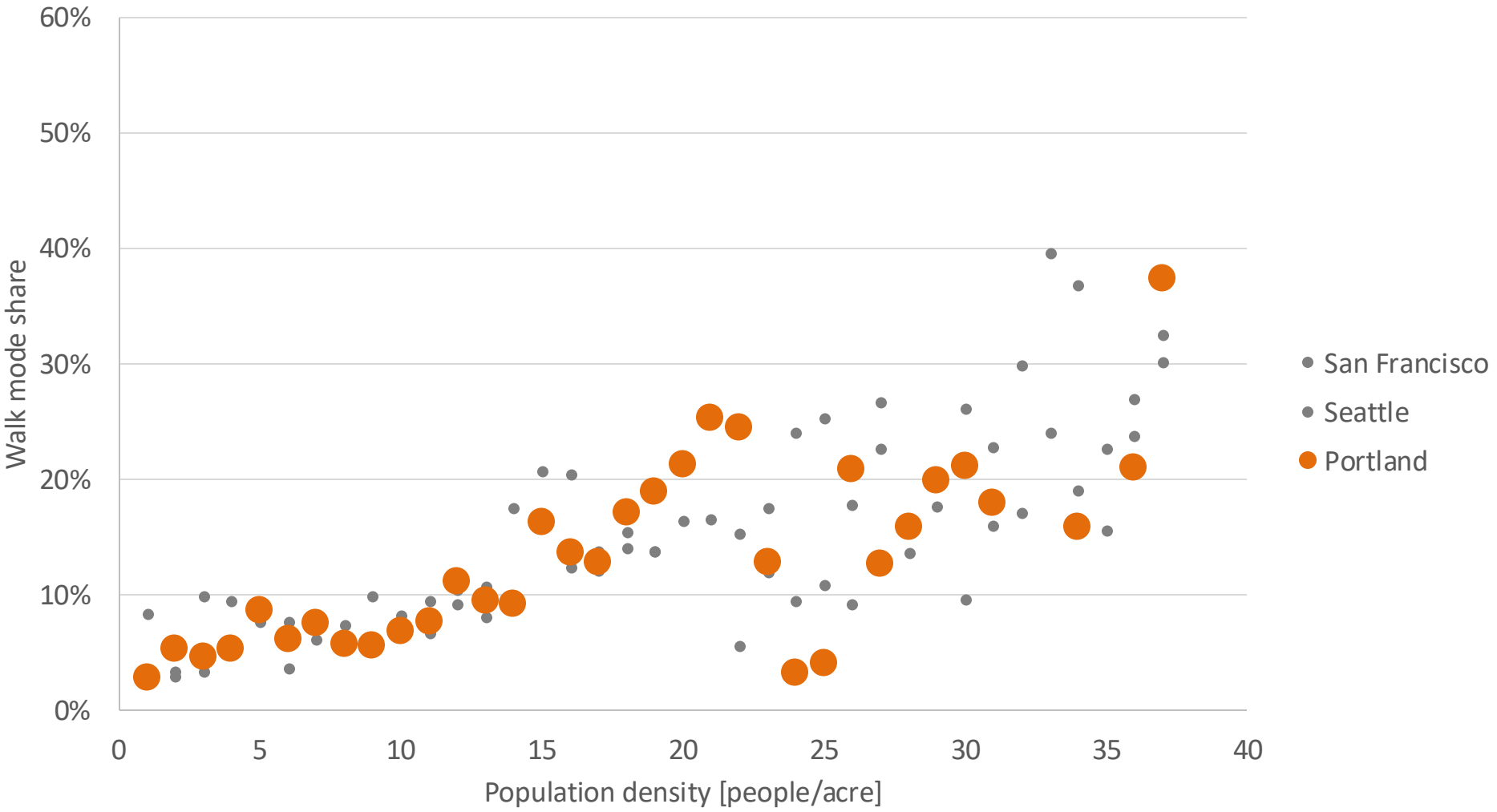
Walk mode share across density levels



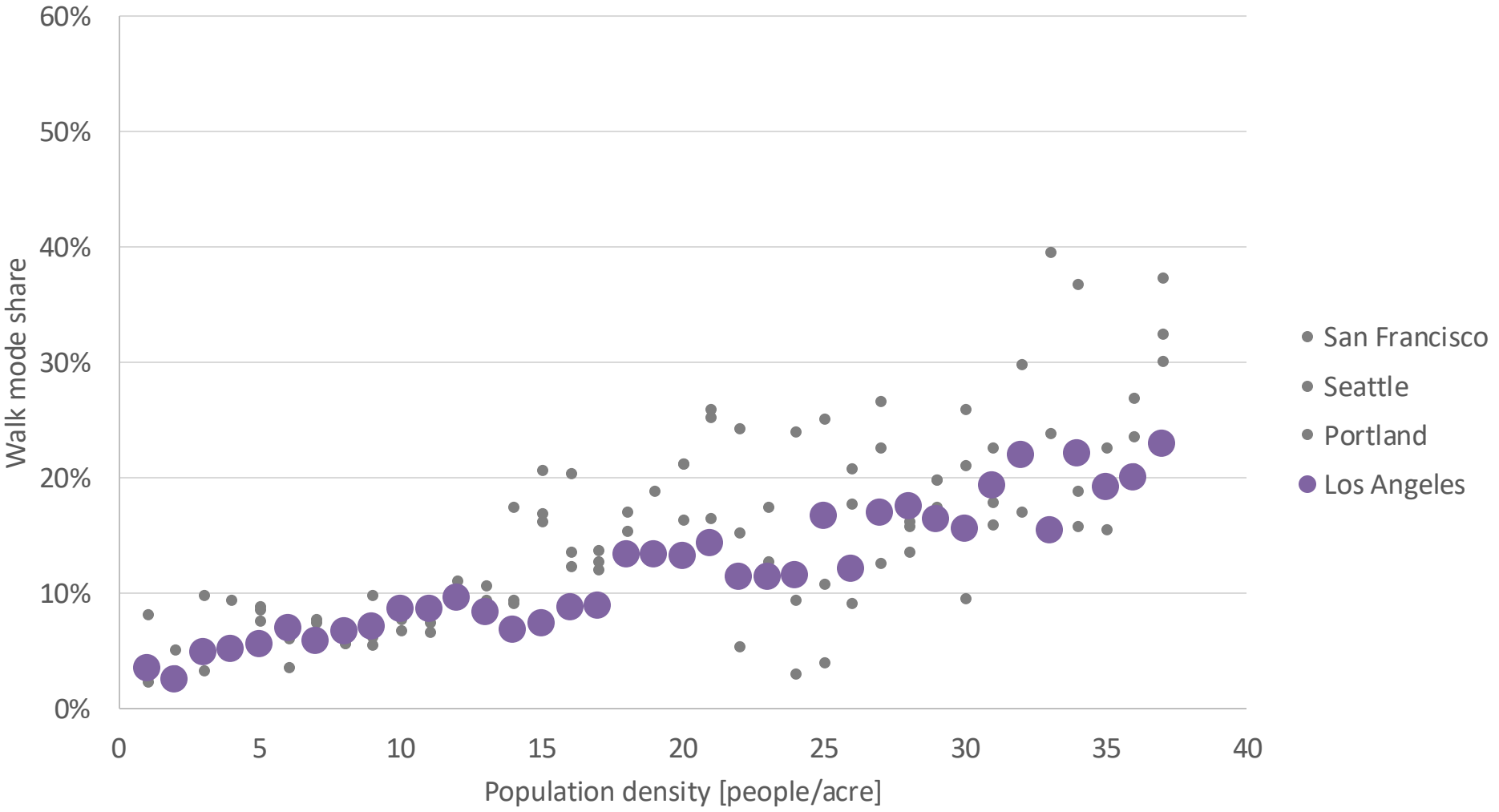
Walk mode share across density levels



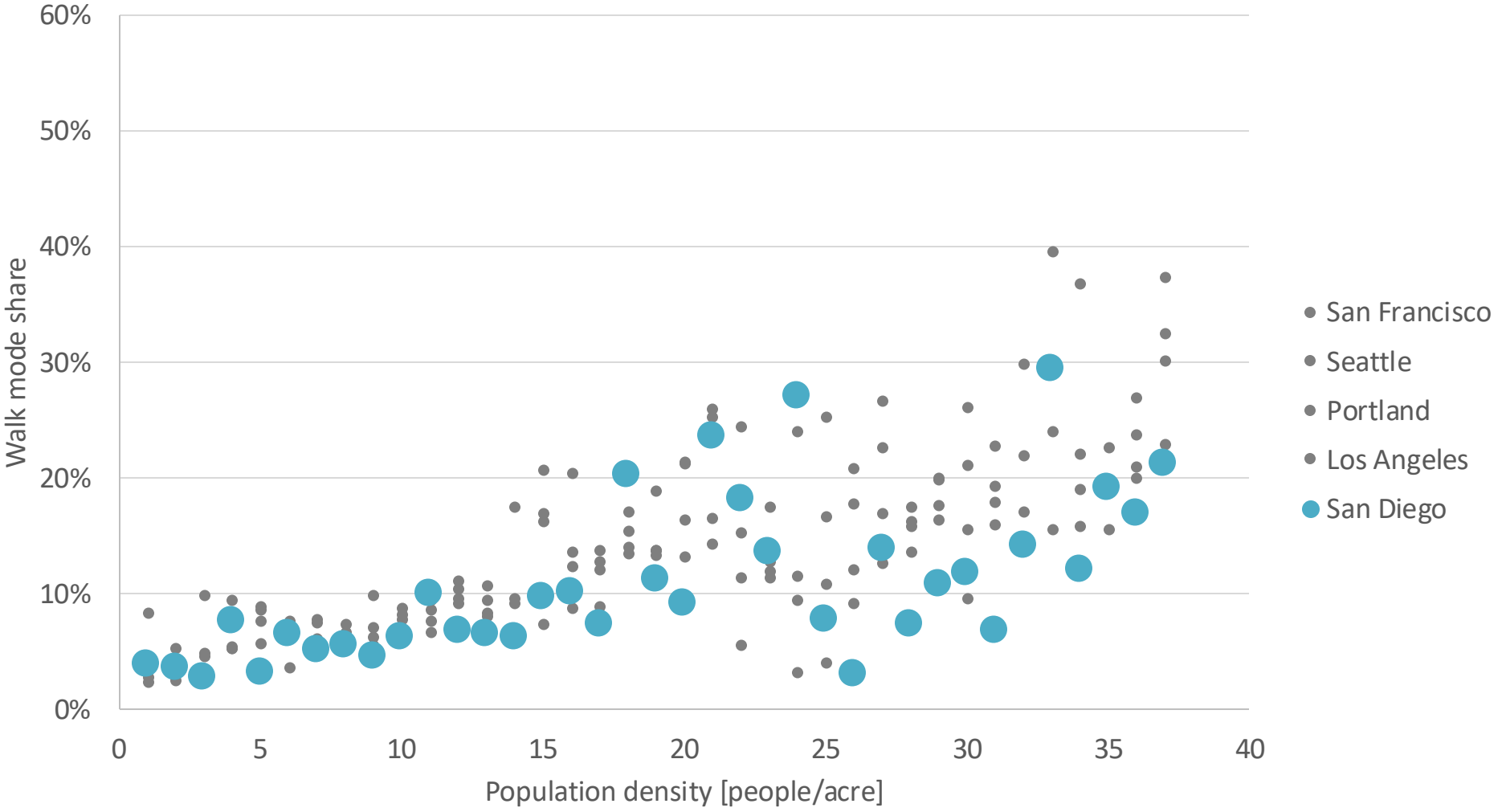
Walk mode share across density levels



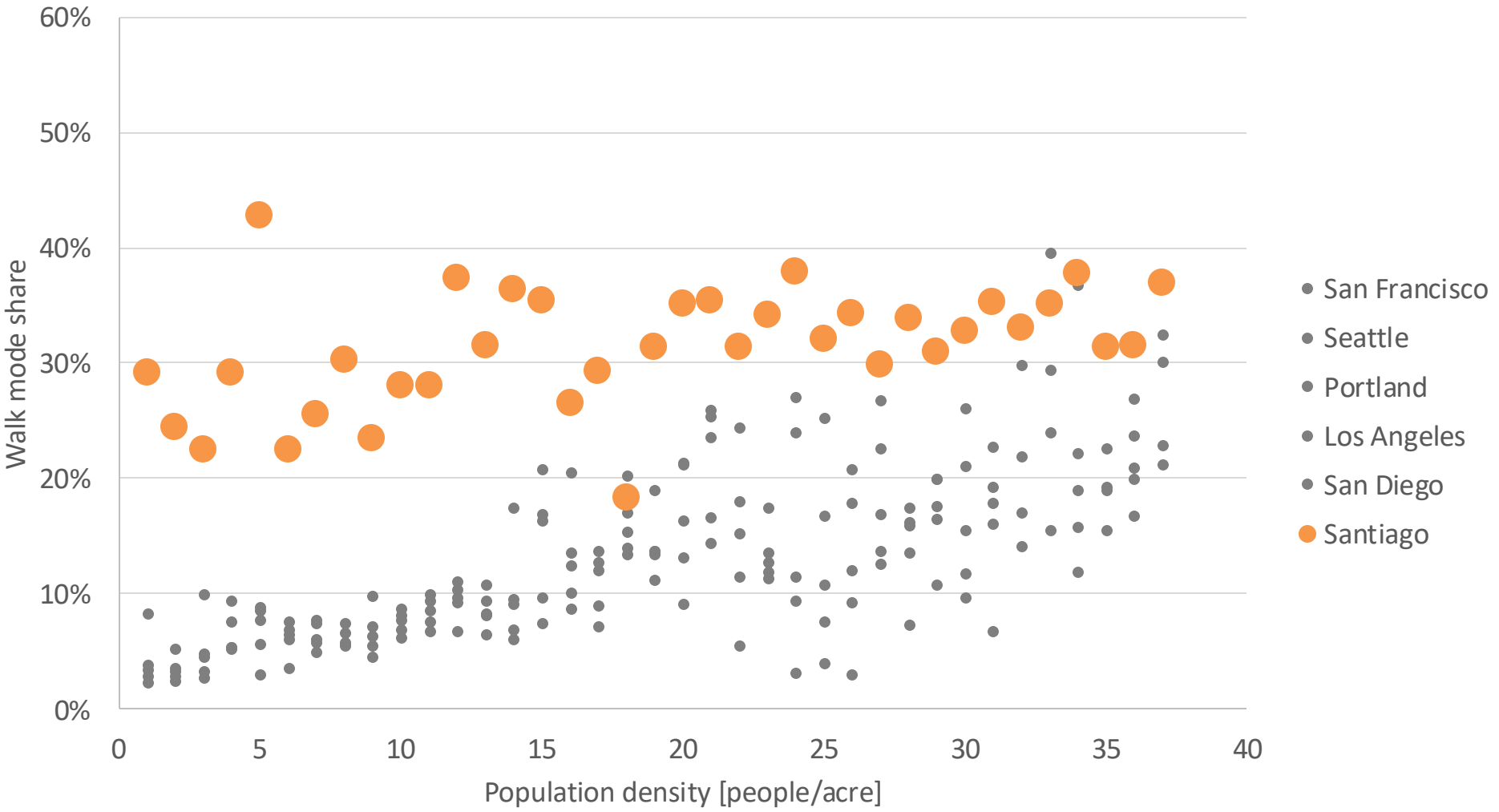
Walk mode share across density levels



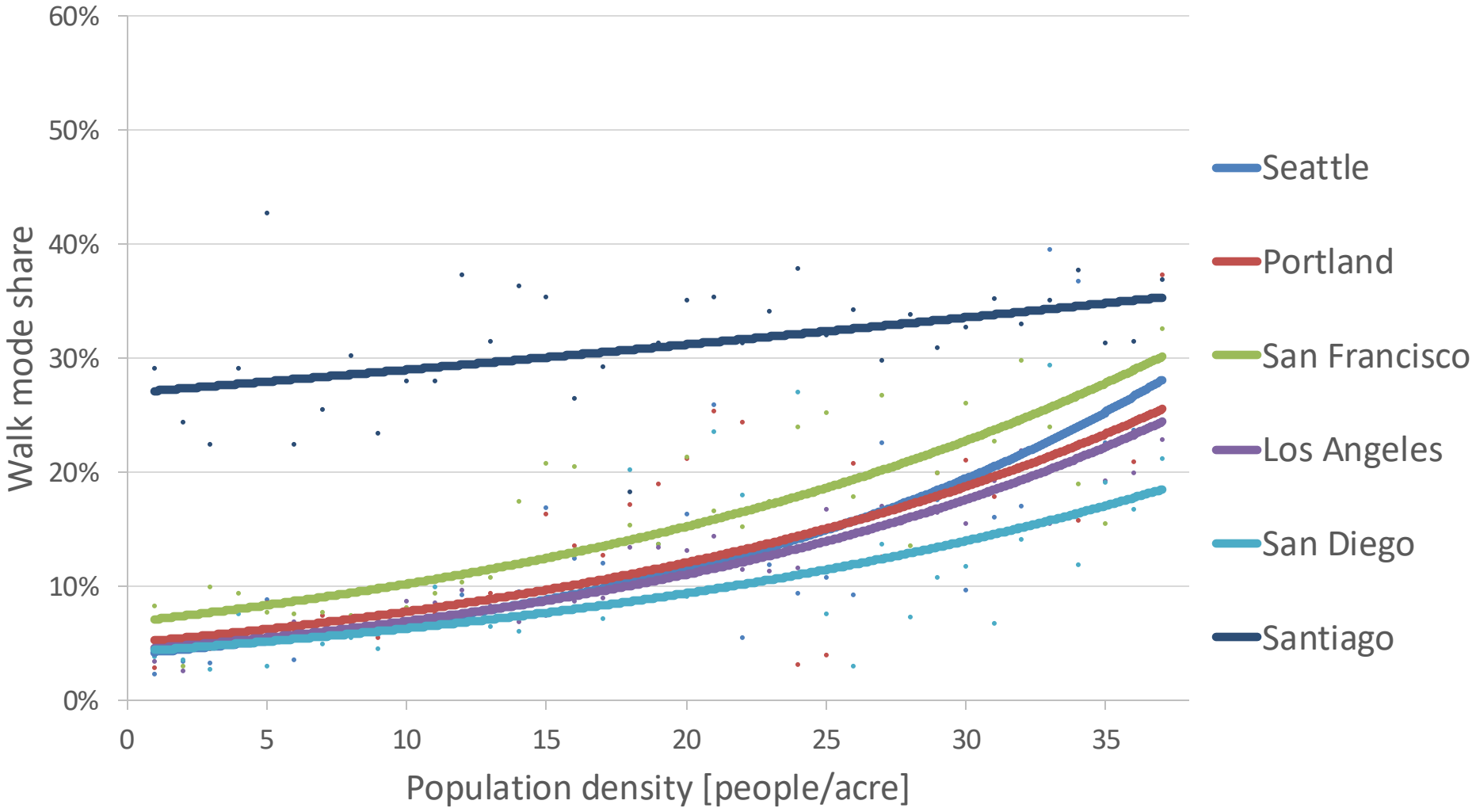
Walk mode share across density levels



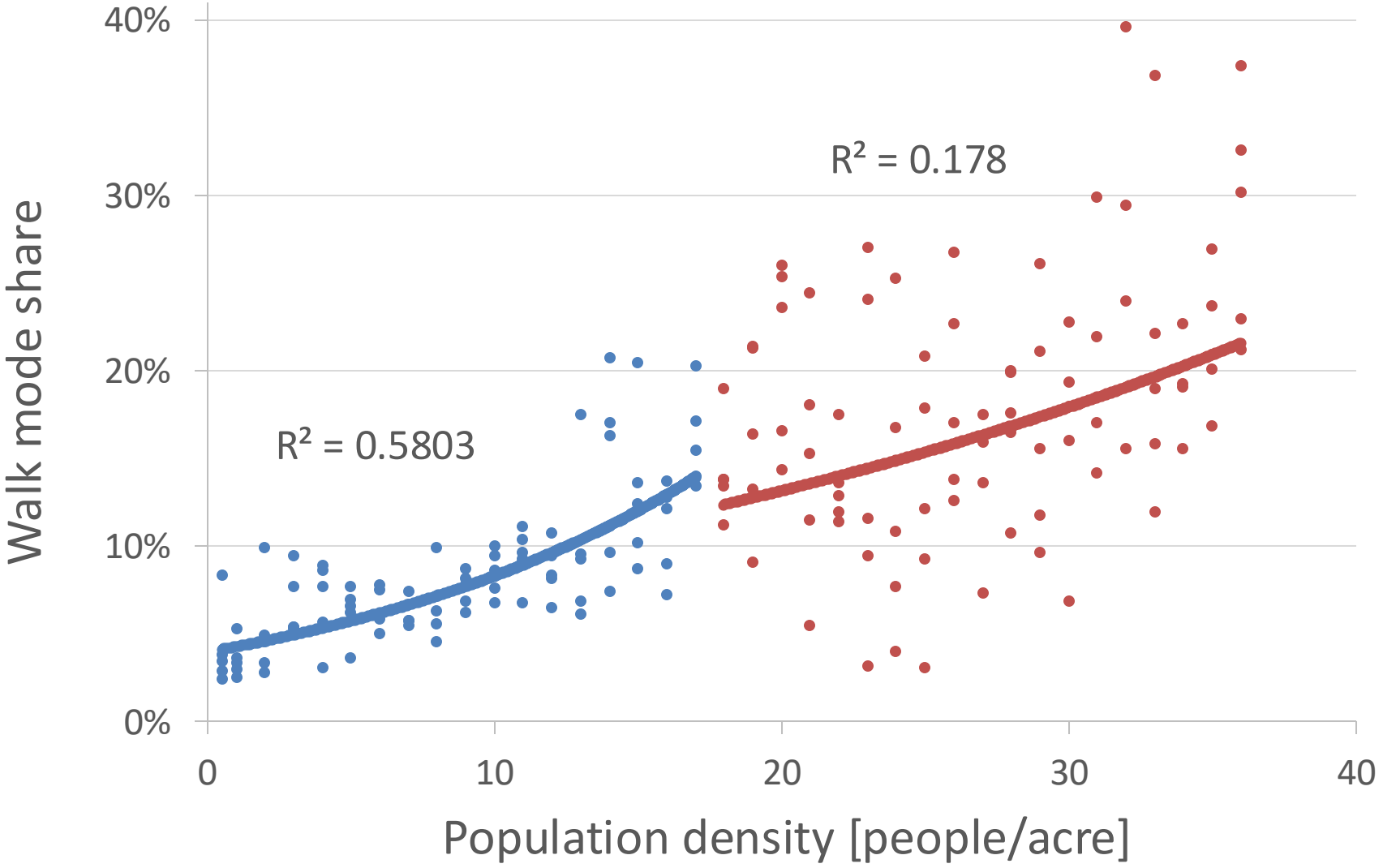
Walk mode share across density levels



Trend lines across density levels



Two different regimes in US cities



Key Findings

- Across US cities, there is variation in relationship between walking & built environment measures across
  - Less variation in population density, the most important explanatory variable
  - Employment, retail services and intersection density exhibit more varied relationship to walking across cities
- Within US cities, we identify at least two regimes: Low/high population density environment
  - A positive, linear effect in walking with densities up to 15-25 people per/acre
  - Above that threshold, the effect is less clear. Could have more regimes?
  - Higher density places are not common in US cities (small sample)
- In Santiago, we see less variation in walking with density patterns.

Conclusions

- In terms of travel behavior:
  - Different built environment responses in each city may be due to larger urban spatial structure: density gradients, regional accessibility, polycentricity, spatial extent
  - Nonlinearities exist
  - Cultural and socio-economic differences

- In terms of transferability:
  - Across US cities, suburban areas are most suited to transfer findings, measures, & models
  - In more urban areas of cities, there are differences in the scale (i.e. variation in maximum densities, transit frequencies, etc.)
  - No evidence to show that anything in US compares to Santiago (different regimes?)

Future Work

- Need better representation of households in higher density environments
- Characterize overall urban spatial structure and the distributions of these built environment components
- Test complementarity among variables
- Account for these different regimes in our models
- Reconstruct & re-estimate PIE for different regions based upon our findings
  - Some preliminary work already done in Montreal

Questions?

Project info & reports:

http://trec.pdx.edu/research/project/510

http://trec.pdx.edu/research/project/677

http://trec.pdx.edu/research/project/1028

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